STP 8-91K15-SM-TG

SOLDIER'S MANUAL AND TRAINER'S GUIDE

MOS 91K MEDICAL LABORATORY SPECIALIST

SKILL LEVELS 1/2/3/4/5

HEADQUARTERS, DEPARTMENT OF THE ARMY

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SKILL LEVELS 1/2/3/4/5
AND TRAINER'S GUIDE

MOS 91K
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PREFACE

This publication is for skill level 1, 2, 3, 4, and 5 soldiers holding military occupational specialty (MOS) 91K and for trainers and first-line supervisors. It contains standardized training objectives, in the form of task summaries, to train and evaluate soldiers on critical tasks which support unit missions during wartime. Trainers and first-line supervisors should ensure soldiers holding MOS/SL 91K1/2/3/4/5 have access to this publication. It should be made available in the soldier's work area, unit learning center, and unit libraries.

This manual applies to both Active and Reserve Component soldiers.

The proponent of this publication is the US Army Medical Department Center and School. Send comments and recommendations on DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commandant, Academy of Health Sciences, ATTN: MCCS-HTI (TLS), Fort Sam Houston, TX 78234-6122.

CHAPTER 1

INTRODUCTION

GENERAL

This manual identifies the individual MOS training requirements for soldiers in MOS 91K. Commanders, trainers, and soldiers should use it to plan, conduct, and evaluate individual training in units. This manual is the primary MOS reference to support the self-development and training of every soldier.

Use this manual with Soldier's Manuals of Common Tasks (STP 21-1-SMCT and STP 21-24-SMCT), Army Training and Evaluation Programs (ARTEPs), and FM 25-101, Battle Focused Training, to establish effective training plans and programs which integrate soldier, leader, and collective tasks.

SOLDIER'S RESPONSIBILITIES

Each soldier is responsible for performing individual tasks which the first-line supervisor identifies based on the unit's METL. The soldier must perform the task to the standards listed in the SM. If a soldier has a question about how to do a task or which tasks in this manual he or she must perform, it is the soldier's responsibility to ask the first-line supervisor for clarification. The first-line supervisor knows how to perform each task or can direct the soldier to the appropriate training materials.

NCO SELF-DEVELOPMENT AND THE SOLDIER'S MANUAL

Self-development is one of the key components of the leader development program. It is a planned progressive and sequential program followed by leaders to enhance and sustain their military competencies. It consists of individual study, research, professional reading, practice, and self-assessment. Under the self-development concept, the NCO, as an Army professional, has the responsibility to remain current in all phases of the MOS. The SM is the primary source for the NCO to use in maintaining MOS proficiency.

Another important resource for NCO self-development is the Army Correspondence Course Program (ACCP). Refer to DA Pamphlet 351-20 for information on enrolling in this program and for a list of courses, or write to: Commandant, Academy of Health Sciences, ATTN: MCCS-HSN, Fort Sam Houston, TX 78234-6199.

Unit learning centers are valuable resources for planning self-development programs. They can help access enlisted career maps, training support products, and extension training materials.

TRAINING SUPPORT

This manual includes the following information which provides additional training support information.

- Appendix A, DA Form 5165-R (Field Expedient Squad Book). This appendix provides an overprinted copy of DA Form 5165-R for the tasks in this MOS. The NCO trainer can use this form to set up the leader book described in FM 25-101, appendix B. The use of this form may help preclude writing the soldier tasks associated with the unit's mission essential task list, and can become a part of the leader book.

- Appendix B contains information on several skills and knowledges which are important for MOS 91K personnel.

- Glossary. The glossary, which follows the last appendix, is a single comprehensive list of acronyms, abbreviations, definitions, and letter symbols.

- References. This section contains two lists of references, required and related, which support training of all tasks in this SM. Required references are listed in the conditions statement and are required for the soldier to do the task. Related references are materials which provide more detailed information and a more thorough explanation of task performance.

CHAPTER 2

TRAINER'S GUIDE (TG)

GENERAL

The TG identifies the essential components of a unit training plan for individual training. Units have different training needs and requirements based on differences in environment, location, equipment, dispersion, and similar factors. Therefore, the TG is a guide used for conducting unit training and not as a rigid standard.

The TG provides information necessary for planning training requirements for the MOS. The TG--

- Identifies subject areas in which to train soldiers.
- Identifies the critical tasks for each subject area.
- Specifies where soldiers are trained to standard on each task.
- Recommends how often to train each task to sustain proficiency.
- Recommends a strategy for cross-training soldiers.
- Recommends a strategy for training soldiers to perform higher level tasks.

BATTLE FOCUSED TRAINING

As described in FM 25-100, Training the Force, and FM 25-101, Battle Focused Training, the commander must first define the mission essential task list (METL) as the basis for unit training. Unit leaders use the METL to identify the collective, leader, and soldier tasks which support accomplishment of the METL. Unit leaders then assess the status of training and lay out the training objectives and the plan for accomplishing needed training. After preparing the long- and short-range plans, leaders then execute and evaluate training. Finally, the unit's training preparedness is reassessed, and the training management cycle begins again. This process ensures that the unit has identified what is important for the wartime mission, that the training focus is applied to the necessary training, and that training meets established objectives and standards.

RELATIONSHIP OF SOLDIER TRAINING PUBLICATIONS (STPs) TO BATTLE- FOCUSED TRAINING

The two key components of enlisted STPs are the Trainer's Guide (TG) and Soldier's Manual (SM). The TG and SM give leaders important information to help in the battle-focused training process. The TG relates soldier and leader tasks in the MOS and SL to duty positions and equipment. It provides information on where the task is trained, how often training should occur to sustain proficiency, and who in

the unit should be trained. As leaders go through the assessment and planning stages, they should use the TG as an important tool in identifying what needs to be trained.

The execution and evaluation of soldier and leader training should rely on the Armywide training objectives and standards in the SM task summaries. The task summaries ensure that soldiers in any unit or location have the same definition of task performance and that trainers evaluate the soldiers to the same standard. The diagram on the following page shows the relationship between battle-focused training and the use of the TG and SM. The left-hand side of the diagram (taken from FM 25-101) shows the soldier training process while the right side of the diagram shows how the STP supports each step of this process.

TRAINER'S RESPONSIBILITIES

Training soldier and leader tasks to standard and relating this training to collective mission-essential tasks is the NCO trainer's responsibility. Trainers use the steps below to plan and evaluate training.

- Identify soldier and leader training requirements. The NCO determines which tasks soldiers need to train on using the commander's training strategy. The unit's METL and ARTEP and the MOS Training Plan (MTP) in the TG are sources for helping the trainer define the individual training needed.

- Plan the training. Training for specific tasks can usually be integrated or conducted concurrently with other training or during "slack periods." The unit's ARTEP can assist in identifying soldier and leader tasks which can be trained and evaluated concurrently with collective task training and evaluation.

- Gather the training references and materials. The SM task summary lists all references which can assist the trainer in preparing for the training of that task.

- Determine risk assessment and identify safety concerns. Analyze the risk involved in training a specific task under the current conditions at the time of scheduled training. Ensure that your training preparation takes into account those cautions, warnings, and dangers associated with each task.

- Train each soldier. Show the soldier how the task is done to standard, and explain step-by-step how to do the task. Give each soldier one chance to do the task step-by-step.

- Emphasize training in mission-oriented protective posture (MOPP) level 4 clothing. Soldiers have difficulty performing even the very simple tasks in a nuclear/chemical environment. The combat effectiveness of the soldier and the unit can degrade quickly when trying to perform in MOPP 4. Practice is the best way to improve performance. The trainer is responsible for training and evaluating soldiers in MOPP 4 so that they are able to perform critical wartime tasks to standards under nuclear/chemical environment.

- Check each soldier. Evaluate how well each soldier performs the tasks in this manual. Conduct these evaluations during individual training sessions or while evaluating soldier proficiency during the conduct of unit collective tasks. This manual provides an evaluation guide for each task to enhance the trainer's ability to conduct year-round, hands-on evaluations of tasks critical to the unit's mission. Use the

BATTLE-FOCUS PROCESS		STP SUPPORT PROCESS
SELECTS SUPPORTING SOLDIER TASKS	_____	USES TG TO RELATE TASKS TO METL
CONDUCTS TRAINING ASSESSMENT	_____	USES TG TO DEFINE WHAT SOLDIER TASKS TO ASSESS
DETERMINES TRAINING OBJECTIVES	_____	USES TG TO SET OBJECTIVES
DETERMINES STRATEGY AND PLANS FOR TRAINING	_____	USES TG TO RELATE SOLDIER TASKS TO STRATEGY
CONDUCTS PRE-EXECUTION CHECKS	_____	USES SM TO DETERMINE TRAINING PREPARATION
EXECUTES TRAINING AND CONDUCTS AFTER-ACTION REVIEW	_____	USES SM TASK SUMMARY AS SOURCE FOR TASK PERFORMANCE
EVALUATES TRAINING AGAINST ESTABLISHED STANDARDS	_____	USES SM TASK SUMMARY AS STANDARD FOR EVALUATION

information in the MTP as a guide to determine how often to train the soldier on each task to ensure that soldiers sustain proficiency.

- Record the results. The leader book referred to in FM 25-101, appendix B, is used to record task performance and gives the leader total flexibility on the method of recording training. The trainer may use DA Forms 5164-R (Hands-On Evaluation) and 5165-R (Field Expedient Squad Book) as part of the leader book. The forms are optional and locally reproducible. STP 21-24-SMCT contains a copy of the forms and instructions for their use.

- Retrain and evaluate. Work with each soldier until he or she can perform the task to specific SM standards.

EVALUATION GUIDE

An evaluation guide exists for each task summary in the SM. Trainers use the evaluation guides year-round to determine if soldiers can perform their critical tasks to SM standards. Each evaluation guide contains one or more performance measures which identify what the trainer needs to observe to score a soldier's performance. Each step is clearly identified by a "P" (Pass) and "F" (Fail), located under the "Results" column on each evaluation guide. Some tasks involve a process which the trainer must observe as the soldier performs the task. For other tasks, the trainer must evaluate an "end product" resulting from doing the task. The following are some general points about using the evaluation guide to evaluate soldiers:

- Review the guide to become familiar with the information on which the soldier will be scored.

- Ensure that the necessary safety equipment and clothing needed for proper performance of the job are on hand at the training site.

- Prepare the test site according to the conditions section of the task summary. Some tasks contain special evaluation preparation instructions. These instructions tell the trainer what modifications must be made to the job conditions to evaluate the task. Reestablish the test site to the original requirements after evaluating each soldier to ensure that conditions are the same for each soldier.

- Advise each soldier of the information in the Brief Soldier section of the task summary before evaluating.

- Score each soldier according to the performance measures in the evaluation guide. Unless otherwise stated in the task summary, the soldier must pass all performance measures to be scored GO. If the soldier fails any steps, show what was done wrong and how to do it correctly.

- Record the date and task performance ("GO" or "NO-GO") in the leader book.

TRAINING TIPS FOR THE TRAINER

1. Prepare yourself.

- Get training guidance from your chain of command on when to train, which soldiers to train, availability of resources, and a training site.

- Get the training objective (task, conditions, and standards) from the task summary in this manual.

- Ensure you can do the task. Review the task summary and the references in the reference section. Practice doing the task or, if necessary, have someone train you on the task.

- Choose a training method.

- Prepare a training outline consisting of informal notes on what you want to cover during your training session.

- Practice your training presentation.

2. Prepare the resources.

- Obtain the required resources identified in the conditions statement for each task.

- Gather equipment and ensure it is operational.

- Coordinate for use of training aids and devices.

- Prepare the training site according to the conditions statement and evaluation preparation section of the task summary, as appropriate.

3. Prepare the soldiers.

- Tell the soldier what task to do and how well it must be done. Refer to the standards statement and evaluation preparation section for each task as appropriate.

- Caution soldiers about safety, environment, and security.

- Provide any necessary training on basic skills that soldiers must have before they can be trained on the task.

- Pretest each soldier to determine who needs training in what areas by having the soldier perform the task. Use DA Form 5164-R and the evaluation guide in each task summary to make this determination.

4. Train the soldiers who failed the pretest.

- Demonstrate how to do the task or the specific performance steps to those soldiers who could not perform to SM standards. Have soldiers study the appropriate materials.

- Have soldiers practice the task until they can perform it to SM standards.

- Evaluate each soldier using the evaluation guide.

- Provide feedback to those soldiers who fail to perform to SM standards and have them continue to practice until they can perform to SM standards.

5. Record results in the leader book.

MILITARY OCCUPATIONAL SPECIALTY TRAINING PLAN

One of the key components of the TG is the MOS Training Plan (MTP). The MTP has two parts to assist the commander in preparing a unit training plan which satisfies integration, cross-train, train-up, and sustainment training requirements for soldiers in this MOS.

PART ONE

Part one of the MTP shows the relationship of an MOS SL between duty position and critical tasks. The critical tasks are grouped by task commonality into subject areas. Section I lists subject area numbers and titles used throughout the MTP. Section II defines the training requirements for each duty position within an MOS and relates duty positions to subject areas and cross-training and train-up/merger requirements.

- Duty position column--contains the MOS duty positions, by skill level, which have different training requirements.

- Subject area column--lists by subject area number, the subject areas in which the soldier must be proficient for that duty position.

- Cross-train column--lists the recommended duty position for which soldiers should be cross-trained.

- Train-up/merger column--lists the corresponding duty position for the next higher SL or MOS the soldier will merge into on promotion.

PART TWO

Part two lists by subject areas, the critical tasks to be trained in an MOS, task number, task title, location, sustainment training frequency, and training SL.

- Subject area column--lists the subject area number and title in the same order as in the MTP, Part One, Section I.

- Task number column--lists the task numbers for all tasks included in the subject area.

- Task title column--lists the task title.

- Training location column--identifies the training location where the task is first trained to STP standards. If the task is first trained to standard in the unit, the word "UNIT" will be in this column. If the task is first trained to standard in the training base, it will identify the resident course where the task was taught.

Figure 2-1 contains a list of training locations and their brevity codes.

AIT	-	Advanced Individual Training
ANCOC	-	Advanced Noncommissioned Officer's Course
BCT	-	Basic Combat Training
BNC	-	Basic Noncommissioned Officer's Course
OSUT	-	One Station Unit Training
PLDC	-	Primary Leadership Development Course
SMC	-	Sergeants Major Course
UNIT	-	Trained in the Unit

Figure 2-1. Training locations

- Sustainment training frequency column--indicates the recommended frequency at which tasks should be trained to ensure the soldier maintains task proficiency. Figure 2-2 identifies the frequency codes to use in this column.

AN - annually
BM - bimonthly (once every two months)
MO - monthly
QT - quarterly
SA - semiannually

Figure 2-2. Sustainment training frequency codes

- Sustainment training SL column--lists the SLs of the MOS for which soldiers must receive sustainment training to ensure they maintain proficiency to SM standards.

- A chart at the end of the MTP indicates the ARTEPs which the individual critical tasks support. This establishes the crosswalk between individual and collective training.

MOS TRAINING PLAN

MOS 91K

PART I. SUBJECT AREAS AND DUTY POSITIONS

SECTION 1. SUBJECT AREA CODES

1. Vital Signs
2. Contamination Control
3. Emergency Medical Treatment
4. General Medical
5. Basic Chemistry/Urinalysis
6. Microbiology
7. Serology
8. Basic Blood Bank
9. Basic Hematology
10. Advanced Chemistry
11. Advanced Blood Bank and Hematology

MOS TRAINING PLAN

MOS 91K

PART I SUBJECT AREAS AND DUTY POSITIONS

SECTION 2. DUTY POSITION TRAINING REQUIREMENTS

	DUTY POSITION	SUBJECT AREAS	CROSS TRAIN	TRAIN-UP/ MERGER
SL 1	Medical Laboratory Specialist	1-8	NA	NA
SL 2	Medical Laboratory Specialist	1-8	NA	91K3 Medical Laboratory NCO
SL 3	Medical Laboratory NCO	1-10	NA	NA
SL 4	Medical Laboratory NCO	1-10	NA	NA
SL 5	Medical Laboratory NCO	1-10	NA	NA

MOS TRAINING PLAN

Part II CRITICAL TASKS **MOS 91K** **Skill Level 1**

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
1. Vital Signs	081-831-0010	Measure A Patient's Respirations	AIT	AN	1-5
	081-831-0011	Measure A Patient's Pulse	AIT	AN	1-5
	081-831-0012	Measure A Patient's Blood Pressure	AIT	AN	1-5
	081-831-0013	Measure A Patient's Temperature	AIT	AN	1-5
2. Contamination Control	081-831-0007	Perform A Patient Care Handwash	AIT	AN	1-5
	081-831-0008	Put On Sterile Gloves	AIT	AN	1-5
	081-831-0037	Disinfect Water For Drinking	AIT	AN	1-5
3. Emergency Medical Treatment	081-831-0018	Open The Airway	AIT	AN	1-5
	081-831-0019	Clear An Upper Airway Obstruction	AIT	AN	1-5
	081-831-0048	Perform Rescue Breathing	AIT	AN	1-5
	081-831-0046	Administer External Chest Compressions	AIT	SA	1-5
4. General Medical	081-831-0035	Manage A Convulsive And/Or Seizing Patient	AIT	AN	1-5
	081-831-0038	Treat A Casualty For A Heat Injury	AIT	AN	1-5
	081-831-0039	Treat A Casualty For A Cold Injury	AIT	AN	1-5
5. Basic Chemistry/ Urinalysis	081-821-1017	Perform A Routine Urinalysis	AIT	AN	1-4
	081-821-1052	Perform Laboratory Tests Using A Kodak DT60 Analyzer	AIT	AN	1-5
	081-821-1063	Perform A Sodium (Na) And Potassium (K) Determination Using A CIBA Corning 614 Electrolyte Analyzer	AIT	AN	1-5
6. Microbiology	081-821-1013	Perform A Gram Stain	AIT	AN	1-5
	081-821-1014	Perform A Giemsa Stain For The Presence Of Malarial Parasites	AIT	AN	1-5
	081-821-1066	Perform Concentration Techniques For Ova And Parasites (Con- trate Method)	AIT	AN	1-5
	081-821-1042	Perform A Macroscopic Examination Of Feces And Test For Occult Blood	AIT	AN	1-5
	081-821-1056	Perform A Potassium (Sodium) Hydroxide Preparation Of Skin Scrapings	AIT	AN	1-5
	081-821-1065	Perform A Microscopic Examination Of Pinworm Preparations	AIT	AN	1-5
	081-821-1067	Perform A Urine Culture, Colony Count, And Susceptibility Test	AIT	AN	1-5

Part II CRITICAL TASKS MOS 91K Skill Level 1

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	081-821-1068	Perform A Wound Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1069	Perform A Blood Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1070	Perform A Sputum Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1071	Perform A Stool Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1072	Perform A Cerebrospinal (CSF) Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1073	Perform A Culture And Susceptibility Test For Gonorrhea	AIT	AN	1-5
	081-821-1074	Perform A Throat Culture And Susceptibility Test	AIT	AN	1-5
	081-821-1053	Perform A Disk Diffusion Antibiotic Susceptibility Test	AIT	AN	1-5
	081-821-1075	Perform A Microscopic Examination For Acid-Fast Bacteria	AIT	AN	1-5
7. Serology	081-821-1033	Perform A Rapid Plasma Reagin (RPR) Test	AIT	AN	1-5
	081-821-1058	Perform A Serological Test For Infectious Mononucleosis	AIT	AN	1-5
	081-821-1064	Perform A Qualitative HCG Test	AIT	AN	1-5
8. Basic Blood Bank	081-821-1018	Perform ABO Grouping And Confirmation Tests	AIT	AN	1-5
	081-821-1019	Perform An Rh Typing	AIT	AN	1-5
	081-821-1020	Perform A Test For Rh Variant (Weak D)	AIT	AN	1-5
	081-821-1021	Perform An Antibody Screen	AIT	AN	1-5
	081-821-1022	Perform Direct Antiglobulin Tests	AIT	AN	1-5
	081-821-1023	Perform A Crossmatch Procedure	AIT	AN	1-5
	081-821-1024	Store Blood	AIT	AN	1-5
9. Basic Hematology	081-821-1034	Obtain A Blood Specimen By Capillary Puncture	AIT	AN	1-5
	081-833-0032	Obtain A Blood Specimen Using A Vacutainer	AIT	AN	1-5
	081-821-1036	Perform A WBC Count On Whole Blood	AIT	AN	1-5
	081-821-1083	Perform A Wright's Stain Using Camco Quik Stain	AIT	AN	1-5

Part II CRITICAL TASKS MOS 91K Skill Level 1

Subject Area	Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
	081-821-1039	Perform A WBC Differential Count	AIT	AN	1-5
	081-821-1040	Perform A Microhematocrit Determination	AIT	AN	1-5
	081-821-1041	Perform A One-Stage Prothrombin Time Test	AIT	AN	1-5
	081-821-1046	Perform A Complete Blood Count (CBC) Using The QBC II Centrifugal Hematology System	AIT	AN	1-5
	081-821-1049	Perform A Manual Platelet Count	AIT	AN	1-5
	081-821-1076	Perform A Prothrombin Time (PT) Test Using The MLA Electra 750	AIT	AN	1-5
	081-821-1077	Perform An Activated Partial Thromboplastin Time (APTT) Test Using The MLA Electra 750	AIT	AN	1-5
	081-821-1078	Perform A Fibrinogen Level Determination	AIT	AN	1-5
	081-821-1079	Perform A Fibrin/Fibrinogen Degradation Products (FDP) Test Using The Thrombo-Wellcotest Latex Test Kit	AIT	AN	1-5

Part II CRITICAL TASKS MOS 91K Skill Level 3

10. Advanced Chemistry	081-821-1080	Perform A Blood Gas Analysis Using The GEMstat Blood Gas Analyzer	BNCOC	AN	3-5
	081-821-1081	Determine The Clinical Significance Of A Routine Urinalysis	BNCOC	AN	3-5
11. Advanced Blood Bank and Hematology	081-821-1025	Issue And Receive Unused Blood	BNCOC	AN	3-5
	081-821-1026	Prepare Blood For Shipment	BNCOC	AN	3-5
	081-821-1027	Prepare Packed Cells	BNCOC	AN	3-5
	081-821-1031	Collect Donor Blood	BNCOC	AN	3-5
	081-821-1032	Process Donor Blood	BNCOC	AN	3-5
	081-821-1038	Perform A Differential And A White Blood Cell Count On Cerebrospinal Fluid (CSF)	BNCOC	AN	3-5
	081-821-1043	Determine Blood Donor Eligibility	BNCOC	AN	3-5
	081-821-1082	Thaw Fresh Frozen Plasma	BNCOC	AN	3-5

INDIVIDUAL TASK/ARTEP CROSSWALK

	026-30 027-30	057-30 456-30	058-30	437-30 457-30	487-30	705	715	725	765-30
081-831-0010	X	X	X	X	X	X	X	X	X
081-831-0011	X	X	X	X	X	X	X	X	X
081-831-0012	X	X	X	X	X	X	X	X	X
081-831-0013	X	X	X	X	X	X	X	X	X
081-831-0007	X	X	X	X	X	X	X	X	X
081-831-0008	X	X	X	X	X	X	X	X	X
081-831-0037	X	X	X	X	X	X	X	X	X
081-831-0018	X	X	X	X	X	X	X	X	X
081-831-0019	X	X	X	X	X	X	X	X	X
081-831-0048	X	X	X	X	X	X	X	X	X
081-831-0046	X	X	X	X	X	X	X	X	X
081-831-0035	X	X	X	X	X	X	X	X	X
081-831-0038	X	X	X	X	X	X	X	X	X
081-831-0039	X	X	X	X	X	X	X	X	X
081-821-1017	X	X	X	X		X	X	X	X
081-821-1052						X	X	X	
081-821-1063						X	X	X	
081-821-1013	X	X	X	X		X	X	X	X
081-821-1014						X	X	X	X
081-821-1066						X	X	X	X
081-821-1042	X	X	X	X		X	X	X	X
081-821-1056						X	X	X	X
081-821-1065						X	X	X	X
081-821-1067							X	X	

INDIVIDUAL TASK/ARTEP CROSSWALK

	026-30 027-30	057-30 456-30	058-30	437-30 457-30	487-30	705	715	725	765-30
081-821-1068							X	X	
081-821-1069							X	X	
081-821-1070							X	X	
081-821-1071							X	X	
081-821-1072							X	X	
081-821-1073							X	X	
081-821-1074							X	X	
081-821-1053							X	X	
081-821-1075							X	X	
081-821-1033						X	X	X	X
081-821-1058						X	X	X	X
081-821-1064						X	X	X	X
081-821-1018					X	X	X	X	X
081-821-1019					X	X	X	X	X
081-821-1020					X	X	X	X	X
081-821-1021					X	X	X	X	X
081-821-1022					X	X	X	X	X
081-821-1023					X	X	X	X	X
081-821-1024	X	X	X	X	X	X	X	X	X
081-821-1034	X	X	X	X		X	X	X	X
081-833-0032	X	X	X	X		X	X	X	X
081-821-1036	X	X	X	X		X	X	X	X
081-821-1083	X	X	X	X		X	X	X	X

INDIVIDUAL TASK/ARTEP CROSSWALK

	026-30 027-30	057-30 456-30	058-30	437-30 457-30	487-30	705	715	725	765-30
081-821-1039	X	X	X	X		X	X	X	X
081-821-1040	X	X	X	X		X	X	X	X
081-821-1041						X	X	X	
081-821-1046						X	X	X	
081-821-1049						X	X	X	
081-821-1076						X	X	X	
081-821-1077						X	X	X	
081-821-1078							X	X	
081-821-1079							X	X	
081-821-1080						X	X	X	
081-821-1081						X	X	X	
081-821-1025	X	X	X	X	X	X	X	X	X
081-821-1026					X	X	X	X	X
081-821-1027					X	X	X	X	X
081-821-1031					X	X	X	X	
081-821-1032					X	X	X	X	
081-821-1038						X	X	X	
081-821-1043					X	X	X	X	
081-821-1082						X	X	X	X

CHAPTER 3
MOS SKILL LEVEL TASKS

SECTION I
SKILL LEVEL 1 TASKS

081-831-0010

MEASURE A PATIENT'S RESPIRATIONS

CONDITIONS

Necessary materials and equipment: a watch and appropriate forms.

STANDARDS

Count a patient's respirations for 1 full minute. Identify any abnormalities in respiration rate, depth, rhythm, pattern, and quality.

TRAINING/EVALUATION

Training Information Outline

1. Count the number of times the chest rises in 1 minute.

NOTE: The patient should not be aware that respirations are being counted. If the patient is aware, he or she often becomes tense, and an accurate count becomes extremely difficult. The normal respiration rate for an adult is generally considered to be between 12 and 20 respirations per minute.

2. Evaluate the respirations.

   a. Depth.

      (1) Normal--deep, even movement of the chest.

      (2) Shallow--minimal rise and fall of the chest and abdomen.

      (3) Deep--the rib cage expands fully, and the diaphragm descends to create a maximum capacity.

   b. Rhythm and pattern.

      (1) Healthy--exhalations are twice as long as inhalations.

      (2) Irregular.

(3) Hypoventilation--slow and shallow respirations.

(4) Hyperventilation--sustained increased rate and depth of respiration.

(5) Sigh--deep inhalation followed by a slow audible exhalation.

(6) Apnea--temporary absence of breathing.

(7) Tachypnea--increased respiration rate, usually 24 or more breaths per minute.

c. Quality.

(1) Normal--effortless, automatic, regular rate, even depth, noiseless, and free of discomfort.

(2) Dyspnea--difficult or labored breathing.

(3) Wheezing or whistling sound.

(4) Rattling or bubbling.

3. Check for the physical characteristics of abnormal respirations.

a. Appearance--the casualty may appear restless, anxious, pale, ashen, or cyanotic.

b. Position--the casualty may alter his or her position by leaning forward or may be unable to lie flat.

c. Cough.

(1) Acute--comes on suddenly.

(2) Chronic--has existed for a long time.

(3) Dry--coughs without sputum.

(4) Productive--coughs which expel sputum.

(a) Normal sputum--clear, semiliquid mucus which may appear watery, frothy, or thick.

(b) Abnormal sputum--may be green, yellow, gray, or blood-tinged, and may have a foul or sweetish smell.

4. Record the rate of respirations and any observations noted on the appropriate forms.

5. Report any abnormal respirations to the supervisor immediately.

Evaluation Preparation

Setup: You must count the rate with the soldier. If you are using a simulated patient, you may test step 2 by having him or her purposely exhibit abnormal breathing characteristics. A tolerance of plus or minus two counts will be allowed.

Brief soldier: Tell the soldier to count, evaluate, and record a patient's respirations.

Evaluation Guide

Performance Measures	**Results**	
1. Count the number of times the chest rises in 1 minute.	P	F
2. Evaluate the respirations.	P	F
3. Check for the physical characteristics of abnormal respirations.	P	F
4. Record the rate of respirations and any observations noted on the appropriate forms.	P	F
5. Report any abnormal respirations to the supervisor immediately.	P	F

REFERENCES: None

081-831-0011

MEASURE A PATIENT'S PULSE

CONDITIONS

Necessary materials and equipment: a watch, stethoscope, and appropriate forms.

STANDARDS

Count a patient's pulse for 1 full minute. Identify any abnormalities in the pulse rate, rhythm, and strength.

TRAINING/EVALUATION

Training Information Outline

1. Position the patient so that the pulse site is accessible.
2. Palpate the pulse site.
    a. Place the tips of the index and middle fingers on the pulse site.

NOTE: A stethoscope must be used to monitor the apical site.

    b. Press the fingers, using moderate pressure, to feel the pulse.
3. Count for 1 full minute and evaluate the pulse.

NOTE: To detect irregularities, it is necessary to count for 1 full minute.

    a. Pulse rate.
        (1) Normal adult rate--60 to 80 beats per minute.
        (2) Bradycardia--less than 50 beats per minute.
        (3) Tachycardia--more than 100 beats per minute.
    b. Pulse rhythm.
        (1) Regular.
            (a) Usually easy to find.
            (b) Has a regular rate and rhythm.

(c) Varies with the individual.

(2) Irregular/intermittent--any change from a regular beating pattern.

NOTE: If a peripheral pulse is irregular or intermittent, a second pulse should be taken at the carotid, femoral, or apical site. (See Figure 3-1.)

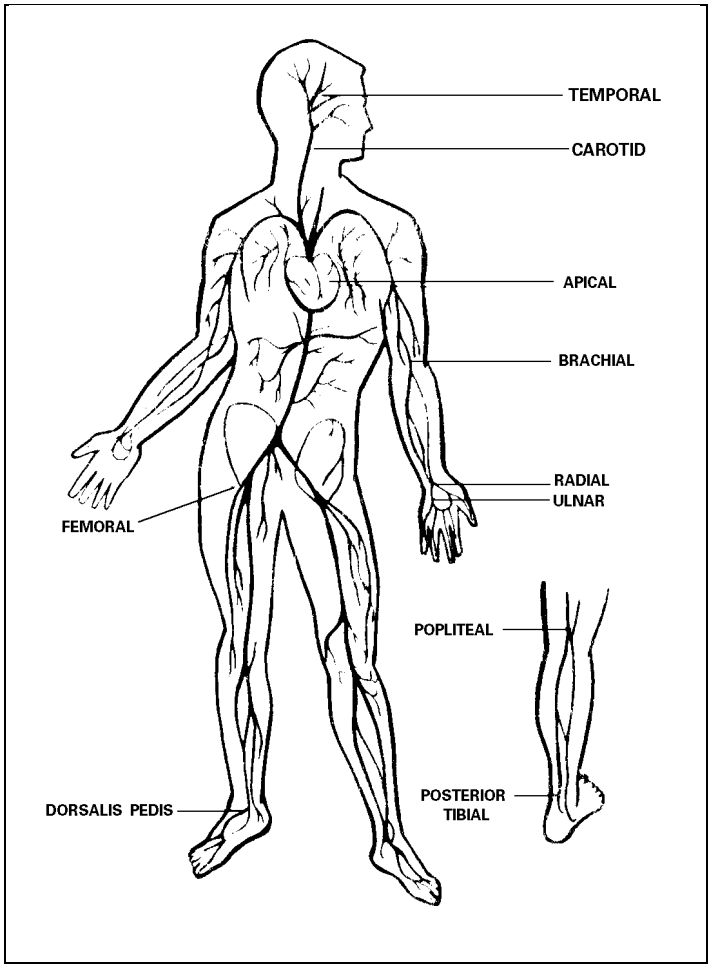


Figure 3-1

c. Pulse strength.

(1) Strong.

(a) Easy to find.

(b) Has even beats with good force.

(2) Bounding.

(a) Easy to find.

(b) Exceptionally strong heartbeats which make the arteries difficult to compress.

(3) Weak/thready--difficult to find.

4. Record the rate, rhythm, strength, and any significant deviations from normal on the appropriate forms.

5. Report any significant pulse abnormalities to the supervisor immediately.

Evaluation Preparation

Setup: While the soldier is palpating a pulse site, you must palpate the corresponding site. Specify which site the soldier is to palpate. If the apical site is chosen, either a double stethoscope or separate stethoscopes may be used. A tolerance of plus or minus two beats will be allowed.

Brief soldier: Tell the soldier to count, evaluate, and record the patient's pulse.

Evaluation Guide

Performance Measures	**Results**	
1. Position the patient so that the pulse site is accessible.	P	F
2. Palpate the pulse site.	P	F
3. Count for 1 full minute and evaluate the pulse.	P	F
4. Record the rate, rhythm, strength, and any significant deviations from normal on the appropriate forms.	P	F
5. Report any significant pulse abnormalities to the supervisor immediately.	P	F

REFERENCES: None

081-831-0012

MEASURE A PATIENT'S BLOOD PRESSURE

CONDITIONS

Necessary materials and equipment: sphygmomanometer, clean stethoscope, and appropriate forms.

STANDARDS

Measure a patient's blood pressure and record the measurement on the appropriate forms.

TRAINING/EVALUATION

Training Information Outline

1. Explain the procedure to the patient, if necessary.

    a. The length of time the procedure will take.

    b. The site to be used.

    c. The physical sensations the patient will feel.

2. Check the equipment.

    a. Ensure that the cuff is deflated completely and fully retighten the thumbscrew.

    b. Ensure the sphygmomanometer gauge reads zero.

NOTE: Steps 2, 3, and 4 describe the procedure for taking the blood pressure at the brachial site. If the brachial site cannot be used, measure the blood pressure using a larger cuff applied to the thigh. The patient should be lying down (preferably on the stomach; otherwise, on the back with one knee flexed). Apply the cuff at mid-thigh, and place the stethoscope over the popliteal artery. The remainder of the procedure is the same as for the brachial artery site.

3. Position the patient.

    a. Place the patient in a relaxed and comfortable sitting, standing, or lying position.

NOTE: A reading obtained from a standing position will be slightly higher.

    b. Place the patient's arm palm up at approximately heart level. Support the arm so that it is relaxed.

4. Place the cuff at the brachial artery site.

a. Place the cuff so that the lower edge is one to two inches above the elbow and the bladder portion is over the artery.

b. Wrap the cuff just tightly enough to prevent slippage.

c. If applicable, clip the gauge to the cuff in alignment with the palm.

5. Position the stethoscope, if used.

a. Palpate for the brachial pulse.

b. Place the diaphragm of the stethoscope over the pulse site.

6. Inflate the cuff until the gauge reads at least 140 mm Hg or 10 mm Hg higher than the usual range for that patient, if known.

NOTE: If a pulsation is heard when the gauge reaches 140 mm Hg, continue to inflate the cuff 10 mm Hg beyond the point at which the last pulsation was heard.

CAUTION

The cuff should not remain inflated for more than two minutes.

7. Determine the blood pressure.

a. If a stethoscope is used, complete the following steps.

(1) Rotate the thumbscrew slowly in a counterclockwise motion, allowing the cuff to deflate slowly.

(2) Watch the gauge and remember the reading when the first distinct sound is heard (systolic pressure).

(3) Continue to watch the gauge and remember the reading where the sound changes again and becomes muffled or unclear (diastolic pressure).

(4) Release the remaining air.

b. If a stethoscope is not used, complete the following steps.

(1) Palpate for the radial pulse.

(2) Rotate the thumbscrew slowly in a counterclockwise motion, allowing the cuff to deflate slowly.

(3) Watch the gauge and remember the point at which the pulse returns (systolic pressure).

NOTE: The diastolic pressure cannot be determined using this method.

NOTE: If the procedure must be repeated, wait at least 1 minute before repeating steps 5 through 7.

8. Record the blood pressure on the appropriate forms.

   a. Record the systolic reading over the diastolic reading, for example 120/80.

   b. Record the readings in even numbers.

9. Evaluate the blood pressure reading by comparing it with one of the following:

   a. The patient's previous reading.

   b. An average of the patient's previous readings.

   c. The normal range: 100-140/60-90 for males and 90-130/50-60 for females.

10. Report abnormal readings to the supervisor.

Evaluation Preparation

Setup: A double stethoscope should be used if available. A tolerance of ± 4 mm Hg will be allowed. If other methods are used, such as independent measurements on different sites or at different times, the evaluator must apply discretion in applying the ± 4 mm Hg standard. You will allow the soldier to retake the blood pressure at least once if the soldier feels that it is necessary to obtain an accurate reading. You will use discretion in allowing additional repetitions based upon the difficulty of obtaining a reading on the patient.

Brief soldier: Tell the soldier to take a patient's blood pressure. Tell the soldier that the blood pressure may be retaken, if necessary, to obtain an accurate reading.

Evaluation Guide

Performance Measures	**Results**
1. Explain the procedure to the patient, if necessary.	P F
2. Check the equipment.	P F
3. Position the patient.	P F
4. Place the cuff just tightly enough to prevent slippage.	P F
5. Position the stethoscope, if used.	P F
6. Inflate the cuff until the gauge reads at least 140 mm Hg or10 mm Hg higher than the usual range for that patient, if known.	P F
7. Determine the blood pressure.	P F
8. Record the blood pressure on the appropriate forms.	P F
9. Evaluate the blood pressure.	P F
10. Report any abnormal readings to the supervisor.	P F

REFERENCES: None

081-831-0013

MEASURE A PATIENT'S TEMPERATURE

CONDITIONS

You have performed a patient care handwash. Necessary materials and equipment: disinfected oral and rectal thermometers, thermometer canisters marked "used," water soluble lubricant, gauze pads, a watch, and appropriate forms.

STANDARDS

Record a patient's temperature to the nearest 0.2° F.

TRAINING/EVALUATION

Training Information Outline

1. Determine which site to use.

a. Take an oral temperature if the patient is conscious, can follow directions, and can breathe normally through the nose.

CAUTION

Do not take an oral temperature when the patient--

1. Has had recent facial or oral surgery;
2. Is confused, disturbed, or heavily sedated;
3. Is being administered oxygen by mouth or nose;
4. Is likely to bite down on the thermometer;
5. Has smoked, chewed gum, or ingested anything hot or cold within the last 15 to 30 minutes.

b. Take a rectal temperature if the oral site is ruled out by the patient's condition or when the patient is unconscious.

CAUTION

Do not take a rectal temperature on a patient with a cardiac condition, diarrhea, a rectal disorder such as hemorrhoids, or recent rectal surgery.

c. Take an axillary temperature if the patient's condition rules out using the other two methods.

2. Select the proper thermometer.

   a. An oral thermometer has a blue tip and may be labeled "Oral."

   b. A rectal thermometer has a red tip and may be labeled "Rectal."

   c. Axillary temperatures are taken with oral thermometers.

3. Explain the procedure and position the patient.

   a. Take an oral temperature with the patient seated or lying face up.

   b. Take a rectal temperature with the patient lying on either side with the top knee flexed.

   c. Take an axillary temperature with the patient lying face up with the armpit exposed.

4. Measure the temperature.

   a. Shake the thermometer down to below 94° F.

   b. Place the thermometer at the proper site.

   (1) If you are taking an oral temperature, place the thermometer in the heat pocket under the tongue and tell the patient to close his or her lips and not to bite down.

   (2) If you are taking a rectal temperature, insert the thermometer 1 to 2 inches into his or her rectum.

CAUTION
Lubricate the tip prior to insertion. Hold the thermometer in place.

   (3) If you are taking an axillary temperature, pat the armpit dry and then place the bulb end in the center with the glass tip protruding to the front of the patient's body. Place the arm across his or her chest.

   c. Leave the thermometer in place for the required time.

   (1) Oral--at least 3 minutes.

   (2) Rectal--at least 2 minutes.

   (3) Axillary--at least 10 minutes.

5. Remove the thermometer and wipe it down with a gauze square.

6. Read the scale.

7. Put the thermometer in the proper "used" canister.

8. Record the temperature to the nearest 0.2° F on the appropriate forms and report any abnormal temperature change immediately to the supervisor.

NOTE: The normal temperature range is--

Oral	- 97.0° F to 99.0° F.
Rectal	- 98.0° F to 100.0° F.
Axillary	- 96.0° F to 98.0° F.

NOTE: Record an axillary temperature with an "A" on the patient's record. Record a rectal temperature with an "R" on the patient's record.

Evaluation Preparation

Setup: To test step 1 for evaluation purposes, create a scenario in which the patient's condition will dictate which site the soldier must choose.

Brief soldier: Tell the soldier to measure, evaluate, and record a patient's temperature.

Evaluation Guide

Performance Measures	**Results**	
1. Determine which site to use.	P	F
2. Select the proper thermometer.	P	F
3. Explain the procedure and position the patient.	P	F
4. Measure the temperature.	P	F
5. Remove the thermometer and wipe it down with a gauze square.	P	F
6. Read the scale.	P	F
7. Put the thermometer in the proper "used" canister.	P	F
8. Record the temperature to the nearest 0.2° F on the appropriate forms and report any abnormal temperature change immediately to the supervisor.	P	F

REFERENCES:	***Required***	***Related***
		FM 8-230

081-831-0007

PERFORM A PATIENT CARE HANDWASH

CONDITIONS

You are about to administer patient care or have just had hand contact with a patient or contaminated material. Necessary materials and equipment: running water or two empty basins, a canteen, a water source, soap, towels (cloth or paper), and a towel receptacle or trash can.

STANDARDS

Perform a patient care handwash without recontaminating your hands.

TRAINING/EVALUATION

Training Information Outline

1. Remove wristwatch and jewelry, if applicable.

NOTE: Rings should not be worn. If rings are worn, they should be of simple design with few crevices for harboring bacteria. Fingernails should be clean, short, and free of nail polish.

2. Roll shirt sleeves to above the elbows, if applicable.

3. Prepare to perform the handwash.

   a. If using running water, turn on the warm water.

   b. If running water is not available, set up the basins and open the canteen.

4. Wet the hands, wrists, and forearms.

   a. If using running water, hold the hands, wrists, and forearms under the running water.

   b. If running water is not available, fill one basin with enough water to cover the hands and refill the canteen.

5. Cover the hands, wrists, and forearms with soap.

NOTE: For routine patient care, use regular hand soap. For an invasive procedure such as a catheterization or an injection, use antimicrobial soap.

6. Wash the hands, wrists, and forearms.

    a. Use a circular scrubbing motion, going from the fingertips toward the elbows.

    b. Give particular attention to creases and folds in the skin.

    c. Wash ring(s), if present.

7. Rinse the hands, wrists, and forearms.

    a. If using running water.

        (1) Hold the hands higher than the elbow under the running water until all soap is removed.

        (2) Do not touch any part of the sink or faucet.

    b. If not using running water.

        (1) Use a clean towel to grasp the canteen with one hand.

        (2) Rinse the other hand, wrist, and forearm, letting the water run into the empty basin. Hold the hands higher than the elbows.

        (3) Repeat the procedure for the other arm.

        (4) Do not touch any dirty surfaces while rinsing the hands.

8. Dry the hands, wrists, and forearms.

    a. Use a towel to dry one arm from the fingertips to the elbow without retracing the path with the towel.

    b. Dispose of the towel properly without dropping the hand below waist level.

    c. Repeat the process for the other arm using another towel.

9. Use a towel to turn off the running water, if applicable.

10. Reinspect the fingernails and clean them and rewash the hands, if necessary.

Evaluation Preparation

Setup: None

Brief soldier: Tell the soldier to perform a patient care handwash. You may specify which method to use. The soldier need not perform both.

Evaluation Guide

Performance Measures	**Results**	
1. Remove wristwatch and jewelry, if applicable.	P	F
2. Roll shirt sleeves to above the elbows, if applicable.	P	F
3. Prepare to perform the handwash.	P	F
4. Wet hands, wrists, and forearms.	P	F
5. Cover the hands, wrists, and forearms with soap.	P	F
6. Wash the hands, wrists, and forearms.	P	F
7. Rinse the hands, wrists, and forearms.	P	F
8. Dry the hands, wrists, and forearms.	P	F
9. Use a towel to turn off the running water, if applicable.	P	F
10. Reinspect the fingernails and clean them and rewash the hands, if necessary.	P	F

REFERENCES:	***Required***	***Related***
		FM 8-230

081-831-0008

PUT ON STERILE GLOVES

CONDITIONS

Necessary materials and equipment: handwashing facilities, sterile gloves, and a flat, clean, dry surface.

STANDARDS

Put on and remove sterile gloves without contaminating self or the gloves.

TRAINING/EVALUATION

Training Information Outline

1. Select and inspect the package.
    a. Select the proper size of glove.
    b. Inspect the package for possible contamination.
        (1) Water spots.
        (2) Moisture.
        (3) Tears.
        (4) Any other evidence that the package is not sterile.
2. Perform a patient care handwash.
3. Open the sterile package.
    a. Place the package on a flat, clean, dry surface in the area where the gloves are to be worn.
    b. Peel the outer wrapper open to completely expose the inner package.
4. Position the inner package.
    a. Remove the inner package touching only the folded side of the wrapper.
    b. Position the package so that the cuff end is nearest the soldier.

5. Unfold the inner package.

    a. Grasp the lower corner of the package.

    b. Open the package to a fully flat position without touching the gloves.

6. Expose both gloves.

    a. Grasp the lower corners or designated areas on the folder.

    b. Pull gently to the side without touching the gloves.

7. Put on the first glove.

    a. Grasp the cuff at the folded edge and remove it from the wrapper.

    b. Step away from the table or tray.

    c. Keeping the hands above the waist, insert the fingers of the other hand into the glove.

    d. Pull the glove on touching only the exposed inner surface of the glove.

NOTE: If there is difficulty in getting the fingers fully fitted into the glove fingers, make the adjustment after both gloves are on.

8. Put on the second glove.

    a. Insert the fingertips of the gloved hand under the edge of the folded over cuff.

NOTE: The gloved thumb may be kept up and away from the cuff area or may be inserted under the edge of the folded over cuff with the fingertips.

    b. Keeping the hands above the waist, insert the fingers of the ungloved hand into the glove.

    c. Pull the glove on.

    d. Do not contaminate either glove.

9. Adjust the gloves to fit properly.

    a. Grasp and pick up the glove surfaces on the individual fingers to adjust them.

    b. Pick up the palm surfaces and work the fingers and hands into the gloves.

    c. Interlock the gloved fingers and work the gloved hands until the gloves are firmly on the fingers.

NOTE: If either glove tears while putting them on or adjusting the gloves, both gloves must be removed and the procedure must be repeated.

10. Remove the gloves.

    a. Grasp one glove at the heel of the hand with the other gloved hand.

    b. Peel off the glove, retaining it in the palm of the gloved hand.

    c. Reach under the cuff of the remaining glove with one or two fingers of the ungloved hand.

    d. Peel off the glove over the glove being held in the palm.

    e. Do not contaminate self.

CAUTION
Do not "snap" the gloves while removing them.

11. Discard the gloves IAW local SOP.

12. Perform a patient care handwash.

Evaluation Preparation

Setup: If performance of this task must be simulated for training and evaluation, the same gloves may be used repeatedly as long as they are properly rewrapped after each use. You may give the soldier a torn or moist glove package to test step 1.

NOTE: If the soldier does not know his or her glove size, have several different sizes available to try on to determine the correct size.

Brief soldier: Tell the soldier to put on and remove the sterile gloves.

Evaluation Guide

Performance Measures	Results	
1. Select and inspect the package.	P	F
2. Perform a patient care handwash.	P	F
3. Open the sterile package.	P	F
4. Position the inner package.	P	F
5. Unfold the inner package.	P	F
6. Expose both gloves.	P	F
7. Put on the first glove.	P	F
8. Put on the second glove.	P	F
9. Adjust the gloves to fit properly.	P	F
10. Remove the gloves.	P	F
11. Discard the gloves IAW the local SOP.	P	F
12. Perform a patient care handwash.	P	F

REFERENCES: None

081-831-0037

DISINFECT WATER FOR DRINKING

CONDITIONS

You are a member of a field sanitation team. You have just filled a Lyster bag or Water Buffalo from a source that is not safe for drinking. Necessary materials and equipment: calcium hypochlorite, clean stirring implement, mess kit spoon, a canteen cup, and a field chlorination kit.

STANDARDS

Disinfect water to a chlorine residual of 5 parts per million (ppm) or as ordered by the command surgeon.

TRAINING/EVALUATION

Training Information Outline

1. Mix the stock disinfecting solution.
    a. Add the prescribed dosage of calcium hypochlorite to 1/2 canteen cup of water.
        (1) 3 ampules per 36 gallons of water.
        (2) 22 ampules or 3 plastic MRE spoonfuls (from a bulk container) in 400 gallons of water.
    b. Stir the stock solution.
2. Add the stock solution to the water container.
    a. Pour the stock solution into the water container.
    b. Mix the solution vigorously with a clean implement.
    c. Cover the container.
3. Flush the faucets.
4. Test the chlorine residual after 10 minutes.
    a. Follow the manufacturer's instructions on the color comparator in the chlorination kit to test the chlorine residual.
    b. Retest the chlorine residual after 20 minutes.

5. Retest the water two or three times daily.

Evaluation Preparation

Setup: Test this task only when there is a need to disinfect water for drinking. Do not simulate this task for training or evaluation.

Brief soldier: Tell the soldier to disinfect the water. After the soldier completes step 5, ask him or her how often the water should be retested.

Evaluation Guide

Performance Measures	**Results**	
1. Mix the stock disinfecting solution.	P	F
2. Add the stock solution to the water container.	P	F
3. Flush the faucets.	P	F
4. Test the chlorine residual after 10 minutes.	P	F
5. Retest the chlorine residual after 20 minutes.	P	F
6. Retest the water two or three times daily.	P	F

REFERENCES: None

081-831-0018

OPEN THE AIRWAY

CONDITIONS

You are evaluating a casualty who is not breathing. You are not in an NBC environment.

STANDARDS

All of the steps to open the casualty's airway are completed without causing unnecessary injury.

Training Information Outline

1. Roll the casualty onto his or her back, if necessary.
   a. Kneel beside the casualty.
   b. Raise the near arm and straighten it out above the head.
   c. Adjust the legs so that they are together and straight or nearly straight.
   d. Place one hand on the back of the casualty's head and neck.
   e. Grasp the casualty under the arm with the free hand.
   f. Pull steadily and evenly toward you, keeping the head and neck in line with the torso.
   g. Roll the casualty as a single unit.
   h. Place the casualty's arms at his or her sides.
2. Establish the airway using the head-tilt/chin-lift or jaw thrust method.
   a. Head-tilt/chin-lift method.

CAUTION

Do not use this method if a spinal or neck injury is suspected.

NOTE: Remove any foreign material or vomitus seen in the mouth as quickly as possible.

(1) Kneel at the level of the casualty's shoulders.

(2) Place one hand on the casualty's forehead and apply firm, backward pressure with the palm of the hand to tilt the head back.

(3) Place the fingertips of the other hand under the boney part of the casualty's lower jaw, bringing the chin forward.

CAUTIONS

1. Do not use the thumb to lift the lower jaw.
2. Do not press deeply into the soft tissue under the chin with the fingers.
3. Do not completely close the casualty's mouth.

b. Jaw thrust.

CAUTION

Use this method if a spinal or neck injury is suspected.

(1) Kneel at the top of the casualty's head.

(2) Grasp the angles of the casualty's lower jaw.

(3) Rest the elbows on the surface on which the casualty is lying.

(4) Lift with both hands displacing the lower jaw forward while tilting the head backward.

NOTE: If this procedure is unsuccessful, tilt the head very slightly.

3. Check for breathing within 3 to 5 seconds. While maintaining the open airway position, place an ear over the casualty's mouth and nose, looking toward the chest and stomach.

a. Look for the chest to rise and fall.

b. Listen for air escaping during exhalation.

c. Feel for the flow of air on the side of the casualty's face.

4. Take appropriate action.

a. If the casualty resumes breathing, maintain the airway and place the casualty in the recovery position.

(1) Roll the casualty as a single unit onto his or her side.

(2) Place the lower arm behind his or her back.

(3) Place the hand of the upper arm under his or her chin.

(4) Flex the upper leg.

NOTE: Check the casualty for other injuries, if necessary.

b. If the casualty does not resume breathing, perform rescue breathing. (See task 081-831-0048.)

Evaluation Preparation

Setup: Place a CPR mannequin or another soldier acting as the casualty face down on the ground. For training and evaluation, you may specify to the soldier whether the casualty has a spinal injury to test step 2, or you may create a scenario in which the casualty's condition will dictate to the soldier how to treat the casualty. After step 3 tell the soldier whether the casualty is breathing or not and ask what should be done.

Brief soldier: Tell the soldier to open the casualty's airway.

Evaluation Guide

Performance Measures	**Results**	
1. Roll the casualty onto his or her back, if necessary.	P	F
2. Establish the airway using the head-tilt/chin-lift or jaw thrust method.	P	F
3. Check for breathing within 3 to 5 seconds.	P	F
4. Take appropriate action.	P	F
5. Do not cause further injury to the casualty.	P	F

REFERENCES: None

081-831-0019

CLEAR AN UPPER AIRWAY OBSTRUCTION

CONDITIONS

You are evaluating a casualty who is not breathing or is having difficulty breathing, and you suspect the presence of an upper airway obstruction.

STANDARDS

Complete, in order, all the steps necessary to clear an object from a casualty's upper airway. Continue the procedure until the casualty can talk and breathe normally or until you are relieved by a qualified person.

TRAINING/EVALUATION

Training Information Outline

1. Clear the airway.

    a. Conscious casualty.

        (1) Determine whether or not the casualty needs help. Ask the casualty whether he or she is choking.

        (a) If the casualty has good air exchange (is able to speak, coughs forcefully, or wheezes between coughs), do not interfere except to encourage the casualty.

        (b) If the casualty has poor air exchange (weak, ineffective cough; high-pitched noise while inhaling; increased respiratory difficulty; and possible cyanosis), continue with step 1a(2).

        (c) If the casualty has a complete airway obstruction (is unable to speak, breathe, or cough and may clutch the neck between the thumb and finger), continue with step 1a(2).

        (2) If the casualty is lying down, bring him or her to a sitting or standing position.

        (3) Apply abdominal or chest thrusts.

NOTE: Use abdominal thrusts unless the casualty is in the advanced stages of pregnancy, is very obese, or has a significant abdominal wound.

        (a) Abdominal thrusts.

            1. Stand behind the casualty and wrap your arms around his or her waist.

2. Make a fist with one hand and place the thumb side of the fist against the casualty's abdomen in the midline slightly above the navel and well below the tip of the xiphoid process.

3. Grasp the fist with your other hand and press the fist into the casualty's abdomen with quick backward and upward thrusts.

NOTE: Make each thrust a separate, distinct movement given with the intent of relieving the obstruction.

4. Continue giving thrusts until the blockage is expelled, or the casualty becomes unconscious.

(b) Chest thrusts.

1. Stand behind the casualty and encircle his or her chest with your arms just under the armpits.

2. Make a fist with one hand and place the thumb side of the fist against the middle of the casualty's breastbone.

CAUTION

Do not position the hand on the xiphoid process or the lower margins of the rib cage.

3. Grasp the fist with your other hand and give backward thrusts.

NOTE: Administer each thrust with the intent of relieving the obstruction.

4. Continue giving thrusts until the blockage is expelled, or the casualty becomes unconscious.

NOTE: If the casualty becomes unconscious, position the casualty on his or her back, perform a finger sweep (see step 1b(2)), open the airways (see task 081-831-0018), and then start rescue breathing procedures (see task 081-831-0048).

b. Unconscious casualty.

NOTE: Perform abdominal or chest thrusts on the unconscious casualty only after attempts to open the airway and ventilate the casualty indicate that the airway is obstructed.

(1) Apply abdominal or chest thrusts.

NOTE: Use abdominal thrusts unless the casualty is in the advanced stages of pregnancy, is very obese, or has a significant abdominal wound.

(a) Abdominal thrusts.

1. Kneel astride the casualty's thighs.

2. Place the heel of one hand against the casualty's abdomen in the midline slightly above the navel and well below the tip of the xiphoid process.

3. Place the other hand directly on top of the first.

4. Press into the abdomen with quick upward thrusts up to five times.

(b) Chest thrusts.

1. Kneel close to either side of the casualty's body.

2. With the middle and index fingers of the hand nearest the casualty's legs, locate the lower margin of the casualty's rib cage on the side nearest you.

3. Move the fingers up the rib cage to the notch where the ribs meet the sternum in the center of the lower part of the chest.

4. With the middle finger on this notch, place the index finger next to it on the lower end of the sternum.

5. Place the heel of the other hand on the lower half of the sternum next to the index finger of the first hand.

6. Remove the first hand from the notch and place it on top of the hand on the sternum so that the hands are parallel to each other.

NOTE: You may either extend or interlace your fingers but keep the fingers off the casualty's chest.

7. Lock your elbows into position, straighten your arms, and position your shoulders directly over your hands.

8. Press straight down depressing the sternum 1 1/2 to 2 inches and then release the pressure completely without lifting the hands from the chest.

9. Repeat the chest thrust up to five times.

NOTE: Make each thrust a separate, distinct movement given with the intent of relieving the obstruction.

(2) Perform a finger sweep.

(a) Open the casualty's mouth by grasping both the tongue and lower jaw with your thumb and fingers and lifting.

(b) Insert the index finger of your other hand down along the inside of the cheek and deeply into the throat to the base of the tongue.

(c) Use a hooking motion to attempt to dislodge the foreign body and maneuver it into the mouth for removal.

CAUTION

Do not force the object deeper into the airway.

(3) Attempt to ventilate. If the airway is still not clear, repeat the sequence of thrusts, finger sweep, and attempt to ventilate until the airway is cleared or you are relieved by qualified personnel.

2. When the object is dislodged, check for breathing. Perform rescue breathing, if necessary (see task 081-831-0048) or continue to evaluate the casualty for other injuries.

Evaluation Preparation

NOTE: Only the procedure for clearing an airway obstruction in a conscious casualty will be evaluated. The procedure for an unconscious casualty can be evaluated as a part of task 081-831-0048.

Setup: You will need another soldier to play the part of the casualty.

Brief soldier: Describe the symptoms of a casualty with good air exchange, poor air exchange, or a complete airway obstruction. Ask the soldier what should be done and score step 1 based on the answer. Then, tell the soldier to clear an upper airway obstruction. Tell the soldier to demonstrate how to position the casualty, where to stand, and how to position his or her hands for the thrusts. The soldier must tell you how they should be done and how many thrusts should be performed. Ensure that the soldier understands that he or she must not actually perform the thrusts. After completion of step 5, ask the soldier what must be done if the casualty becomes unconscious.

Evaluation Guide

Performance Measures	Results	
1. Determine whether the casualty needs help.	P	F
2. Move the casualty to a sitting or standing position, if necessary.	P	F
3. Stand behind the casualty.	P	F
4. Position arms and hands properly to perform the thrusts.	P	F
5. Tell how to perform the thrusts and how many should be performed.	P	F
6. State that the following actions would be taken if the casualty becomes unconscious.	P	F
a. Reposition the casualty.		
b. Perform a finger sweep.		
c. Open the airway.		
d. Perform rescue breathing procedures.		
7. Complete all necessary steps in order.	P	F

REFERENCES: None

081-831-0048

PERFORM RESCUE BREATHING

CONDITIONS

You are treating a casualty who is unconscious and is not breathing. You have opened the airway. You are not in an NBC environment.

STANDARDS

Complete, in order, all the steps necessary to restore breathing. Continue the procedure until the casualty starts to breathe or until you are relieved by another qualified person, stopped by a physician, required to perform CPR, or too exhausted to continue.

TRAINING/EVALUATION

Training Information Outline

1. Ventilate the casualty using the mouth-to-mouth or mouth-to-nose method, as appropriate.

NOTE: The mouth-to-nose method is recommended when you cannot open the casualty's mouth, there are jaw or mouth injuries, or you cannot maintain a tight seal around the casualty's mouth.

a. Mouth-to-mouth method.

(1) Maintain the chin-lift while pinching the nostrils closed using the thumb and index fingers of the hand on the casualty's forehead.

(2) Take a deep breath and make an airtight seal around the casualty's mouth with his or her mouth.

(3) Blow two full breaths (1 1/2 to 2 seconds each) into the casualty's mouth, taking a breath between them while watching for the chest to rise and fall and listening and feeling for air to escape during exhalation.

(4) If the chest rises and air escapes, go to step 4.

(5) If the chest does not rise or air does not escape, continue with step 2.

b. Mouth-to-nose method.

(1) Maintain the head-tilt with the hand on the forehead while using the other hand to lift the casualty's jaw and close the mouth.

(2) Take a deep breath and make an airtight seal around the casualty's nose with your mouth.

(3) Blow two full breaths (1 1/2 to 2 seconds each) into the casualty's nose, taking a breath between them while watching for the chest to rise and fall and listening and feeling for air to escape during exhalation.

NOTE: It may be necessary to open the casualty's mouth or separate the lips to allow air to escape.

(4) If the chest rises, go to step 4.

(5) If the chest does not rise, continue with step 2.

2. Reposition the head to ensure an open airway and repeat step 1, if necessary.

a. If the chest rises, go to step 4.

b. If the chest does not rise, continue with step 3.

3. Clear an airway obstruction, if necessary. (See task 081-831-0019.) When the obstruction has been cleared, continue with step 4.

4. Check the carotid pulse for 5 to 10 seconds.

a. While maintaining the head tilt with one hand, place the index and middle fingers of the other hand on the casualty's throat.

b. Slide the fingers into the groove beside the casualty's Adam's apple and feel for a pulse for 5 to 10 seconds.

c. If a pulse is present, go to step 5.

d. If a pulse is not found, begin CPR. (See task 081-831-0046.)

5. Continue rescue breathing.

a. Ventilate the casualty at the rate of about 10 to 12 breaths per minute.

b. Watch for rising and falling of the chest.

c. Recheck for pulse and breathing after every 12 breaths.

NOTE: Although not evaluated, continue rescue breathing as stated in the task standard. When breathing is restored, watch the casualty closely, maintain an open airway, and check for other injuries. (See task 081-831-0018.)

Evaluation Preparation

Setup: For training and evaluation, a CPR mannequin must be used. Position the mannequin on its back with its neck hyperextended. To test step 1, you may specify to the soldier whether to use the mouth-to-mouth or mouth-to-nose method, or you may create a scenario in which the casualty's condition dictates which method is to be used. You may determine how much of the task is tested by telling the soldier whether the airway is clear or a pulse is found as the soldier proceeds through the task. However, you should ensure that the soldier is routed through the task far enough to continue rescue breathing after checking the carotid pulse.

Brief soldier: Tell the soldier to perform rescue breathing.

Evaluation Guide

Performance Measures	**Results**	
1. Ventilate the casualty using the mouth-to-mouth or mouth-to-nose method, as appropriate.	P	F
2. Reposition the head to ensure an open airway and repeat step 1, if necessary.	P	F
3. Clear an airway obstruction, if necessary.	P	F
4. Check the carotid pulse for 5 to 10 seconds.	P	F
5. Continue rescue breathing.	P	F
6. Complete all necessary steps in order.	P	F

REFERENCES: None

081-831-0046

ADMINISTER EXTERNAL CHEST COMPRESSIONS

CONDITIONS

You are treating a casualty who is not breathing and has no pulse. The airway is open and is clear. Another soldier who is CPR qualified may be available to assist or may arrive while you are performing one-rescuer CPR. You are not in an NBC environment.

STANDARDS

Continue CPR until the pulse is restored or until the rescuer(s) is/are relieved by other qualified persons, stopped by a physician, or too tired to continue.

TRAINING/EVALUATION

Training Information Outline

A. Perform one-rescuer CPR.

1. Ensure that the casualty is positioned on a hard, flat surface.

2. Position the hands for external chest compressions.

a. With the middle and index fingers of the hand nearest the casualty's feet, locate the lower margin of the casualty's rib cage on the side near the rescuer.

b. Move the fingers up the rib cage to the notch where the ribs meet the sternum in the center of the lower part of the chest.

c. With the middle finger on the notch, place the index finger next to it on the lower end of the sternum.

d. Place the heel of the other hand on the lower half of the sternum, next to the index finger of the first hand.

e. Remove the first hand from the notch and place it on top of the hand on the sternum so that both hands are parallel to each other.

NOTE: You may either extend or interlace your fingers but keep the fingers off the casualty's chest.

3. Position the body.

a. Lock the elbows with the arms straight.

b. Position the shoulders directly over the hands.

4. Give 15 compressions.

a. Press straight down to depress the sternum 1 1/2 to 2 inches.

b. Come straight up and completely release pressure on the sternum to allow the chest to return to its normal position. The time allowed for release should equal the time required for compression.

CAUTION

Do not remove the heel of the hand from the casualty's chest or reposition the hand between compressions.

c. Give 15 compressions in 9 to 11 seconds (at a rate of 80 to 100 per minute).

5. Give two full breaths.

a. Move quickly to the casualty's head and lean over.

b. Open the casualty's airway. (See task 081-831-0018.)

c. Give two full breaths (1 1/2 to 2 seconds each).

6. Repeat steps A2 through A5 four times.

7. Assess the casualty.

a. Check for the return of the carotid pulse for 3 to 5 seconds.

(1) If the pulse is present, continue with step A7b.

(2) If the pulse is absent, continue with step A8.

b. Check breathing for 3 to 5 seconds.

(1) If breathing is present, monitor breathing and pulse closely.

(2) If breathing is absent, perform rescue breathing only. (See task 081-831-0048.)

8. Resume CPR with compressions.

9. Recheck for pulse every 3 to 5 minutes.

10. Continue to alternate chest compressions and rescue breathing until--

    a. The casualty is revived.

    b. You are too tired to continue.

    c. You are relieved by competent person(s).

    d. The casualty is pronounced dead by an authorized person.

    e. A second rescuer states, "I know CPR," and joins you in performing two-rescuer CPR.

NOTE: A qualified second rescuer joins the first rescuer at the end of a cycle after a check for pulse by the first rescuer. The new cycle starts with one ventilation by the first rescuer, and the second rescuer becomes the compressor. Two-rescuer CPR is then initiated.

B. Two-rescuer CPR.

1. Compressor: Give five chest compressions at the rate of 80 to 100 per minute.

   Ventilator: Maintain an open airway and monitor the carotid pulse occasionally for adequacy of chest compressions.

2. Compressor: Pause.

   Ventilator: Give one full breath (1 1/2 to 2 seconds).

3. Compressor: Continue to give chest compressions until a change in positions is initiated.

   Ventilator: Continue to give ventilations until the compressor indicates that a change is to be made.

4. Compressor: Give a clear signal to change positions.

   Ventilator: Remain in the rescue breathing position.

5. Compressor: Give the fifth compression.

   Ventilator: Give the breath following the fifth compression.

6. Compressor and ventilator simultaneously switch positions.

7. New Ventilator: Check the casualty's carotid pulse for 5 seconds.

   a. If present state, "There is a pulse," and perform rescue breathing.

b. If not present state, "No pulse." Give the casualty one breath and tell the new compressor to give chest compressions.

New compressor: Position the hands to begin chest compressions as directed by the ventilator.

8. Ventilator: Continue to give one breath on each fifth upstroke of chest compressions and ensure that the chest rises.

Compressor: Continue to give chest compressions at the rate of 80 to 100 per minute.

NOTE: If signs of gastric distension are noted, do the following:

1. Recheck and reposition the airway.
2. Watch for the rise and fall of the chest.
3. Ventilate the casualty only enough to cause the chest to rise.

CAUTIONS

1. Do not push on the abdomen.
2. If the casualty vomits, turn the casualty on the side, clear his airway, and then continue CPR.

9. Continue to perform CPR as stated in the task standard.

NOTE: The rescuer doing rescue breathing should recheck the carotid pulse every 3 to 5 minutes.

10. When the pulse and breathing are restored, continue to evaluate the casualty. If the casualty's condition permits, place him or her in the recovery position. (See task 081-831-0018.)

CAUTION

During evacuation CPR or rescue breathing should be continued en route, if necessary. When the pulse and breathing are restored, the casualty should be watched closely.

Evaluation Preparation

Setup: For training and evaluation a CPR mannequin must be used. Place the mannequin face up on the floor. One-rescuer CPR, two-rescuer CPR, or a combination of both (see NOTE after step A10) can be evaluated. If two soldiers are involved, they will be designated as "rescuer #1" and "rescuer #2." Rescuer #1 will start in the chest compression position and will be the only one scored during performance of the task. The evaluator will ensure that all aspects of the task are evaluated by indicating whether pulse is present and when the rescuers should change positions.

Brief soldier: If two soldiers are involved, tell them about their roles as rescuer #1 and #2. Ask rescuer #1 on what kind of surface the casualty should be positioned. Then, tell the soldier(s) to perform one-rescuer or two-rescuer CPR, as appropriate.

Evaluation Guide

Performance Measures	**Results**	
1. Position casualty on a hard, flat surface.	P	F
2. Properly position your hands during chest compressions.	P	F
3. Administer the correct number of chest compressions.	P	F
4. Give chest compressions at the rate of 80 to 100 per minute.	P	F
5. Administer the correct number of breaths.	P	F
6. Give the breaths at the correct rate.	P	F
7. Check the carotid pulse for about 5 seconds approximately 1 minute after starting CPR.	P	F
8. Recheck the carotid pulse every 3 to 5 minutes.	P	F
9. Perform transition to two-rescuer CPR correctly, if applicable.	P	F
10. Change position during two-rescuer CPR correctly, if applicable.	P	F
11. Continue CPR as stated in the task standard.	P	F

REFERENCES: None

081-831-0035

MANAGE A CONVULSIVE AND/OR SEIZING PATIENT

CONDITIONS

Necessary materials and equipment: padded tongue blade and padding materials.

STANDARDS

Complete all steps to manage a convulsive and/or seizing patient without allowing or causing unnecessary injury to the patient.

TRAINING/EVALUATION

Training Information Outline

1. Identify the type of convulsion and/or seizures based upon the following characteristic signs and symptoms:

   a. Petit mal.

      (1) Brief loss of consciousness without loss of motor tone.

      (2) Found chiefly in children and rarely an emergency.

   b. Focal.

      (1) One part of the body (arm, leg, face) is usually involved in tonic-clonic twitching.

NOTE: "Tonic" is muscle tension (stiffness or rigidity). "Clonic" is the alternating contraction and relaxation of muscles in rapid succession.

      (2) Motor symptoms begin in the patient's hand and/or foot and progress up the extremity or spread from the corner of the mouth.

      (3) May rapidly progress to generalized convulsions.

   c. Grand mal (generalized).

      (1) May be preceded by an aura.

      (2) Loss of consciousness and intense tonic-clonic movement.

      (3) May involve incontinence, biting of the tongue, or mental confusion.

(4) The patient will have a stuporous or comatose period following the seizure.

d. Status epilepticus.

(1) Two or more seizures without intervening period of consciousness.

(2) A dire medical emergency, if untreated may lead to--

(a) Aspiration of secretions.

(b) Cerebral or tissue hypoxia.

(c) Brain damage or death.

(d) Fractures of long bones.

(e) Head trauma.

(f) Injured tongue from biting.

NOTE: Mentally note the aspects of seizure activity for recording after the seizure.

2. Maintain the airway of a patient exhibiting tonic-clonic movement.

a. For a patient with a patent airway, insert a padded tongue blade or similar item between the patient's back teeth.

CAUTION

If the patient's teeth are clenched, do not attempt to forcibly open the patient's jaw.

b. For a patient with an obstructed airway, an oropharyngeal airway should be inserted, if possible and necessary, by trained medical personnel. A patient in status epilepticus should have oxygen administered by face mask or nasal prongs.

3. Place the patient on his or her side, if possible.

a. Observe the patient to prevent aspiration and suffocation.

b. The patient's mouth and throat should be suctioned by trained personnel, if possible.

CAUTIONS

1. Do not elevate the patient's head.
2. Do not restrain the patient's limbs during seizures.

4. Prevent injury to tissue and bones by padding or removing objects on which the patient may injure himself or herself.

5. Manage the patient after the convulsive state has ended.

   a. Place the patient on his side, if necessary.

   b. Continue to maintain the patient's airway.

   c. Observe for apnea (the cessation of breathing).

   d. If possible, place the patient in a quiet, reassuring atmosphere.

CAUTION

Sudden, loud noises may cause another seizure.

6. Record the seizure activity.

   a. Duration of the seizure.

   b. Presence of cyanosis, breathing difficulty, or apnea.

   c. Level of consciousness before, during, and after the seizure.

   d. Whether preceded by aura (ask the patient).

   e. Muscles involved.

   f. Type of motor activity.

   g. Incontinence.

   h. Eye movement.

   i. Previous history of seizures, head trauma, and/or drug or alcohol abuse.

7. Evacuate the patient.

   a. Position the patient on his or her side.

   b. Arrange for the administration of oxygen or suction, if available and necessary.

Evaluation Preparation

Setup: For training and evaluation, have another soldier act as a patient.

Brief soldier: Tell the soldier to manage the patient.

Evaluation Guide

Performance Measures	**Results**	
1. Identify the type of convulsions and/or seizures.	P	F
2. Maintain the airway of a patient exhibiting tonic-clonic movement.	P	F
3. Place the patient on his or her side, if possible.	P	F
4. Prevent injury to tissue and bones by padding or removing objects on which the patient may injure himself or herself.	P	F
5. Manage the patient after the convulsive state has ended.	P	F
6. Record the seizure activity.	P	F
7. Evacuate the patient.	P	F
8. Do not cause further injury to the patient.	P	F

REFERENCES: None

081-831-0038

TREAT A CASUALTY FOR A HEAT INJURY

CONDITIONS

A casualty is suffering from a heat injury. No other more serious injuries or conditions are present. Necessary materials and equipment: water, salt, a thermometer, a stethoscope, and a sphygmomanometer.

STANDARDS

Provide the correct treatment based upon the signs and symptoms of the injury.

TRAINING/EVALUATION

Training Information Outline

1. Identify the type of heat injury based upon the following characteristic signs and symptoms:

    a. Heat cramps--muscle cramps of the arms, legs, and/or abdomen.

    b. Heat exhaustion.

        (1) Often--

            (a) Profuse sweating and pale (or gray), moist, cool skin.

            (b) Headache.

            (c) Weakness or faintness.

            (d) Dizziness.

            (e) Loss of appetite or nausea.

        (2) Sometimes--

            (a) Heat cramps.

            (b) Nausea (with or without vomiting).

            (c) Urge to defecate.

            (d) Chills.

(e) Rapid breathing.

(f) Tingling sensation of the hands and feet.

(g) Confusion.

c. Heat stroke.

(1) Rapid onset with the core body temperature rising to above 106° F within 10 to 15 minutes.

(2) Hot, dry skin.

(3) Headache.

(4) Dizziness.

(5) Nausea (stomach pains).

(6) Confusion.

(7) Weakness.

(8) Loss of consciousness.

(9) Possible seizures.

(10) Pulse and respirations are weak and rapid.

2. Provide the proper first aid for the heat injury.

a. Heat cramps.

(1) Move the casualty to a cool shaded area, if possible.

(2) Loosen the casualty's clothing unless he or she is in a chemical environment.

(3) Give the casualty at least one canteen of salt solution. Dissolve 1/4 teaspoon (one MRE packet) of salt in one canteen of water. If salt is unavailable, give plain water.

(4) Evacuate the casualty if the cramps are not relieved after treatment.

b. Heat exhaustion.

(1) Conscious casualty.

(a) Move the casualty to a shaded area, if possible.

(b) Loosen and/or remove the casualty's clothing and boots unless he or she is in a chemical environment.

(c) Pour water on the casualty and fan him or her, if possible.

(d) Slowly give the casualty one canteen of salt solution. (See step 2a(3).)

(e) Elevate the casualty's legs.

(2) An unconscious casualty or one who is nauseated, unable to retain fluids, or whose symptoms have not improved after 20 minutes--

(a) Cool the casualty as in step 2b(1).

(b) Evacuate the casualty to an MTF for IV therapy or if qualified, initiate an IV infusion of Ringer's lactate or sodium chloride.

c. Heat stroke.

CAUTION

Heat stroke is a medical emergency. If the casualty is not cooled rapidly, the body cells, especially the brain cells, are literally cooked; irreversible damage is done to the central nervous system. The casualty must be evacuated to the nearest medical treatment facility immediately.

(1) Conscious casualty.

(a) Remove the casualty's outer garments and/or protective clothing, if possible.

(b) Keep the casualty out of the direct sun, if possible.

(c) Immerse the casualty in cold water, if available, and massage him or her.

(d) Lay the casualty down and elevate his or her legs.

(e) Have the casualty slowly drink at least one canteen of salt solution. (See step 2a(3).)

(f) Evacuate the casualty to an MTF for IV therapy or, if qualified, initiate an IV infusion of Ringer's lactate or sodium chloride to maintain a systolic blood pressure of at least 90 mm Hg.

(2) Unconscious casualty or one who is vomiting or unable to retain oral fluids.

(a) Cool the casualty as in step 2c(1) but give nothing by mouth.

(b) Initiate an IV, if qualified.

(c) Evacuate the casualty.

3. Record the treatment given. (See task 081-831-0033.)

Evaluation Preparation

Setup: For training and evaluation, describe to the soldier the signs and symptoms of heat cramps, heat exhaustion, or heat stroke and ask the soldier what type of heat injury is indicated.

Brief soldier: Ask the soldier what should be done to treat the heat injury.

Evaluation Guide

Performance Measures	**Results**	
1. Identify the type of heat injury.	P	F
2. Provide the proper first aid for the heat injury.	P	F
3. Record the treatment given.	P	F

REFERENCES: None

081-831-0039

TREAT A CASUALTY FOR A COLD INJURY

CONDITIONS

No other more serious injuries or conditions are present. Necessary materials and equipment: dry clothing or similar material, sterile dressings, and a thermometer.

STANDARDS

Correct treatment is provided based upon the signs and symptoms of the injury.

TRAINING/EVALUATION

Training Information Outline

1. Recognize the signs and symptoms of cold injuries.

a. Chilblain is caused by repeated prolonged exposure of bare skin to low temperatures from 60° F down to 32° F.

(1) Acutely red, swollen, hot, tender, and/or itching skin.

(2) Surface lesions with shedding of dead tissue or bleeding lesions.

b. Frostbite is caused by exposure of the skin to cold temperatures that are usually below 32° F depending on the windchill factor, length of exposure, and adequacy of protection.

NOTE: The onset is signaled by a sudden blanching of the skin of the nose, ears, cheeks, fingers, or toes followed by a momentary tingling sensation. Frostbite is indicated when the face, hands, or feet stop hurting.

(1) Superficial (first and second degree).

(a) Redness of the skin in light-skinned individuals and grayish coloring of the skin in dark-skinned individuals, followed by a flaky sloughing of the skin.

(b) Blister formation 24 to 36 hours after exposure followed by sheet-like sloughing of the superficial skin (second degree).

(2) Deep.

(a) Loss of feeling.

(b) Pale, yellow, waxy look if the affected area is unthawed.

(c) Solid feel of the frozen tissue.

(d) Blister formation 12 to 36 hours after exposure unless rewarming is rapid.

(e) Appearance of red-violet discoloration one to five days after the injury.

NOTE: Gangrene and residual nerve damage will result without proper treatment.

c. Generalized hypothermia is caused by prolonged exposure to low temperatures, especially with wind and wet conditions, and it may be caused by immersion in cold water.

CAUTION

With generalized hypothermia the entire body has cooled with the core temperature below 95? F. This is a medical emergency.

(1) Moderate hypothermia.

NOTE: This condition should be suspected in any chronically ill person who is found in an environment of less than 50° F.

(a) Conscious, but usually apathetic or lethargic.

(b) Shivering, with pale, cold skin.

(c) May have acetone scent to breath.

(2) Severe hypothermia.

(a) Unconscious or stuporous.

(b) Ice cold skin.

(c) Inaudible heart beat.

(d) Unobtainable blood pressure.

(e) Unreactive pupils.

(f) Very slow respirations.

d. Immersion syndrome (immersion foot, trench foot and hand) is caused by fairly long (hours to days) exposure of the feet or hands to wet conditions at temperatures from about 50° F down to 32° F.

(1) First phase (anesthetic).

(a) There is no pain sensation, but the affected area feels cold.

(b) The pulse is weak at the affected area.

(2) Second phase (reactive hyperemic)--limbs feel hot and/or burning and have shooting pains.

(3) Third phase (vasospastic).

(a) Affected area is pale.

(b) Cyanosis.

(c) Pulse strength decreases.

(4) Check for blisters, swelling, redness, heat, hemorrhage, or gangrene.

e. Snow blindness.

(1) Scratchy feeling in the eyes as if from sand or dirt.

(2) Watery eyes.

(3) Pain, possibly as late as three to 5 hours later.

(4) Reluctant or unable to open eyes.

2. Treat the cold injury.

a. Chilblain.

(1) Apply local rewarming within minutes.

(2) Protect lesions (if present) with dry sterile dressings.

CAUTION

Do not treat with ointments.

b. Frostbite.

(1) Apply local rewarming using body heat.

CAUTION

Avoid thawing the affected area if it is possible that the injury may refreeze before reaching the treatment center.

(2) Loosen or remove constricting clothing and remove jewelry.

(3) Increase insulation and exercise the entire body as well as the affected body part(s).

CAUTION

Do not massage the skin or rub anything on the frozen parts.

(4) Move the casualty to a sheltered area, if possible.

(5) Protect the affected area from further cold or trauma.

(6) Evacuate the casualty.

NOTE: For frostbite of a lower extremity evacuate the casualty by litter, if possible.

CAUTION

Do not allow the casualty to use tobacco or alcohol.

c. Generalized Hypothermia.

(1) Moderate.

(a) Remove the casualty from the cold environment.

(b) Replace wet clothing with dry clothing.

(c) Cover the casualty with insulating material or blankets.

(d) If available, apply heating pads to the casualty's armpits, groin, and abdomen.

NOTE: If far from a medical treatment facility and the situation and facilities permit, immerse the casualty in a tub of 105° F water.

(e) If available, give sugar and sweet warm fluids.

CAUTION

Do not give the casualty alcohol.

(f) Wrap the casualty from head to toe.

(g) Evacuate the casualty lying down.

(2) Severe.

CAUTION

Handle the casualty very gently.

(a) Cut away wet clothing and replace it with dry clothing.

(b) Maintain the airway. (See task 081-831-0018.)

NOTE: Do not use artificial airways or suctioning devices.

1. Administer oxygen if trained personnel and equipment are available.

2. Assist with ventilation if the casualty's respiration rate is less than five per minute.

CAUTION

Do not hyperventilate the casualty. Keep the rate of artificial ventilation at approximately 8 to 10 per minute.

(c) Monitor the heartbeat. (See task 081-831-0011.) If none is detected, begin CPR. (See tasks 081-831-0046 and 081-831-0048.)

(d) Evacuate the casualty positioned on his or her back with the head in a 10? head-down tilt.

NOTE: The treatment of moderate hypothermia is aimed at preventing further heat loss and rewarming the casualty as rapidly as possible. Rewarming a casualty with severe hypothermia is critical to saving his or her life, but the kind of care rewarming requires is nearly impossible to carry out in the field. Evacuate the casualty promptly to a medical treatment facility. Use stabilizing measures en route.

d. Immersion syndrome.

(1) Dry the affected part immediately and gradually rewarm it in warm air.

CAUTION

Never massage the skin. After rewarming the affected part, it may become swollen, red, and hot. Blisters usually form due to circulation return.

(2) Protect the affected part from trauma and secondary infection.

(3) Elevate the affected part.

(4) Evacuate the casualty as soon as possible.

e. Snow blindness--cover the eyes with a dark cloth and evacuate the casualty to a medical treatment facility.

Evaluation Preparation

Setup: For training and evaluation have another soldier act as the casualty. Select one of the types of cold injuries on which to evaluate the soldier. Coach the simulated casualty on how to answer questions about symptoms. Physical signs and symptoms that the casualty cannot readily simulate, for example blisters, must be described to the soldier.

Brief soldier: Tell the soldier to determine what cold injury the casualty has. After the cold injury has been identified, ask the soldier to describe the proper treatment.

Evaluation Guide

Performance Measures	**Results**	
1. Identify the type of cold injury.	P	F
2. Provide the proper first aid treatment for the injury.	P	F

NOTE: Although not evaluated, the soldier would record the treatment given on the appropriate form and evacuate the casualty as necessary.

REFERENCES: None

081-821-1017

PERFORM A ROUTINE URINALYSIS

CONDITIONS

You have a properly collected specimen and a laboratory request form. Necessary materials and equipment: a clock or watch, a refractometer, applicator sticks, reagent strips (N-Multistix), sulfosalicylic acid test materials, Clinitest materials, Acetest materials, Ictotest materials, a microscope, glass slides and coverslips, a centrifuge, distilled water, test tubes (13 x 100 mm and 15 x 85 mm), disposable transfer pipets, and a logbook.

STANDARDS

The color, appearance, pH, specific gravity, protein, glucose, ketones, bilirubin, nitrite, urobilinogen, blood, and leukocyte esterase are determined from a urine specimen and a microscopic examination is performed. Results are reported with 100 percent accuracy.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Record the appearance and color of the urine on the laboratory request form.	P F

a. Appearance:

(1) If the specimen appears clear, write **"CLEAR"** on the form.

(2) If the specimen is not clear, but can be seen through, write **"HAZY"** on the form.

(3) If the specimen is opaque and cannot be seen through, write **"CLOUDY"** on the form.

b. Report the color as shades of yellow and report any color change which occurs on standing.

NOTE: Normal color varies due to varying amounts of pigment called urochrome. Normal color is straw-yellow amber. Abnormal colors can result from diet, medication, and/or disease. Red in males indicates fresh blood from the lower urinary tract. Orange is caused by medication such as pyridium which is used to treat urinary tract infections. Brown indicates hemoglobin; black, malaria (blackwater fever); colorless, polyuria (absence of urochrome).

Performance Measures	Results	
2. Determine and record the specific gravity, pH, protein, glucose, ketones, bilirubin, nitrite, urobilinogen, blood, and leukocyte esterase. Dip the reagent strip in the specimen, remove it, and then compare each reagent area with the corresponding color chart on the bottle label at the number of seconds specified in the instructions accompanying the reagent strips.	P	F
3. Perform the following confirmation tests for positive reactions on the reagent strip or when indicated by local SOP.	P	F

a. Specific gravity--refractometer method.

(1) Place 1 to 2 drops of urine on the refractometer.

(2) Point the refractometer toward a uniform, bright light source.

(3) Look through the refractometer and read the scale.

(4) Report the value from the left-hand scale, at the juncture of the dark and light areas.

NOTE: Normal values are 1.003 to 1.033.

b. Protein--sulfosalicylic acid test procedure.

(1) Add 10 drops of centrifuged urine to a 13 x 100 mm test tube.

(2) Layer 10 drops of sulfosalicylic acid (3 percent) over the surface of the urine. (Equal amounts of urine and SSA can also be used.)

(3) Observe for turbidity which will confirm a positive result.

(4) Grade the degree of turbidity.

(a) Negative--no turbidity.

(b) Trace--faintly visible turbidity.

(c) 1+--definite turbidity.

(d) 2+--heavy turbidity but no floccules.

(e) 3+--heavy cloud with floccules.

(f) 4+--heavy cloud with heavy floccules.

Performance Measures **Results**

c. Glucose--Clinitest procedure.

(1) Place 5 drops of urine into a 15 x 85 mm test tube.

(2) Add 10 drops of water to the test tube.

(3) Drop in a Clinitest tablet.

(4) Read the results 15 seconds after boiling stops. Observe during the test for pass through.

CAUTION

Do not shake the tube while it is boiling.

(5) Mix the tube by gentle shaking.

(6) Compare the color of the solution with the color chart.

d. Ketones--Acetest procedure.

(1) Place one Acetest tablet onto a clean dry piece of white paper.

(2) Drop 1 drop of urine directly on top of the tablet.

(3) After 30 seconds, compare the color of the tablet to the Acetest chart.

(a) Positive--purple color.

(b) Negative--tan color.

e. Bilirubin--Ictotest procedure.

(1) Place the special Ictotest mat on a paper towel.

(2) Drop 10 drops of urine onto the test mat.

(3) Place 1 Ictotest tablet in the center of the moistened mat.

Performance Measures **Results**

CAUTION

Do not touch the tablet with your fingers.

(4) Place 1 drop of water onto the tablet and wait 5 seconds.

(5) Place a second drop of water onto the tablet so that both drops run off the tablet onto the mat.

(6) Observe for a blue to purple color of the mat at 60 seconds which indicates the presence of bilirubin.

NOTE: Normal urine displays a slightly pink to red color on the mat.

(7) Read the results by comparing the color of the mat to the color chart.

4. Perform microscopic examination. P F

a. Centrifuge the urine specimen at 1500 to 2000 rpm for 5 minutes.

NOTE: A sulfosalicylic acid test, when required, should be performed following centrifugation.

b. Pour off the supernatant, mix, and place a drop of the remaining sediment on a glass slide covering it with a coverslip.

c. Examine the entire cover-slipped area of the slide under low power magnification with subdued light to locate any casts.

NOTE: Confirm the casts under high power with subdued light.

d. Record and report the number of casts per low power field (#/LPF).

e. Scan 10 to 15 fields under high dry (40x) magnification to identify the specific types of cells present.

f. Record and report the count of cells as the number seen per high power field (#/HPF).

g. Record and report elements such as mucous threads, parasites, crystals, and yeast as **OCCASIONAL**, **FEW**, or **MANY**.

h. Grade the amount of bacteria seen from "-" to "4+".

Performance Measures	Results
NOTE: Sperm is reported verbally.	
5. Obtain and report the correct results for a given specimen with 100 percent accuracy.	P F

REFERENCES:	*Required*	*Related*
	None	Product Insert for N-Multistix Reagent Strips

081-821-1052

PERFORM LABORATORY TESTS USING A KODAK DT 60 ANALYZER

CONDITIONS

You have properly collected specimens (serum or plasma) and a laboratory request form. Necessary materials and equipment: a calibrated Kodak Ektachem DT 60 Analyzer with DTE and DTSC modules and associated equipment, Kodak Ektachem DT (reagent) slides, operator's manual for Kodak DT 60, and clean absorbent tissues.

STANDARDS

Procedures are performed precisely and in order. Results are reproducible and within target values.

TRAINING/EVALUATION

Training Information Outline

1. Perform the startup procedure.

   a. Check the power cord connections.

   b. Turn on the DT 60 analyzer and the DTE module (for measurement of electrolyte concentration) or the DTSC module (for measurement of enzyme activity or discrete chemistry tests on serum, plasma, or whole blood).

NOTE: The switch is at the back of the DT 60 analyzer ("1"=ON; "0"=OFF). A "WAIT" signal will flash until the incubator in the DT 60 analyzer reaches the operating temperature. The DT 60 analyzer takes about 20 minutes to warm up, the DTE module takes no warmup time, and the DTSC module takes about 5 minutes.

2. Warm the slides to room temperature for approximately 15 minutes.

3. Enter the date.

   a. Press the RED SHIFT key and press the SERVICE MODE/CAL MODE key.

   b. After an OPTION NO? prompt appears on the display screen, enter option number 17 by pressing the 1 key, the 7 key, and then ENTER.

   c. The display screen will prompt for entry of the DAY/MONTH/YEAR. Enter the current day/month/year by pressing the appropriate numerical keys with day-month-year separated by dashes, then press the ENTER key.

   d. To exit the OPTION MODE, press the RED SHIFT KEY and SERVICE MODE/CAL MODE key.

4. Operate the DT 60 Analyzer if performing any of the tests indicated in Figure 3-2 on page 3-63.

a. Position the slide into the loading station of the DT 60, bar code up and notch to the front.

b. Insert the slide by smoothly pushing the slide advance lever into the spotting station.

c. Enter the patient identification number up to ten characters when the analyzer displays "ID."

(1) Press the patient ID key.

(2) Enter the numbers.

(3) Press the ENTER key.

d. Press one new pipet tip firmly into place on the Kodak Ektachem DT pipet.

e. Aspirate the fluid, holding the pipet vertically.

(1) Insert the pipet tip into the fluid.

(2) Depress the DT pipet button once and release it.

(3) After the sound of the first beep, withdraw the pipet from the fluid.

(4) At the sound of the second beep, remove the excess fluid from the tip by wiping the tip with a clean absorbent tissue.

(5) Visually inspect for the correct fluid volume.

f. Spot the slide with aspirated specimen.

(1) Carefully insert the pipet into the pipet locator.

(2) Depress the pipet button to spot the slide.

(3) Remove the pipet from the locator when the tone sounds.

NOTE: Do not insert another slide into the spotting station until the LED readout displays "ANALYZER READY."

5. Operate the DTSC Module if performing any of the tests indicated in Figure 3-2 on page 3-63.

a. Manually insert the slide, notch to the right, bar code up. The slide is automatically carried to the spotting station.

b. Enter the patient identification the same as in steps 4c(1) through 4c(3).

c. Press one new pipet tip firmly into place on the Kodak Ektachem DT pipet.

d. Aspirate the fluid as in steps 4e(1) through 4e(5).

e. Spot the slide when the DTSC flashing green light indicates "READY TO SPOT" status.

(1) Carefully insert the pipet into the DTSC pipet locator.

(2) Depress the pipet button to spot the slide.

(3) Remove the pipet from the locator when the tone sounds.

6. Operate the DTE Module if performing any of the tests indicated in Figure 3-2 on page 3-63.

a. Place a slide into the loading station of the DTE Module with the bar code down and the notch to the front.

b. Insert the slide by smoothly pushing the slide advance lever into the spotting station.

c. Enter the patient identification the same as in steps 4c(1) through 4c(3).

d. Press two new pipet tips firmly in place on the Kodak Ektachem DTE pipet.

e. Aspirate the fluid holding the pipet vertically.

(1) Depress the DTE pipet button and continue to hold the button down as you insert the pipet into the pipet locator at the aspiration station.

(2) Insert the pipet tips into the fluid that was preloaded in the DTE dual sample cups in the DTE aspiration station.

NOTE: DTE dual sample cups contain patient or control sample and electrolyte reference fluid.

(3) Slowly release the button to aspirate the fluid.

NOTE: There is no audible beep when using the DTE pipet.

(4) To remove excess fluid from the pipet tips, carefully wipe the tips with a clean absorbent tissue.

(5) Visually check the fluid volumes in both tips.

NOTE: Both tips should have approximately equal fluid levels.

f. Spot the slide.

(1) Carefully insert the DTE pipet into the DTE pipet locator in the DTE loading station.

(2) Depress the pipet button and continue to hold it down. While the button is depressed, promptly but slowly remove the pipet from the locator.

NOTE: Do not insert another slide into the DTE Module until the red indicator light stops flashing and the LED indicator on the DT 60 indicates "DTE READY."

7. Record the results.

Evaluation Guide

Performance Measures	**Results**
1. Perform the startup procedure.	P F
2. Warm the slides.	P F
3. Operate the DT 60 Analyzer.	P F
4. Operate the DTSC or DTE module as required.	P F
5. Record the results.	P F

REFERENCES:	***Required***	***Related***
	Operator's Manual for Kodak DT 60 Analyzer	None

TEST REQUIRED	MODULE	EXPECTED RANGES
Sodium	DTE	137-145 mmol/L
Potassium	DTE	3.6-5.0 mmol/L
Chloride	DTE	98-107 mmol/L
Carbon Dioxide	DTE	22-31 mmol/L
Total Protein	DT 60	6.3-8.2 g/dl (63-82 g/L)
Creatinine	DT 60	Males 0.7-1.4 mg/dl Females 0.5-1.2 mg/dl
Amylase	DT 60	30-110 u/L
Glucose	DT 60	Males 18-44 yrs 75-110 mg/dl Females 18-64 yrs 65-105 mg/dl
Urea Nitrogen	DT 60	Males 18-64 yrs 9-21 mg/dl Females 18-64 yrs 7-18 mg/dl
Total Bilirubin	DT 60	0.0-1.4 mg/dl
AST	DTSC	5-40 U/L
ALT	DTSC	7-56 U/L
CK	DTSC	Males 55-170 U/L Females 30-135 U/L
Calcium	DTSC	8.4-10.2 mg/dl

Figure 3-2

081-821-1063

PERFORM A SODIUM (Na) AND POTASSIUM (K) DETERMINATION USING A CIBA CORNING 614 ELECTROLYTE ANALYZER

CONDITIONS

You have a properly collected serum specimen. Necessary materials and equipment: a calibrated Corning 614 ISE Na^+/K^+ Analyzer with operator's manual, a control sample (high, medium, or low), disposable transfer pipets, sample cups, a logbook, an indelible marker, and a test tube rack.

STANDARDS

The sodium (Na) and potassium (K) concentrations of the control and specimen are determined. The control concentration is within the established range.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Label sample cups with control and specimen ID.	P	F
2. Use a transfer pipet to put control and specimen into cups.	P	F
3. Press the YES button in response to the LCD "ANALYZE BLOOD?" message.	P	F
4. Open the sample probe to the first position.	P	F
5. Place the tip of the probe into the control/specimen and push the YES button.	P	F
6. Hold the control/specimen under the probe while the"SAMPLING-WAIT" message is displayed.	P	F
7. Close the sample probe when prompted.	P	F
8. Read and record results from the display or paper strip.	P	F

Reference values:

a. Sodium: 135-145 mmol/L
b. Potassium: 3.5-5.0 mmol/L

Performance Measures	Results

NOTE: Specific reference values for individual laboratories may be slightly different due to the population.

9. Initial the paper strip and turn it in to supervisor.	P	F

REFERENCES:	*Required*	*Related*
	Operator's Manual for Corning 614 ISE Na^+/K^+ Electrolyte Analyzer	None

081-821-1013

PERFORM A GRAM STAIN

CONDITIONS

You have a culture with one or more organisms growing in it. Necessary materials and equipment: a Bunsen burner, Gram stain reagents, an inoculating loop, an inoculating needle, glass slides, water, a staining rack, a diamond point pen or lead pencil, needle, syringe, disposable transfer pipets, a timer, and a logbook.

STANDARDS

A smear is prepared and stained so that Gram-negative organisms appear pink to red and Gram-positive organisms appear blue to purple with 100 percent accuracy.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Label a slide with a lead pencil or diamond point pen.	P F
2. Prepare the smear.	P F

a. From a liquid specimen or medium, if applicable.

(1) Place 1 drop in the center of a labeled slide using a sterile pipet, syringe or loop.

(2) Spread inoculum to about the size of a dime.

(3) Allow the smear to completely air-dry.

b. From a colony on an agar plate, if applicable.

(1) Place a small drop of water in the center of the labeled slide.

(2) Touch the top center of the colony with a sterile inoculating needle and transfer a small amount of bacteria to the drop of water.

(3) Mix the bacteria and water with the needle and spread it to about the size of a dime.

(4) Allow the smear to completely air-dry.

Performance Measures	Results

c. From a swab, if applicable.

(1) Roll the swab across the center of a dry labeled slide.

(2) Allow the smear to completely air-dry.

3. Use either of the following methods to fix the smear: P F

a. Methanol.

(1) Flood the smear with methanol and allow it to stand for 1 minute.

(2) Tilt the slide to drain off excess methanol and allow it to completely air-dry.

b. Heat. Gently heat the smear by passing it through the burner flame two or three times.

CAUTION

Do not overheat the slide.

4. Stain the slide. P F

a. Flood the slide with crystal violet for 1 minute.

b. Rinse the smear with tap water.

c. Flood the slide with Gram's iodine for 1 minute.

d. Rinse the smear with tap water.

e. Rinse the slide with decolorizer for 2 to 5 seconds.

f. Rinse the smear with tap water.

g. Flood the slide with safranin for 30 to 60 seconds.

h. Rinse the smear with tap water.

i. Blot the smear dry by placing it between paper towels or allow the smear to air-dry.

Performance Measures	**Results**	
NOTE: Test each new batch of reagents with known Gram-positive and Gram-negative organisms. Quality control slides may be prepared by adding a drop of a 24-hour culture to a glass slide and allowing the broth to dry. Fix each slide and store them in a box until ready for QC testing. A slide containing separate drops of Gram-positive and Gram-negative organisms should be stained each day to test the quality of the Gram stain reagent. Alternatively, a mixture containing both Gram-negative and Gram-positive organisms can be used to prepare the control slides.		
5. Examine the smears under oil immersion for--	P	F
a. Gram stain reaction.		
b. Cell shape.		
c. Arrangements.		
6. Record the results in the logbook and on the laboratory request form.	P	F

REFERENCES: None

081-821-1014

PERFORM A GIEMSA STAIN FOR THE PRESENCE OF MALARIAL PARASITES

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: Camco Wright-Giemsa stain, distilled water, glass slides, coverslips, staining dishes, water, lintless cloths, 95 percent ethanol, rubber gloves, methanol, timer, microscope, immersion oil, mounting medium, and capillary tubes.

STANDARDS

The presence or absence of *Plasmodium* species is determined from the peripheral blood smear and accurate results are reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Prepare the glass slides by cleaning them in 95 percent ethanol and wiping them until completely dry.	P F
2. Prepare the blood smears.	P F

a. Prepare the thin smear.

(1) Place a small drop of blood at a point midway between the sides of the slide and a short distance from one end.

(2) Place the edge of another slide (spreader) on the specimen slide at a 30° angle.

(3) Slide the spreader slide toward the drop of blood until contact is made.

(4) Immediately push the spreader slide toward the opposite end of the specimen slide, drawing the blood behind it. The smear should cover 1/2 to 2/3 of the slide.

b. Prepare the thick smear.

(1) Place 3 or 4 drops of the blood specimen at the end of a slide.

Performance Measures **Results**

(2) Use a corner of another slide to stir the drop over an area about the size of a dime. It is approximately the proper thickness if ordinary news print is just legible when looking through the freshly prepared smear. At least two thick and two thin smears should be prepared for each specimen.

NOTE: A positive control slide should be stained with all malaria specimens when available.

c. Allow the smear to air-dry in a flat position.

3. Write the name or identification number of the patient in the thick area of the thin smear with a lead pencil. P F

4. Stain the smear within 24 hours after air drying and examine for uniform staining qualities. P F

a. Fix the thin smear in methanol for 3 to 5 seconds.

CAUTION

Do not allow the thick smear to come in contact with the methanol or near the methanol vapors as this will fix the cells.

b. Allow the smear to air-dry.

c. Dip the thick smear in distilled water three to five times to ensure that the stain will be adequately absorbed and to lyse the intact RBCs.

d. Allow the smear to air-dry.

e. Place the entire slide in staining solution for 10 seconds.

f. Dip the entire slide in distilled water for 20 seconds or more (for desired color balance).

NOTE: Time will depend on the age, thickness, and density of the smear.

h. Remove the slides from the water and allow them to air-dry, standing on end on absorbent paper.

Performance Measures	Results

CAUTION

Do not blot the slides dry. This may damage the blood smears.

5. Examine the entire smear under the oil immersion objective. P F

a. If malarial parasites are present in the thick smear, report "*Plasmodium* species seen". Confirm by reading the thin smear and report by genus and species.

b. If no malarial parasites are present, report "No *Plasmodium* species seen".

6. Record the results in the logbook and on the laboratory request form. P F

7. Obtain the expected results for the given smear. P F

REFERENCES: None

081-821-1066

PERFORM CONCENTRATION TECHNIQUES FOR OVA AND PARASITES (CON-TRATE METHOD)

CONDITIONS

You have a properly collected fecal specimen and a laboratory request form. Necessary materials and equipment: Feka Con-Trate System containing filtering devices, disposable centrifuge tubes with caps, Muco Pen X (reagent A) and Ethyl Acetate (reagent B), manufacturer's instructions for Con-Trate Fecal Concentration, cotton tipped applicator sticks, microscope slides, 22 x 40 mm coverslips, 10 percent formalin, a centrifuge, disposable transfer pipets, a tube rack, a squirt bottle, Lugol's iodine, and a vortex mixer.

STANDARDS

A fecal specimen is microscopically examined with accurate results reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Perform the concentration procedure.	P F

a. Strain about 3 ml of the specimen suspension through the disposable filtering device into a 15 ml conical centrifuge tube.

b. Fill the tube to 12 ml with 10 percent formalin.

c. Centrifuge at 2000 rpm for 5 minutes.

d. Remove the tubes and pour off the supernatant.

e. Prepare slides for acid-fast bacteria (AFB) staining by placing 1 drop of the sediment on a glass slide and allowing it to air dry.

f. Add formalin to the 8 ml mark on the tube.

Performance Measures **Results**

WARNING

Formalin may be fatal if swallowed and harmful if inhaled. Exposure may create a cancer risk and may cause blindness. Keep away from heat, sparks, or flame. Avoid breathing vapor. Use only with adequate ventilation. Wash thoroughly after handling.

g. Add ethyl acetate to the 12 ml tube, stopper the tube, and vortex.

WARNING

Ethyl acetate is flammable. Keep away from heat, sparks, or flame. It is harmful if swallowed or inhaled. Use only with adequate ventilation. Avoid contact with eyes. Wash thoroughly after handling.

h. Allow the tube to stand for 3 minutes.

i. Centrifuge at 2000 rpm for 5 minutes.

j. Ream the plug with an applicator stick and decant the supernatant.

CAUTION

Do not allow debris or ethyl acetate to contaminate the sediment.

2. Perform the microscopic examination. P F

a. Transfer 1 drop of the sediment to a glass slide.

b. Add 1 drop of Lugol's iodine and cover with a coverslip.

c. Scan the whole slide on low (10x) power.

d. Identify using high-dry (40x) objective. Scan at least 75 fields under high dry.

Performance Measures	Results
3. Record and report the results on the laboratory request form.	P F
a. If organisms are recovered, report by genus and species.	
b. If no organisms are seen, report "No ova parasites seen."	

REFERENCES:	*Required*	*Related*
	Manufacturer's Instructions for Con-Trate Fecal Concentration	None

081-821-1042

PERFORM A MACROSCOPIC EXAMINATION OF FECES AND TEST FOR OCCULT BLOOD

CONDITIONS

You have a freshly collected stool specimen without preservatives and a laboratory request form. Necessary materials and equipment: an occult blood developer kit with manufacturer's instructions, disposable transfer pipets, applicator sticks, and a watch which indicates seconds.

STANDARDS

The fecal specimen is examined for visible parasites, color, consistency, mucus, and gross and occult blood. Accurate results are reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Determine the consistency and color of the specimen and record the results.	P	F
2. Examine the specimen for mucus (white patches) on the surface and record the results.	P	F
3. Perform a visual inspection for red and/or tarry spots and patches (gross blood) and record the results.	P	F
4. Perform a survey for visible parasites.	P	F
5. Perform the test for occult blood. This is useful in mass screening for colorectal cancer.	P	F

NOTE: The manufacturer's instructions must be referred to for the particular brand of test in the inventory. Slight variations in the following procedure are to be found due to different source companies.

a. Label the test envelope with the patient's identification.

b. Collect a small portion of the stool sample on one end of an applicator stick.

c. Apply a thin smear inside the first box (labeled "A" or "1" depending on the kit).

d. If indicated, apply a second thin smear inside the second box (labeled "B" or "2").

e. Close the cover.

Performance Measures **Results**

f. Open the flap on the backside of the kit and apply 2 drops of developer to the paper directly over each smear.

g. Read the results within 60 seconds.

NOTE: After reading the results, add developer to the positive and negative performance monitors. A blue color should appear in the positive monitor within 10 seconds. No blue color will appear in the negative monitor. If the positive and negative controls are as expected, the test envelope and reagent are good and the results of the patient's specimen are presumed valid.

(1) **Positive** - Any trace of blue on or at the edge of the smears.

(2) **Negative** - No detectable blue on or at the edge of the smears.

NOTE: Refer to the manufacturer's instructions for specific times and quantitation. The principle of this test is the general reaction:

$$\text{Hemoglobin} \xrightarrow[\text{peroxidase}]{\text{pseudo}} H_2O_2 + \text{orthotoluidine} \xrightarrow{O} \text{guaiac benzidine} \rightarrow \text{Blue Color}$$

6. Record all results on the laboratory request form. P F

REFERENCES:	***Required***	***Related***
	Manufacturer's Instructions for Occult Blood Kit	None

081-821-1056

PERFORM A POTASSIUM (SODIUM) HYDROXIDE PREPARATION OF SKIN SCRAPINGS

CONDITIONS

You have a properly collected specimen (sample of skin, nail, or scalp scrapings) and a laboratory request form. Necessary materials and equipment: 10 percent potassium hydroxide (or 10 percent sodium hydroxide), glass microscope slides, cover slips, a Bunsen burner or incinerator, and a microscope.

STANDARDS

The specimen is examined for fungal elements and accurate results are reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Place the clinical scrapings into 1 or 2 drops of 10 percent KOH or10 percent NaOH on a glass slide.	P	F
2. Cover with a coverslip.	P	F
3. Gently heat the slide over a flame for a few seconds. Do not boil.	P	F
NOTE: If heat is not used, allow the preparation to stand for 15 to 30 minutes, preferably longer, before reading.		
4. Examine the specimen first under low power.	P	F
5. Identify spores and mycelium under high power magnification.	P	F
6. Record and report results on the laboratory request form.	P	F
a. If fungal structures are seen, report "Fungal Structures Present."		
b. If no fungal structures are seen, report "No Fungal Structures Observed."		
7. Confirm positive slides with supervisor.	P	F

REFERENCES: None

081-821-1065

PERFORM A MICROSCOPIC EXAMINATION OF PINWORM PREPARATIONS

CONDITIONS

A patient has a laboratory request form requiring a check for pinworms. Necessary materials and equipment: clear cellulose tape (3/4" wide is best), microscope slides, tongue depressor, cotton, toluene or xylene, and a microscope.

STANDARDS

The collection of the specimen is correct and yields a sample suitable for determining the presence or absence of *E. vermicularis* eggs.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the collection slide.	P	F
a. Anchor one end of the cellulose tape to the underside of the microscope slide.		
b. Fold the tape over the near end of the slide and smooth the adhesive down along the full length of the slide.		
c. Attach a paper tab to the free end of the tape for labeling.		
d. Store in the refrigerator.		
2. Collect the specimen.	P	F
a. Using the paper tab, pull the tape back from the slide leaving the fold over the underside attached.		
b. Loop the tape over a tongue depressor to hold it steady.		
c. Press the sticky tape surface against the perianal skin. Press open the perianal folds to gain access to eggs in the crevices.		
d. Use a limited area of the tape surface to decrease the area for microscopic examination.		
e. Smooth the tape back into place using a piece of cotton.		

Performance Measures **Results**

CAUTION

The eggs will stick to you and are infective for several hours after being passed.

3. Perform a microscopic examination of the slide. P F

a. Lift the tape from the slide and place a drop of toluene or xylene on the slide. Smooth the tape back into position.

NOTE: Slides may be stored up to several weeks in the refrigerator before being examined; however, do not put the toluene or xylene on the slide until ready for examination as distortion to the eggs occurs.

b. Search the slide for eggs using low power magnification and reduced light.

4. Record and report the results. P F

REFERENCES: None

081-821-1067

PERFORM A URINE CULTURE, COLONY COUNT, AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected urine specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a sterile 0.001 ml calibrated loop, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), MacConkey agar (MAC), differential testing reagents, and susceptibility testing disks and plates.

STANDARDS

The pathogen or pathogens are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inoculate the appropriate media. (See Appendix B.)	P	F
a. Use a sterile, 0.001 ml calibrated loop to inoculate well mixed urine to sheep blood agar and MacConkey agar plates. Make one streak down the center of the plate.		
b. Streak to spread the inoculum using a flamed nichrome inoculating loop. This is at a 90° angle to the inoculum streak.		
2. Incubate the inoculated media.	P	F
a. Incubate MacConkey agar without increased CO_2 at 35° C for 18 to 24 hours.		
b. Incubate the blood agar plate at 35° C with or without increased CO_2 for 18 to 24 hours.		
3. Visually examine the culture media for evidence of growth.	P	F
a. Count the number of colonies of each colony type. Calculate the average between the two plates and multiply by the dilution factor of the loop (1000 in the case of the 0.001 ml loop) to calculate the colony count for each organism.		
b. Determine if a colony type needs identification and susceptibility testing by comparing the colony count with the information in Figure 3-3.		

COLONY COUNT	IDENTIFICATION	ANTIBIOTIC SUSCEPTIBILITY
$> 1 \times 10^5$	YES	YES
1×10^4 TO 1×10^5	YES	NO
$< 1 \times 10^4$	NO	NO

Figure 3-3

c. Gram stain each different colony type which requires identification and susceptibility testing. Assume that growth on MAC is Gram-negative bacilli unless the colony is very small compared to the growth on the BAP.

4. Perform differential testing as indicated by the Gram stain. (See Appendix B.) P F

5. Perform susceptibility testing as indicated. (See task 081-821-1053.) P F

6. Record and report the results in the logbook and on the laboratory request form. P F

REFERENCES: None

081-821-1068

PERFORM A WOUND CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected wound fluid specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), supplemented chocolate agar (SCA), MacConkey agar (MAC), thioglycollate 135C broth (THIO), differential testing reagents, susceptibility testing disks and plates, and a candle jar or CO_2 incubator.

STANDARDS

The pathogen or pathogens is(are) identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Perform a direct Gram stain of the specimen.	P	F
2. Inoculate the appropriate media. (See Appendix B.)	P	F
a. Use a drop of thoroughly mixed fluid specimen to inoculate each plate and tube of culture media.		
b. Inoculate swab specimens directly to the culture media and to the THIO.		
3. Incubate the inoculated media.	P	F
a. Incubate MacConkey agar and THIO broth without CO_2 at 35° C for 18 to 24 hours.		
b. Incubate sheep blood agar at 35° C in increased CO_2 for 18 to 24 hours.		

NOTE: Blood agar and THIO broths which show no growth in 18 to 24 hours should be incubated 48 to 72 hours before being considered negative for bacteria.

4. Visually examine the culture media for evidence of growth.	P	F
a. Determine the colony types on each agar plate which most likely represent a pathogen.		

Performance Measures	Results
b. Gram stain each different colony type on each plate medium and from THIO.	

NOTE: MacConkey agar is selective for Gram-negative bacilli. Growth only in the bottom of the THIO tube may represent an anaerobe. This can be reported as a "presumptive anaerobe" if there is no matching growth and Gram stain on the BAP.

5. Perform differential testing on the probable pathogen as indicated by the Gram stain. (See Appendix B.)	P	F
6. Perform susceptibility testing on the probable pathogen as indicated. (See task 081-821-1053.)	P	F
7. Record and report the results in the logbook and on the laboratory request form.	P	F

REFERENCES: None

081-821-1069

PERFORM A BLOOD CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: 70 percent ethyl or isopropyl alcohol swabs, glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), supplemented chocolate agar (SCA), MacConkey agar (MAC), two blood culture bottles (50 ml each), differential testing reagents, a candle jar or CO_2 incubator, centrifuge (1500 x g), and susceptibility testing disks and plates.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Decontaminate the stoppers of the blood culture bottles with alcohol swabs.	P	F
2. Inoculate each blood culture bottle with 5 ml of blood.	P	F
a. Vent one bottle with a filtered needle to provide aerobic conditions. The unvented bottle provides anaerobic conditions.		
b. Label each bottle appropriately.		
3. Incubate both bottles at 35° C.	P	F
4. Perform processing as necessary. (See Figure 3-4 on page 3-86.)	P	F
a. Gram stain results of a 6 to 24 hour visually positive culture should be immediately reported to the physician.		
b. The blood agar plate and supplemented chocolate agar are incubated at 35° C in 5 to 10 percent CO_2 for 3 days.		
c. If the anaerobic bottle shows growth at any time during the incubation period and the subculture plates have no growth, report as "Presumptive anaerobe isolated" and proceed to identify the bacteria.		

Performance Measures	Results	
d. On the 7th day of incubation visually inspect the bottles for evidence of growth. If no growth is seen, prepare a Gram stain smear. If no bacteria are seen on the smear, the culture can be reported as "Negative for the presence of bacteria." However, if slow-growing or fastidious bacteria is suspected (i.e. *Brucella* species), the bottles should be incubated 21 to 30 days before discarding.		
5. Visually examine the culture plates for evidence of growth.	P	F
a. Determine the predominant colony type on each agar plate.		
b. Gram stain each different colony type on each plate medium.		
NOTE: MacConkey agar is selective for Gram-negative bacilli.		
6. Perform differential testing as indicated by the Gram stain. (See Appendix B.)	P	F
7. Perform susceptibility testing as indicated. (See task 081-821-1053.)	P	F
8. Record and report the results in the logbook and on the laboratory request form.	P	F

REFERENCES: None

LABORATORY PROCESSING OF BLOOD CULTURE BOTTLES

DAY	AEROBIC BOTTLE	ANAEROBIC BOTTLE
1	Log-in, **vent** bottle Inoculate culture bottles Incubate at 35° C	Log-in, **do not vent** bottle Inoculate culture bottles Incubate at 35° C
2 (24 hrs)	Observe for visual evidence of growth Gram stain positive bottles Report smear result if positive Subculture positives to media Blind subculture of bottle even if no visual evidence of growth	Observe for visual evidence of growth Gram stain positive bottles Report smear result if positive Subculture positives to media No blind subculture
3 (48 hrs)	Observe media for growth No blind subculture	Observe media for growth No blind subculture
4 (72 hrs)	Blind subculture if no visual evidence of growth	Blind subculture if no visual evidence of growth
5-7	Observe negative bottles Observe subculture media Report negative results on day 7 Stain before discarding No blind subculture	Observe negative bottles Observe subculture media Report negative results on day 7 No stain No blind subculture

Figure 3-4

081-821-1070

PERFORM A SPUTUM CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected sputum specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), supplemented chocolate agar (SCA), MacConkey agar (MAC), differential testing reagents, susceptibility testing disks and plates, and a candle jar or CO_2 incubator.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Perform a direct Gram stain of the specimen.	P	F
NOTE: An acceptable specimen will contain at least 25 polymorphonuclear cells (PMNs) and less than 10 squamous epithelial cells per oil immersion field. If unacceptable, request a fresh specimen.		
2. Inoculate the appropriate media. (See Appendix B.)	P	F
a. Streak for isolation using the 4-quadrant method.		
b. Make a *Staphylococcus aureus* streak that extends across the plate beginning in the first quadrant and extending through the fourth quadrant. This will determine if *Haemophilus* species is present.		
NOTE: The *Staphylococcus aureus* streak is unnecessary when SCA is included in the set-up.		
3. Incubate the inoculated media.	P	F
a. Incubate MacConkey agar without CO_2 at 35° C for 18 to 24 hours.		
b. Incubate the blood agar plate and supplemented chocolate agar at 35°C in increased CO_2 for 18 to 24 hours.		

Performance Measures	Results	
NOTE: If the plates show no growth but the smear was positive, or the patient is receiving anti-microbial agents, continue to incubate the plates up to 72 hours to enhance slow growing fastidious or stressed bacteria.		
4. Visually examine the culture media for evidence of growth.	P	F
a. Determine the predominant colony type on each agar plate.		
b. Gram stain each different colony type on each plate medium except MAC.		
NOTE: MacConkey agar is selective for Gram-negative bacilli.		
5. Perform differential testing as indicated by the Gram stain. (See Appendix B.)	P	F
6. Perform susceptibility testing as indicated. (See task 081-821-1053.)	P	F
7. Record and report the results in the logbook and on the laboratory request form.	P	F

REFERENCES: None

081-821-1071

PERFORM A STOOL CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected stool specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), MacConkey agar (MAC), hektoen agar (HEK), differential testing reagents, and susceptibility testing disks and plates.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inoculate the appropriate media. (See Appendix B.)	P	F
2. Incubate all inoculated media at 35° C without CO_2.	P	F
3. Visually examine the culture media for evidence of growth.	P	F

a. Determine the predominant colony type on each agar plate.

(1) The blood agar plate (BAP) is typically overgrown with Gram-negative bacilli. However, it may prove useful if the MAC and HEK plates are absent of colonies due to staphylococcal or yeast gastroenteritis or if the patient is on broad spectrum antibiotic therapy.

(2) If the MacConkey plate contains only red or pink colonies, the plate can be discarded as being "negative" for enteric pathogens. The uncolored or transparent colonies may be those of intestinal pathogens and should be used to inoculate the enteric identification kit.

(3) Examine the HEK agar plate for red, clear, or black colonies after 18 to 24 hours incubation. Most normal intestinal bacteria ferment one or more of the carbohydrates (xylose, lactose, or sucrose) and produce organic acids which are indicated by yellow colonies on the HEK agar.

b. Gram stain each different colony type from each plate medium except for those colonies growing on HEK and MAC agar which are presumed to be Gram-negative bacilli.

Performance Measures	Results
4. Perform differential testing as indicated by the Gram stain and growth pattern. (See Appendix B.)	P F
5. Perform susceptibility testing as indicated. (See task 081-821-1053.)	P F
6. Record and report the results in the logbook and on the laboratory request form.	P F

REFERENCES: None

081-821-1072

PERFORM A CEREBROSPINAL FLUID (CSF) CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected CSF specimen in a sterile screw-capped tube and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, India ink, blood agar plate (BAP), supplemented chocolate agar (SCA), MacConkey agar (MAC), thioglycollate 135C broth (THIO), differential testing reagents, a candle jar or CO_2 incubator, and susceptibility testing disks and plates.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Centrifuge the specimen for 15 minutes at 2500 rpm.	P	F
2. Aseptically transfer the supernatant to a THIO tube for incubation.	P	F
3. Perform a direct Gram stain of the sediment.	P	F
4. Perform an India ink wet preparation, if requested.	P	F
5. Perform an acid-fast stain, if requested.	P	F
6. Inoculate the appropriate media (see Appendix B) using a drop of thoroughly mixed specimen.	P	F
7. Incubate the inoculated media.	P	F

a. Incubate MacConkey agar and THIO broth without CO_2 at 35° C for 24 to 72 hours. Observe every 24 hours.

b. Incubate BAP and SCA at 35° C in increased CO_2 for 24 to 72 hours. Observe every 24 hours.

Performance Measures	Results
8. Visually examine the culture media for evidence of growth.	P F
a. Determine the predominant colony type on each agar plate.	
b. Gram stain each different colony type on each plate medium except MAC and from THIO.	

NOTE: MacConkey agar is selective for Gram-negative bacilli.

9. Perform differential testing as indicated by Gram stain and growth pattern. (See Appendix B.)	P F
10. Perform susceptibility testing as indicated. (See task 081-821-1053.)	P F
11. Record and report the results in the logbook and on the laboratory request form.	P F

REFERENCES: None

081-821-1073

PERFORM A CULTURE AND SUSCEPTIBILITY TEST FOR GONORRHEA

CONDITIONS

You have a properly collected urethral/genital specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), Thayer-Martin agar (TM), differential testing reagents, susceptibility testing disks and plates, and a candle jar or CO_2 incubator.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Perform a direct Gram stain of the specimen.	P	F
2. Inoculate the appropriate media. (See Appendix B.)	P	F
a. When requested by the physician, inoculate Thayer-Martin agar with a large "Z" on the surface and streak cross-wise over the entire surface using a back and forth motion.		
b. Inoculate swab specimens directly to the first quadrant of the culture media and streak for four-quadrant isolation.		
3. Incubate the blood agar plate and the Thayer-Martin agar at 35° C in increased CO_2 for 24 to 72 hours.	P	F
NOTE: The primary causative agent for gonorrhea requires 3 to 7 percent CO_2 for growth and is temperature sensitive. Frequent false negatives occur when the proper incubation is not provided.		
4. Visually examine the culture media for evidence of growth.	P	F
a. Determine the predominant colony type on each agar plate. Since Thayer-Martin agar is selective, most organisms other than *Neisseria* will not grow on it.		
b. Gram stain each different colony type on the plate medium.		

Performance Measures	Results
5. Perform differential testing as indicated by the Gram stain and growth pattern. (See Appendix B.)	P F
6. Perform susceptibility testing as indicated. (See task 081-821-1053.)	P F
7. Record and report the results in the logbook and on the laboratory request form.	P F

REFERENCES: None

081-821-1074

PERFORM A THROAT CULTURE AND SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected throat specimen and a laboratory request form. Necessary materials and equipment: glass slides, an inoculating loop and needle, a Bunsen burner or incinerator, Gram stain reagents, a microscope, immersion oil, blood agar plate (BAP), supplemented chocolate agar (SCA), differential testing reagents, susceptibility testing disks and plates, and a candle jar or CO_2 incubator.

STANDARDS

The pathogen or pathogens is/are identified according to the flow chart and the antibiotic susceptibility determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inoculate the appropriate media. (See Appendix B.)	P	F
NOTE: Swab specimens are inoculated directly to the first quadrant and streaked for isolation using a sterile inoculating loop. Stab the BAP two to three times in each quadrant.		
2. Incubate the inoculated media. The blood agar plate(BAP) is incubated at 35° C in increased CO_2 for 18 to 24 hours.	P	F
3. Visually examine the culture media for evidence of growth.	P	F
a. Determine the predominant colony type on each agar plate.		
b. Determine the hemolytic pattern of each colony type.		
NOTE: Group A *streptococci* form small translucent colonies with wide zones of beta hemolysis.		
c. Gram stain each different colony type seen on the plate media.		
4. Perform differential testing as indicated by the Gram stain and growth pattern. (See Appendix M.)	P	F

Performance Measures	Results
5. Perform antibiotic susceptibility testing as indicated. (See task 081-821-1053.)	P F

NOTE: Group A *streptococci* are usually susceptible to most antibiotics and are not routinely tested for antibiotic susceptibility.

6. Record and report the results in the logbook and on the laboratory request form.	P F

REFERENCES: None

081-821-1053

PERFORM A DISK DIFFUSION ANTIBIOTIC SUSCEPTIBILITY TEST

CONDITIONS

You have a properly collected bacterial specimen and a laboratory request form. Necessary materials and equipment: antibiotic disks, a chart listing zone diameter standards, a disk dispenser, Mueller-Hinton agar plates, an inoculating needle, a Bunsen burner or incinerator, a tube of Trypticase Soy Broth, a 0.5 McFarland barium sulfate standard solution, control strain of *Staphylococcus aureus* (ATCC 29213), control strain of *Escherichia coli* (ATCC 25922), blood agar plates, sterile cotton swabs, sterile forceps, 35° C incubator, and a millimeter ruler.

STANDARDS

The antibiotic susceptibility of an organism is identified.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Prepare the inoculum.	P F
a. Use an inoculating needle to pick 4 or 5 colonies from the specimen plate and inoculate a tube containing 3 to 5 ml of Trypticase Soy Broth.	
b. Match the turbidity to the 0.5 McFarland barium sulfate standard solution. Add colonies, dilute with broth or incubate to adjust the turbidity.	
2. Streak the plate with inoculum.	P F
a. Dip a sterile cotton swab into the standardized inoculum and rotate the swab around the inside of the tube to remove the excess inoculum.	
b. Streak the swab evenly over the agar surface in three directions to ensure confluent growth of the organism.	
c. "Rim" the edge of the plate with the swab.	
d. Allow the inoculum to dry for 3 to 5 minutes with the plate cover in place.	

Performance Measures	**Results**	
3. Perform quality control.	P	F
a. Control strains of *Staphylococcus aureus* (ATCC 29213) and *Escherichia coli* (ATCC 25922) are tested each week, each time a new lot of Mueller-Hinton agar is used, each time a new lot of antimicrobial disks are used, or whenever a zone diameter outside of the acceptable minimum or maximum zone size is obtained.		
b. Store working control cultures on blood agar plates and subculture weekly.		
4. Place disks on the agar surface.	P	F
a. Use the automatic disk dispenser which will ensure even contact for all the disks.		
b. If sterile forceps are used, evenly space up to nine disks in the periphery and two to three disks in the center of the 150 mm Mueller-Hinton plate. Press the disks gently to ensure even contact.		
5. Incubate the plate within 30 minutes at 35° C without CO_2.	P	F
6. Read the plates.	P	F
a. After 18 to 24 hours incubation, measure the zone diameters where growth is inhibited using the millimeter ruler. A diameter of 6 mm is the diameter of the disk itself and indicates no zone. (Refer to Figure 3-5.)		
(1) *Proteus mirabilis* and *Proteus vulgaris* may swarm into areas of inhibited growth but the zone of predominant growth is usually outlined and the inside veil of swarming growth is ignored when measuring.		
(2) Sulfonamides may show a slight growth for several generations before the antibiotic causes an inhibition of growth. In this case, ignore a few colonies growing inside the obvious outer zone.		

Performance Measures **Results**

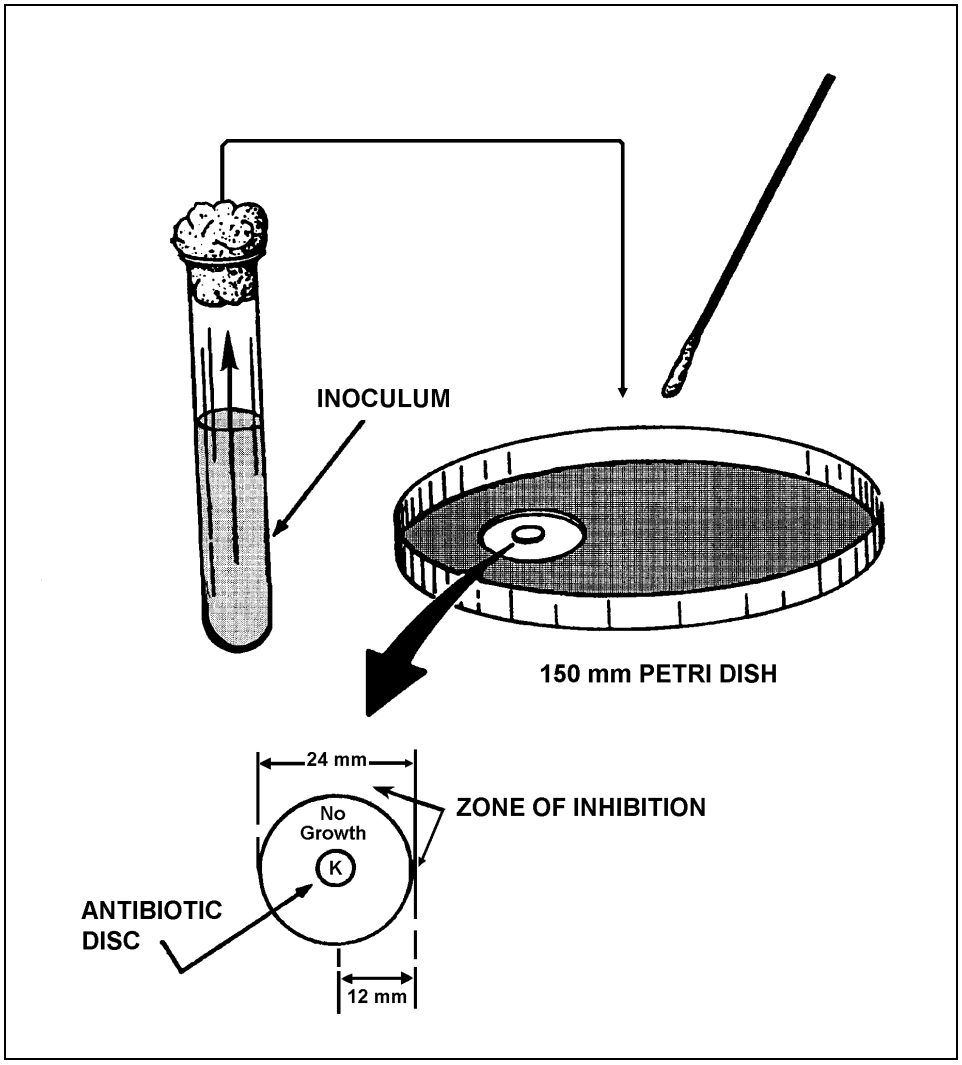


Figure 3-5

b. Use the interpretive chart to determine if the tested strain is **susceptible**, **intermediate**, or **resistant**.

7. Record and report the results. P F

REFERENCES: None

081-821-1075

PERFORM A MICROSCOPIC EXAMINATION FOR ACID-FAST BACTERIA

CONDITIONS

You have a properly collected patient specimen in a sterile disposable container and a laboratory request form. Necessary materials and equipment: Kinyoun's stain reagents, microscope slides, a Bunsen burner or incinerator, an inoculating loop, a microscope, and immersion oil.

STANDARDS

An unconcentrated specimen is stained adequately with Kinyoun's stain to cause acid-fast organisms to appear as red colored rods, coccobacilli, or filaments.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures **Results**

> **CAUTION**
>
> Acid-fast bacteria are highly infectious. Specimens and smears **must** be handled with care. Use face-masks and gloves and wash hands immediately after performing the AFB examination. Perform these procedures in a biosafety cabinet if available.

1. Prepare a smear of the specimen on a glass slide. Air-dry and fix the smear by passing it briefly through a flame. P F

2. Stain the smear. P F

   a. Flood the fixed smear with Kinyoun's carbol-fuchsin stain for 3 minutes.

   b. Wash the smear gently with running water.

   c. Decolorize it with Kinyoun's acid-alcohol reagent until no color appears in the washing. This should take about 2 minutes.

   d. Wash the smear gently with running water.

   e. Counterstain with Kinyoun's methylene blue reagent for 30 seconds.

Performance Measures	Results
f. Wash the smear gently with running water.	
g. Allow the smear to air-dry.	
3. Examine the smear using the oil immersion objective. Scan the length of the slide at least three times in the stained area (about 300 fields).	P F

NOTE: Acid-fast organisms will appear as red coccobacilli, rods, or filaments. Some may appear beaded. The background will be bluish.

REFERENCES: None

081-821-1033

PERFORM A RAPID PLASMA REAGIN (RPR) TEST

CONDITIONS

You have a properly collected serum specimen tube and a laboratory request form. Necessary materials and equipment: a card rotator machine (calibrated to 100 rpm) with a humidifier cover, a bottle of water for the humidifier cover, a needle dropper, an ampule of RPR antigen, gauze, a test tube rack, a test tube marker, dispenstirs, controls, a test card, a logbook, and a clock or watch.

STANDARDS

The presence or absence of reaginic antibodies is determined and accurate results are reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Allow the reagents and specimen to reach room temperature.	P	F
2. Use a dispenstir to dispense 1 drop of unknown serum and reactive and nonreactive controls into separate 18 mm circles on the RPR card.	P	F
3. Use the flat end of the dispenstir to spread each specimen to the limits of the circle.	P	F
4. Mix and dispense 1 drop of antigen into each specimen on the card.	P	F

NOTE: The needle should deliver 30 drops of antigen, ±1 drop, per 0.5 ml. Dispense the first few drops of antigen on the corner of the card to rid the needle of bubbles.

5. Place the card on the rotator, cover with a humidifier lid, and rotate for 8 minutes.	P	F

NOTE: The rotator speed should be 100 rpm (±5 rpm).

6. Examine macroscopically for agglutination by tilting and rotating each card by hand.	P	F
a. Write **"REACTIVE"** on the worksheet for characteristic clumping of carbon particles.		
b. Write **"NONREACTIVE"** on the worksheet for no clumping of carbon particles.		

NOTE: A slight roughness is considered nonreactive.

Performance Measures	Results	
7. Obtain the correct results for the controls and the unknown.	P	F

NOTE: Reactive specimens should be confirmed by a test specific for treponemal antibody (FTA-Fluorescent Treponemal Antibody test). False positives can be caused by other diseases: infectious mononucleosis, leprosy, lupus erythematosus, or viral pneumonia.

8. Record the results in the logbook and on the laboratory request form.	P	F

REFERENCES:	***Required***	***Related***
	None	Product Insert for Rapid Plasma Reagin Test

081-821-1058

PERFORM A SEROLOGICAL TEST FOR INFECTIOUS MONONUCLEOSIS

CONDITIONS

You have a properly collected patient specimen and a laboratory request form. Necessary materials and equipment: a Mono-Latex Reagent Kit containing mono-latex reagent, a mononucleosis positive control, a mononucleosis negative control, capillary tubes with bulbs, a black glass slide, disposable stirrers, and a timer.

STANDARDS

The latex agglutination test for infectious mononucleosis antibodies is performed with 100 percent accurate results for the patient specimen and positive and negative controls.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Allow the reagents and specimen to warm to room temperature.	P	F
2. Fill a fresh capillary tube to the line for each specimen.	P	F
3. Use the capillary bulb to deliver 1 free-falling drop of specimen (50 µl) into the center of the appropriate circle on the black glass slide.	P	F
4. Dispense 1 drop from each control bottle into the appropriate circle.	P	F
5. Resuspend latex particles by gentle mixing.	P	F
6. Deliver 1 drop of resuspended latex to the top of each specimen and control.	P	F

CAUTION

Hold the latex bottle exactly vertical and do not touch the tip of the reagent latex to any of the specimens or controls.

7. Mix the contents of each circle with a clean stirrer covering the entire area.	P	F
8. Rock the slide immediately in a circular motion at 40 rocks per minute.	P	F

Performance Measures	Results	
NOTE: If a rotator is used, rotate at 100 to 120 rpm for a full 2 minutes.		
9. Read and report the results on the laboratory request form.	P	F
a. Visible agglutination at 2 minutes is a positive reaction.		
b. Lack of agglutination at 2 minutes indicates a negative reaction.		

NOTE: Infectious mononucleosis heterophile antibodies have been associated with disease states other than infectious mononucleosis, such as leukemia, cytomegalovirus, Burkitt's lymphoma, rheumatoid arthritis and viral hepatitis.

REFERENCES:	***Required***	***Related***
	None	Product Insert for Serologic Test for Infectious Mononucleosis

081-821-1064

PERFORM A QUALITATIVE HCG TEST

CONDITIONS

You have a properly collected first morning urine specimen and a laboratory request form. Necessary materials and equipment: Tandem Icon II HCG test kit including the test cylinder, antibody conjugate (bottle A), substrate reagent (bottle B), wash concentrate (bottle C), and package insert; transfer pipets; reagent station; and a Tandem Icon II HCG control set (urine).

STANDARDS

A urine pregnancy test is performed on a specimen and controls. Results are reported with 100 percent accuracy.

EVALUATION/TRAINING

Evaluation Guide

Performance Measures	**Results**
1. Prepare the specimen and reagents.	P F
a. Allow the specimen and reagents to warm to room temperature and gently mix each by swirling.	
b. Dipstick urine for specific gravity.	
NOTE: Centrifuge turbid specimens at 1000 rpm for 3 minutes and use the supernatant for the test.	
2. Perform the urine pregnancy test.	P F
a. Place 5 drops of the urine specimen onto the center of the Icon HCG membrane allowing it to drain through the membrane before adding the next reagent (usually 5 to 10 seconds).	
b. Place 3 drops of antibody conjugate (bottle A) onto the center of the Icon HCG membrane and wait at least 1 minute for complete drainage and antibody reaction.	
c. Direct wash solution onto the inner wall of the cylinder so that it flows onto the membrane. Fill the cylinder up to the ridged line and wait for complete drainage before adding the next reagent.	
d. Dispense 3 drops of substrate reagent (bottle B) onto the center of the membrane and wait 2 minutes for the color to develop.	

Performance Measures	Results	
e. Stop the color development by adding wash solution to the cylinder up to the fill line.		
f. With the "P" facing you, observe for color development at the test zone and positive reference zone.		
3. Interpret urine pregnancy test results.	P	F
a. No blue spot at the test zone indicates a negative result.		
NOTE: If the specific gravity is $\leq$ 1.005, add this comment to the report: Specific gravity $\leq$ 1.005, results may be invalid; please resubmit.		
b. A blue spot in the test zone, regardless of the color intensity, indicates a positive result.		
c. For the test to be valid, the reference zone must also appear as a blue spot within 2 minutes after adding the substrate. If no color appears, the test is invalid.		
NOTE: A light blue color that develops over the entire membrane indicates that inadequate washing has occurred. Random blue specks should not be interpreted as a positive result.		
4. Record and report the results on the laboratory request form.	P	F

REFERENCES:	***Required***	***Related***
	Manufacturer's Instructions for Qualitative HCG Test	None

081-821-1018

PERFORM ABO GROUPING AND CONFIRMATION TESTS

CONDITIONS

You have patient or donor blood specimens. Necessary materials and equipment: 10 x 75 mm test tubes, a test tube rack, an indelible marker, disposable transfer pipets, reagents, a processing worksheet, a logbook, a centrifuge (calibrated to 1000 RCF @ 3175 rpm), and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The ABO group is determined by performing cell grouping and serum grouping with 100 percent accuracy.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Prepare the equipment and the specimen.	P F
a. Obtain a test tube rack.	
b. Place the patient/donor blood tube and serum tube in the rack.	
c. Prepare a 2 to 5 percent cell suspension from the blood tube.	
d. Obtain five test tubes, label them properly, and place them in the rack.	
(1) Label tube #1, "A" with the patient ID number.	
(2) Label tube #2, "B" with the patient ID number.	
(3) Label tube #3, "A,B" with the patient ID number.	
(4) Label tube #4, "AC" with the patient ID number.	
(5) Label tube #5, "BC" with the patient ID number.	
2. Prepare the specimen for group testing.	P F
a. Add 1 drop of "Anti-A" reagent and 1 drop of the patient's cell suspension to the tube marked "A".	

Performance Measures **Results**

b. Add 1 drop of "Anti-B" reagent and 1 drop of the patient's cell suspension to the tube marked "B".

c. Add 1 drop of "Anti-A,B" reagent and 1 drop of the patient's cell suspension to the tube marked "A,B".

d. Add 2 drops of the patient's serum and 1 drop of "A" cells to the tube marked "AC".

e. Add 2 drops of the patient's serum and 1 drop of "B" cells to the tube marked "BC".

3. Perform the ABO group test. P F

a. Mix each tube by gentle shaking.

b. Centrifuge the test tubes for 15 seconds.

c. Examine each tube for hemolysis.

d. Examine each tube for agglutination.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis.

4. Interpret the results of the test and determine the blood group. (See Figures 3-6 and 3-7.) P F

EXAMPLE OF EXPECTED RESULTS

ABO BLOOD GROUP	ANTI-A	ANTI-B	ANTI-A,B	A CELLS	B CELLS
A	3+	0	4+	0	2+
B	0	2+	3+	2+	0
AB	1+	2+	2+	0	0
O	0	0	0	3+	3+

Figure 3-6

Performance Measures **Results**

ABO BLOOD GROUP	ANTIGENS PRESENT	ABO ANTIBODIES PRESENT
A	A	Anti-B
B	B	Anti-A
AB	A and B	No ABO antibodies
O	No ABO antigens	Anti-A and Anti-B

Figure 3-7

5. Record the results in the logbook and on the laboratory request form. P F

REFERENCES: ***Required*** ***Related***

TM 8-227-3 None

081-821-1019

PERFORM AN Rh TYPING

CONDITIONS

You have a patient's blood specimen. Necessary materials and equipment: 10 x 75 mm test tubes, an indelible marker, a test tube rack, disposable transfer pipets, prepared reagents: anti-Rh (D) typing serum and 22 percent bovine albumin (control), a processing worksheet, a logbook, a centrifuge (calibrated to 1000 RCF @ 3175 rpm), and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The Rh type of an unknown blood sample is determined with 100 percent accuracy.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the equipment and the specimen.	P	F
a. Obtain a test tube rack.		
b. Place the patient's blood specimen tube in the rack.		
c. Prepare a 2 to 5 percent cell suspension from the patient's blood.		
d. Obtain two test tubes, properly label the tubes, and place them in the rack.		
(1) Label tube #1, "D" with the patient ID number.		
(2) Label tube #2, "DC" with the patient ID number.		
2. Prepare the sample for Rh typing.	P	F
a. Add 1 drop of "Anti-D" and 1 drop of the patient's cell suspension to the tube marked "D".		
b. Add 1 drop of Rh control (22 percent bovine albumin) and 1 drop of the patient's cell suspension to the tube marked "DC".		
3. Perform the Rh (D) typing test.	P	F
a. Mix the test tubes by gentle shaking.		

Performance Measures	**Results**	
b. Centrifuge the test tubes for 15 seconds.		
c. Examine each test tube for hemolysis.		
d. Examine each test tube for agglutination.		
(1) Write "+" on the worksheet for agglutination.		
(2) Write "0" on the worksheet for no agglutination.		
4. Interpret the results of the test and determine the Rh type.	P	F

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis. If the patient specimen is <2+ **AND** the anti-D reagent is polyclonal or chemically modified, **OR** the control tube has agglutination, proceed with the test for Rh variant (weak D).

5. Perform the test for the Rh variant (weak D antigen) if no agglutination is seen in **BOTH** the Anti-D and control tube.	P	F

NOTE: The terms Rh positive and Rh negative refer to the presence or absence of the red cell antigen "D".

6. Record the results in the logbook and on the laboratory request form.	P	F

REFERENCES:	***Required***	***Related***
	TM 8-227-3	None

081-821-1020

PERFORM A TEST FOR Rh VARIANT (WEAK D)

CONDITIONS

You have just performed an Rh typing. Your results were negative. Necessary materials and equipment: two test tubes labeled "D" and "DC" (control) from the Rh (D) typing test, a centrifuge (calibrated to 1000 RCF at 3175 rpm), a test tube rack, disposable transfer pipets, prepared reagents, antihuman globulin (AHG) and check cells, saline, gauze, a processing worksheet, a logbook, a 37? C incubator, and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The presence or absence of Rh variant (weak D) is determined with 100 percent accuracy.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Prepare the tubes for weak D antigen testing.	P F

a. Incubate the tubes labeled "D" and "DC" for 15 to 30 minutes at 37° C.

b. Upon removal from the incubator, centrifuge the tubes for 15 seconds.

c. Examine each test tube for hemolysis.

d. Read for agglutination.

(1) If the "D" tube is positive and the "DC" tube is negative, record the results and discontinue the procedure. The specimen is Rh positive.

(2) If no agglutination is visible in either tube, record "0" and continue testing.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+.

e. Wash the cells in both tubes at least four times with saline to remove protein and any unbound antibodies.

NOTE: If the RBCs are not washed correctly, the unbound antibodies or protein may neutralize the antihuman globulin and cause a false negative result.

Performance Measures	Results	
f. Remove all saline from the last wash by blotting the tubes with gauze.		
2. Perform the weak D antigen test.	P	F
a. Add 2 drops of antihuman globulin (AHG) to both test tubes.		
b. Mix the test tubes by swirling.		
c. Centrifuge the test tubes for 15 seconds.		
d. Examine each test tube for hemolysis.		
e. Examine each test tube for agglutination.		

NOTE: Current standards do not require the use of optical aids, but their use may enhance sensitivity and consistency.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+. Repeat the entire procedure starting with task 081-821-1019 if the "DC" tube shows any agglutination.

f. Add 1 drop of check cells to all negative tubes to confirm the reactivity of the antiglobulin reagent.

NOTE: Check cells are group "O" cells that have been sensitized with IgG. If the tubes do not show agglutination after the addition of check cells, repeat the entire procedure starting with task 081-821-1019.

3. Interpret the results and determine the blood type.	P	F
4. Record the results in the logbook and on the laboratory request form.	P	F

REFERENCES:	***Required***	***Related***
	TM 8-227-3	None

081-821-1021

PERFORM AN ANTIBODY SCREEN

CONDITIONS

You have a patient or donor blood specimen. Necessary materials and equipment: 10 x 75 mm test tubes, gloves, gauze, an indelible marker, a test tube rack, disposable transfer pipets, saline, reagents, a worksheet, a logbook, a 37° C heating block, a centrifuge (calibrated to 1000 RCF @ 3175 rpm), and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The presence or absence of circulating unexpected antibodies is determined with accurate results reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the equipment.	P	F
a. Obtain the test tube rack.		
b. Place the patient serum or plasma in the rack.		
NOTE: The specimen should not be more than 3 days old.		
c. Obtain two test tubes. Label and place them in the rack.		
(1) Label tube #1, "I" with the patient ID number.		
(2) Label tube #2, "II" with the patient ID number.		
2. Prepare the serum or plasma for testing.	P	F
a. Place 2 drops of patient's serum or plasma into each test tube.		
b. Add 1 drop of screening cells I to the test tube labeled "I".		
c. Add 1 drop of screening cells II to the test tube labeled "II".		
NOTE: This is the Saline IAT (indirect antiglobulin test) method including saline, albumin and AHG phases.		

Performance Measures	**Results**	
3. Perform the saline phase (immediate spin).	P	F
a. Mix the test tubes.		
b. Centrifuge the test tubes for 15 seconds.		
c. Examine each test tube for hemolysis.		
d. Examine each test tube for agglutination.		
(1) Write "+" on the worksheet for agglutination.		
(2) Write "0" on the worksheet for no agglutination.		

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis.

4. Perform the albumin phase.	P	F
a. Add 2 drops of 22 percent bovine albumin to both tubes.		
b. Mix the tubes.		
c. Incubate both tubes for 15 to 30 minutes at 37° C.		
d. Centrifuge the test tubes for 15 seconds.		
e. Examine each tube for agglutination.		
(1) Write "+" on the worksheet for agglutination.		
(2) Write "0" on the worksheet for no agglutination.		

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis.

5. Perform the AHG phase.	P	F
a. Wash the cells in both test tubes four times with saline.		
b. Remove all saline from the last wash by blotting the tube with gauze.		
c. Add 2 drops of AHG to both test tubes.		
d. Mix the tubes by gentle swirling.		

Performance Measures **Results**

e. Centrifuge the test tubes for 15 seconds.

f. Examine each test tube for hemolysis.

g. Examine each test tube for agglutination.

NOTE: Current standards do not require the use of optical aids, but their use may enhance sensitivity and consistency.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis.

h. Add 1 drop of check cells to all negative tubes to confirm the reactivity of the antiglobulin reagent.

NOTE: If negative tubes do not show agglutination after adding check cells, the result is invalid and the test must be repeated.

6. Record the results in the logbook and on the laboratory request form. P F

REFERENCES:	***Required***	***Related***
	TM 8-227-3	None

081-821-1022

PERFORM DIRECT ANTIGLOBULIN TESTS

CONDITIONS

You have a patient blood specimen drawn in EDTA. Necessary materials and equipment: 10 x 75 mm test tubes, a test tube rack, gauze, saline, an indelible marker, disposable transfer pipets, reagents, a worksheet, a logbook, a centrifuge (calibrated to 1000 RCF @ 3175 rpm), and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The presence or absence of antibodies coating the red blood cells is determined with accurate results reported.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Prepare the equipment.	P F
a. Obtain the test tube rack.	
b. Place the patient's specimen in the rack.	
c. Obtain two test tubes. Label and place them in the rack.	
(1) Label the first tube "DC" with the patient's ID number.	

NOTE: "DC" is a shortened label for Direct Antiglobulin Test Cells.

(2) Label the second tube "DAT" with the patient's ID number.	

NOTE: "DAT" is a shortened label for Direct Antiglobulin Test.

d. In the tube labeled "DC", prepare a 2 to 5 percent cell suspension from the blood specimen.	
2. Prepare the tube for testing.	P F
a. Place 1 drop of 2 to 5 percent cell suspension into the "DAT" test tube.	
b. Wash the cells at least four times with saline.	

Performance Measures	Results

c. Remove all saline from the last wash by blotting the tube with gauze.

d. Add 2 drops of antihuman globulin (AHG) to the test tube.

3. Perform the test. P F

a. Mix the tube.

b. Centrifuge the test tube for 15 seconds.

c. Examine the test tube for hemolysis.

d. Examine the test tube for agglutination.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+.

e. If using polyspecific AHG or anti-C3d, leave the negative tube at room temperature for 5 minutes. If not using polyspecific AHG or anti-C3d, proceed to step 3i.

f. Centrifuge the tube for 15 seconds.

CAUTION

This post incubation reading should never be substituted for an immediate spin reading because reactions due to IgG coating may become weaker after incubation.

g. Examine the test tube for hemolysis.

h. Examine the test tube for agglutination.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+.

i. Add check cells to all negative tubes to confirm the reactivity of the antiglobulin reagent.

Performance Measures	Results
4. Obtain and record the results in the logbook and on the laboratory request form.	P F

REFERENCES:	*Required*	*Related*
	TM 8-227-3	None

081-821-1023

PERFORM A CROSSMATCH PROCEDURE

CONDITIONS

You have a patient's blood specimen tube and completed SF 518. Necessary materials and equipment: 10 x 75 mm test tubes, an indelible marker, a test tube rack, disposable transfer pipets, gauze, saline, reagents, a worksheet, a centrifuge (calibrated to 1000 RCF @ 3175 rpm), a logbook, a 37° C incubator, and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The compatibility or incompatibility of donor units of blood with that of a recipient is determined with 100 percent accuracy and incompatibilities are evaluated.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Verify the need to perform a crossmatch procedure.	P	F
a. Check that the transfusion request (SF 518) is properly prepared.		
b. Verify the number of units requested for the transfusion.		
NOTE: There must be one SF 518 for each unit requested.		
c. Check that the name and ID number on the blood tubes match those on the request form.		
d. Ensure that the phlebotomist's initials are on the tube with the appropriate date and time.		
2. Determine the recipient's ABO group. (See task 081-821-1018.)	P	F
3. Determine the recipient's Rh type. (See task 081-821-1019.)	P	F
4. Select the donor blood to perform the testing.	P	F
a. Obtain the donor units that are the same blood group and type as that of the recipient.		
b. Select the order of preference of the donor blood, if the group and type matching the recipient is not available.		

Performance Measures	Results	
(1) If the recipient is Group O, give only Group O blood.		
(2) If the recipient is Group A, give Group A blood first and then Group O packed cells.		
(3) If the recipient is Group B, give Group B blood first and then Group O packed cells.		
(4) If the recipient is Group AB, give Group AB blood first and then Group A packed cells or Group B packed cells or Group O packed cells as a last resort, in that order.		
(5) Rh positive blood should be selected for Rh positive recipients.		
(6) Rh negative blood should be saved for Rh negative recipients (this includes individuals who are weak D positive).		
5. Prepare the equipment.	P	F
a. Obtain the test tube rack.		
b. Place the patient's blood specimen tube and serum tube in the rack.		
c. Obtain two test tubes. Label tube #1, "XM" (Crossmatch) with the patient ID number and first donor unit number. Label tube #2 "XM" (Crossmatch) with the patient ID and second donor unit number. Place both tubes in the rack.		
d. Prepare a 2 to 5 percent cell suspension from a segment of each donor unit and from the recipient's cells.		
6. Add 2 drops of recipient's serum and 1 drop of donor's cell suspension to the tubes labeled "XM".	P	F
7. Prepare the test tubes for an immediate spin (saline phase).	P	F
a. Mix the test tubes.		
b. Centrifuge the test tubes for 15 seconds.		
c. Examine each test tube for hemolysis.		
d. Examine each test tube for agglutination.		

Performance Measures **Results**

NOTE: If the antibody detection tests (AB screen) are negative and the recipient has no history of clinically significant antibodies, the immediate spin crossmatch may be performed **ONLY** for the detection of ABO incompatibilities. The antiglobulin phase of testing rarely uncovers clinically significant antibodies in a recipient whose antibody screening test is negative and who has no history of clinically significant antibodies.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+; and annotate hemolysis.

WARNING

If a positive reaction occurs in the crossmatch, stop the crossmatch procedure. The blood is not compatible.

8. Perform the albumin phase. P F

a. Add 2 drops of 22 percent bovine albumin to tubes labeled "XM" (only if no agglutination appeared after the saline phase).

b. Mix the tubes.

WARNING

If a positive reaction occurs in the crossmatch, stop the crossmatch procedure. The blood is not compatible.

9. Continue testing the tubes labeled "XM". P F

a. Incubate the test tubes for 15 to 30 minutes at 37° C.

b. Centrifuge the test tubes for 15 seconds.

c. Examine each test tube for hemolysis.

Performance Measures **Results**

d. Examine each test tube for agglutination.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+.

10. Perform the final testing of the "XM" tubes. P F

a. Wash the tubes four times with saline.

b. Remove all saline from the last wash by blotting with gauze.

c. Add 2 drops of antihuman globulin (AHG) to each tube.

d. Mix each tube gently.

e. Centrifuge each test tube for 15 seconds.

f. Examine each test tube for hemolysis.

g. Examine each test tube for agglutination.

NOTE: Current standards do not require the use of optical aids before a crossmatch may be considered compatible, but their use may enhance sensitivity and consistency.

(1) Write "+" on the worksheet for agglutination.

(2) Write "0" on the worksheet for no agglutination.

NOTE: Grade the degree of agglutination: +/-, 1+, 2+, 3+, or 4+.

h. Add check cells to all negative tubes to confirm the reactivity of the antihuman globulin reagent.

NOTE: If the negative tubes do not show agglutination after the addition of check cells, repeat the bovine albumin phase (steps 8 through 10g).

11. Obtain and record the results in the logbook and on the transfusion request form, SF 518. P F

REFERENCES:	*Required*	*Related*
	TM 8-227-3	None

081-821-1024

STORE BLOOD

CONDITIONS

You have units of blood or blood components. Necessary materials and equipment: refrigeration units, appropriate records, local SOP, and an AABB Technical Manual (TM 8-227-3).

STANDARDS

The temperature of the refrigerator is within the required range. The units are categorized by blood group and type. Outdated, quarantined, and unprocessed blood are stored on the appropriate shelf in the refrigerator.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inspect the equipment.	P	F
a. Ensure that the temperature indicators on the refrigerator are operable.		
b. Ensure that the temperature is between 1° and 6° C.		
2. Verify that the different categories of blood are separated within the refrigerator.	P	F
a. Place blood with other blood of the same group and type.		
b. Place unprocessed blood with other unprocessed blood.		
c. Place crossmatched blood with other crossmatched blood.		
d. Verify that rejected, outdated, or quarantined blood is stored on the proper shelf.		
3. Check for the type of anticoagulant used for maximum storage life of the blood.	P	F

NOTE: Blood prepared with CPDA-1 is usable for 35 days; blood prepared with ACD, CPD, or CP2D is usable for 21 days.

4. Check that required tests were performed on the blood units.	P	F
a. Verify that Rh (D) typing was performed.		

Performance Measures	Results

b. Verify that ABO grouping was performed.

c. Verify that screening for unexpected antibodies was performed.

d. Verify that blood was tested to detect units that might transmit diseases.

(1) HBsAg.

(2) Anti-HIV-1/2.

(3) Anti-HTLV-I/II.

(4) Anti-HBc.

(5) ALT.

(6) Serologic test for Syphilis.

(7) Anti-HCV.

5. Perform ABO group (task 081-821-1018) and Rh type(task 081-821-1019) to verify ABO/Rh label on blood bag. P F

NOTE: If the ABO group and/or the Rh type does not match the label on the bag, notify the supervisor immediately.

6. Inspect the blood for signs of contamination. P F

a. Whole blood and packed red blood cells with abnormal color or other appearance should be rejected for transfusion if--

(1) The red cell mass looks purple.

(2) A zone of hemolysis is observed above the cell mass.

(3) Blood clots are visible.

(4) The plasma is murky or discolored (purple, brown, or red).

(5) Blood or plasma is present at the sealing sites in the tubing or in the ports.

Performance Measures	Results
b. A green hue in the plasma, which may be due to a change in bilirubin pigments caused by exposure to light or to oral contraceptives taken by the donor, need not be a reason to reject the unit.	
7. Notify the supervisor of questionable units and the nature of the suspected problem.	P F

REFERENCES:	*Required*	*Related*
	TM 8-227-3	None

081-821-1034

OBTAIN A BLOOD SPECIMEN BY CAPILLARY PUNCTURE

CONDITIONS

Necessary materials and equipment: capillary tubes, alcohol wipes or betadine pledgets, sealing material (clay or putty), a lancet, and gauze.

STANDARDS

Blood is collected by capillary puncture with minimal discomfort to the patient.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the patient.	P	F
a. Seat the patient next to the worktable.		
b. Explain the procedure.		
2. Select the site for the puncture.	P	F
a. Examine the middle two fingertips of both hands.		
b. Select a site that is free of old calluses and scars.		
c. Tell the patient to place the selected hand on the work table, palm up.		
3. Prepare the site for puncture.	P	F
a. Massage the hand to stimulate circulation, if required.		
b. Rub the site vigorously with an alcohol wipe or a betadine pledget.		
c. Wipe the site dry with gauze.		
4. Puncture the site with the lancet.	P	F
a. Open the package without contaminating the sterile tip of the lancet.		

Performance Measures	Results

b. Ensure that the hand is well supported and the finger held firmly.

c. Quickly impress the tip of the lancet to its full length.

d. Wipe away the first drop of blood with gauze.

5. Fill the capillary tubes. P F

a. Obtain a capillary tube with or without anticoagulant, depending on the test to be performed.

NOTE: Tubes with red rings contain the anticoagulant heparin while tubes with blue rings contain no anticoagulant.

b. Hold the tube horizontally, filling it from either end.

c. Touch the drop of blood until it diminishes. Repeat this until the tube is 3/4 full without bubbles.

CAUTION

Do not squeeze the finger. This will cause excessive tissue fluid which dilutes the sample.

d. Plunge the dry end of the capillary tube into the putty pad to seal it.

e. Repeat steps 5a through 5d for the second tube.

6. Instruct the patient to apply pressure with gauze to the site until the bleeding stops. Dismiss the patient as appropriate. P F

7. Attach the specimen to the back of the laboratory form with the patient's label and route it to the proper section for testing. P F

REFERENCES: None

081-833-0032

OBTAIN A BLOOD SPECIMEN USING A VACUTAINER

CONDITIONS

Necessary materials and equipment: blood specimen tubes, constricting band, vacutainer adapter, vacutainer needles, disinfectant pads, sterile 2 x 2 gauze sponges, betadine or alcohol, adhesive bandage strips, protective pad, labels, and gloves.

STANDARDS

Obtain a blood specimen without causing injury to the patient or violating aseptic technique.

TRAINING/EVALUATION

Training Information Outline

1. Verify the request to obtain a blood specimen. Select the proper blood specimen tube for the test to be performed.

2. Label the blood specimen tube with the information necessary to identify the patient.

3. Perform a patient care handwash.

WARNING

Gloves should be worn for self-protection against transmission of contaminants whenever handling body fluids.

4. Assemble the vacutainer adapter, the needle, and the blood specimen tube.

   a. Inspect the needle for nicks or barbs. Replace the needle if it is flawed or dull.

   b. Insert the rubber stoppered end of the specimen tube into the vacutainer holder and advance the tube until it is even with the guideline.

NOTE: The needle is now partially imbedded into the stopper. If the tube is pushed beyond the guideline, the vacuum of the tube may be broken.

5. Identify the patient.

   a. Ask the patient his or her name and compare the name to the bed card and identification band or tags.

b. If the specimen is being obtained from an outpatient, identify the patient by asking his or her name and comparing the name with the medical records or the laboratory request.

NOTE: Ask the patient about allergies to such things as iodine or alcohol.

6. Explain the procedure and purpose for collecting the blood specimen to the patient.

7. Position the patient.

a. Assist the patient into a comfortable sitting or lying position.

WARNING

Never attempt to draw blood from a standing patient.

b. The patient should be positioned so the arm is well supported and stabilized by using a pillow, table, or other flat surface.

c. Place a protective pad under the elbow and forearm.

8. Expose the area for venipuncture.

9. Select and palpate one of the prominent veins in the bend of the arm (antecubital space).

a. The first choice is the median cubital vein. It is well supported and least apt to roll.

b. The second choice is the cephalic vein.

c. The third choice is the basilic vein. Although it is often the most prominent, it tends to roll easily and makes venipuncture difficult.

WARNINGS

1. Avoid veins that are infected, irritated, injured, or have an IV running distal to the proposed venipuncture site.
2. Do not use the vacutainer to draw blood from small or fragile veins, because this can cause the vein walls to collapse. Use a needle and syringe instead.

10. Prepare the sponges for use.

a. Open the betadine or alcohol and 2 x 2 gauze sponge packages.

b. Place them within easy reach (still in the packages).

11. Apply the constricting band with enough pressure to stop venous return without stopping the arterial flow (a radial pulse will be present).

a. Wrap latex tubing around the limb approximately 2 inches above the proposed venipuncture site.

b. Stretch the tubing slightly and pull one end so that it is longer than the other.

c. Form a loop with the longer end and draw the loop under the shorter end so that the tails of the tubing are turned away from the proposed site.

NOTE: If a commercial band is used, wrap it around the limb as in step 11a and then secure the band by overlapping the Velcro ends.

d. Instruct the patient to form a fist, clench and unclench several times, and then hold the fist in a clenched position.

12. Palpate the selected vein lightly with the index finger, moving an inch or two in either direction so that the size and direction of the vein can be determined. The vein should feel like a spongy tube.

13. With a disinfectant soaked pad, cleanse the area around the puncture site using an outward circular motion.

CAUTION

After cleansing the skin, do not repalpate the area.

WARNING

Do not leave the constricting band on for more than two minutes.

14. Prepare to puncture the vein.

a. Grasp the vacutainer unit and remove the protective needle cover.

b. Position the needle directly in line with the vein. Using the free hand, grasp the patient's arm below the expected point of entry.

c. Place the thumb of the free hand approximately 1 inch below the expected point of entry and pull the skin taut toward the hand.

15. Puncture the vein.

a. Place the needle, bevel up, in line with the vein and pierce the skin at a 15 to 30 degree angle.

b. Decrease the angle until the needle is almost parallel to the skin surface. Direct it toward the vein and pierce the vein wall.

NOTE: A faint "give" will be felt when the vein is entered, and blood will appear in the hub of the needle.

(1) If the venipuncture is unsuccessful, pull the needle back slightly (not above the skin surface) and attempt to pierce the vein again.

CAUTION

If the needle is withdrawn above the skin surface, quickly release the constricting band and stop the procedure. Begin again with a new needle.

(2) If the venipuncture is still unsuccessful, release the constricting band, place a gauze sponge lightly over the site, quickly withdraw the needle, and immediately apply pressure to the site.

(3) Notify the supervisor before attempting to enter another vein.

c. Instruct the patient to unclench the fist.

16. Collect the specimen.

a. Single specimen sample.

(1) With the dominant hand, hold the vacutainer unit and the needle steady.

(2) Place the index and middle fingers of the free hand behind the flange of the vacutainer and ease the tube as far forward as possible. Blood will enter the tube.

WARNING

If the unit and needle are not held steady while pushing in the tube, the needle may either slip out of the vein or puncture the opposing vein wall.

(3) After the tube is approximately two-thirds full of blood or the flow of blood stops, prepare to withdraw the needle.

b. Multiple specimen samples (multiple tubes).

(1) Follow steps 16a(1) and 16a(2) for collecting a single specimen.

(2) Remove the first tube and insert another tube into the vacutainer.

(3) Repeat this procedure until the desired number of tubes are filled or blood stops flowing.

(4) Release the constricting band using the nondominant hand.

(5) After the last tube is approximately two-thirds full of blood or the flow stops, prepare to withdraw the needle.

NOTE: If the blood flow starts to slow down between samples, remove the constricting band.

17. Withdraw the needle.

a. Release the constricting band by pulling on the long, looped end of the tubing or pulling the Velcro fasteners open.

WARNING

Never withdraw the needle prior to removing the constricting band because this will cause blood to be forced out of the venipuncture site with resulting blood loss and/or hematoma formation.

b. Place a gauze sponge lightly over the venipuncture site.

c. Keeping the patient's arm fully extended, withdraw the needle smoothly and quickly. Immediately apply firm manual pressure over the venipuncture site with the sponge.

d. Instruct the patient to elevate the arm slightly and keep the arm fully extended. Continue to apply firm manual pressure to the site for two to three minutes.

18. Remove the specimen tube from the vacutainer.

a. Replace the protective cover over the needle.

NOTE: Dispose of the uncapped needle IAW local SOP.

WARNING

If accidently punctured by a used needle, force the puncture site to bleed, wash it thoroughly, and report the incident to your supervisor immediately.

b. Pull the tube from the vacutainer.

c. If the tube contains an anticoagulant, gently invert the tube several times to mix it with the blood.

19. Apply an adhesive bandage strip to the venipuncture site after the bleeding has stopped. Adhesive bandage strips do not take the place of pressure and, therefore, are not applied until the bleeding has stopped.

20. Provide for the patient's safety and comfort.

    a. Remove the protective pad.

    b. Assist the patient to assume a comfortable position.

21. Dispose of and/or store the equipment.

    a. Collect all the equipment and remove it from the area.

    b. Place the used gauze sponge, alcohol or betadine sponge, and the protective pad in the trash receptacle.

    c. Store the constricting band and vacutainer adapter IAW local SOP and dispose of the needle and syringe IAW local SOP.

22. Remove the gloves.

23. Perform a patient care handwash.

24. Complete the laboratory request.

    a. Patient identification.

    b. Requesting physician's name.

    c. Ward number, clinic, or dispensary.

    d. Date and time of specimen collection.

    e. Test(s) requested.

    f. Specimen source--blood.

    g. Remarks. Write in the admission diagnosis or the type of surgery in this section.

    h. Complete the "urgency" box. (Routine, today, preop, STAT, or ASAP.)

NOTE: There are many laboratory request slips which are used for requesting specific blood tests. All slips must be checked for the minimum information, as given.

25. Forward the specimen to the laboratory.

a. Attach the laboratory request to the specimen tube(s) with a rubber band or paper clip.

NOTE: Ensure that the laboratory requests and blood tubes are appropriately labeled with infectious warning labels IAW local SOP.

b. Arrange for the specimen to be sent to the laboratory or transport the specimen to the laboratory IAW local SOP.

26. Perform a patient care handwash.

27. Record the procedure on the appropriate form.

Evaluation Guide

Performance Measures	**Results**	
1. Select the proper blood specimen tube.	P	F
2. Label the blood specimen tube.	P	F
3. Perform a patient care handwash.	P	F
4. Assemble the vacutainer unit, needle, and blood specimen tube.	P	F
5. Identify the patient.	P	F
6. Explain the procedure and purpose for collecting the blood.	P	F
7. Position the patient.	P	F
8. Expose the venipuncture site.	P	F
9. Select and palpate the vein.	P	F
10. Prepare sponges for use.	P	F
11. Apply the constricting band.	P	F
12. Palpate the selected vein.	P	F
13. Clean the venipuncture site.	P	F
14. Prepare to puncture the vein.	P	F

Performance Measures	Results	
15. Puncture the vein.	P	F
16. Collect the specimen.	P	F
17. Withdraw the needle.	P	F
18. Remove the specimen tube from the vacutainer.	P	F
19. Apply an adhesive bandage strip to the site.	P	F
20. Provide for the patient's safety and comfort.	P	F
21. Dispose of and/or store equipment.	P	F
22. Remove the gloves.	P	F
23. Perform a patient care handwash.	P	F
24. Complete the laboratory request.	P	F
25. Forward the specimen to the laboratory.	P	F
26. Perform a patient care handwash.	P	F
27. Record the procedure on the appropriate form.	P	F
28. Do not violate aseptic technique.	P	F
29. Do not cause further injury to the patient.	P	F

REFERENCES: None

081-821-1036

PERFORM A WBC COUNT ON WHOLE BLOOD

CONDITIONS

You have a properly collected blood sample and a laboratory request form. Necessary materials and equipment: a WBC Unopette, a hemacytometer with coverslip, a microscope, a tally counter, a moisture chamber, a clock, and a logbook.

STANDARDS

The count difference between all nine squares on one side of the hemacytometer is not greater than 10 cells and the difference between the two sides of the hemacytometer does not exceed 15 cells.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inspect the equipment.	P	F
a. Check the hemacytometer and coverslip for nicks, scratches, and cleanliness. Replace, if necessary.		
b. Ensure that the WBC Unopette reservoir and capillary pipet are in usable condition.		
c. Ensure that the tally counter is operable; if not, replace it.		
2. Prepare the blood for the count.	P	F
a. Puncture the Unopette reservoir with the protective shield over the capillary pipet.		
b. Touch the tip of the capillary pipet to the blood specimen and allow the pipet to fill by capillary action.		

NOTE: The filled capillary pipet must be free of bubbles.

c. Wipe excess blood from the outside of the pipet without touching the tip.		
d. Squeeze the reservoir slightly, cover the overflow chamber of the pipet with the index finger, and insert the capillary pipet into the reservoir.		

Performance Measures	**Results**	
e. Simultaneously, remove the finger from the overflow chamber and release pressure from the reservoir to draw the blood into the diluent.		
f. Squeeze the reservoir several times to rinse the pipet and to thoroughly mix the blood with the diluent.		
g. Let the reservoir stand for at least 10 minutes to allow the red cells to hemolyze.		
NOTE: The leukocyte count should be performed within 3 hours.		
3. Prepare the diluted specimen for count.	P	F
a. Mix diluted blood by inverting the reservoir to resuspend the cells.		
b. Convert to a dropper assembly by withdrawing the pipet from the reservoir and reseating it securely with the capillary tube exposed.		
c. Clean the capillary bore by inverting the reservoir and gently squeezing the sides to discard 3 to 4 drops.		
4. Prepare the hemacytometer.	P	F
a. Charge both sides of the hemacytometer by gently squeezing the sides of the reservoir to expel the contents until the chambers are properly filled.		
b. Place the hemacytometer in a moist chamber (Petri dish containing a damp gauze).		
c. Allow the cells to settle for 3 to 5 minutes.		
5. Perform a WBC count.	P	F
a. Check under low power, low light for even distribution of cells.		
b. Count all 9 square millimeters of the counting chamber. Count the WBCs lying within the square and those touching the extreme upper and far right lines.		
NOTE: There should be no more than a 10 cell difference among the 9 squares counted.		
c. Count the second chamber in the same manner.		
NOTE: There should be no more than a 15 cell difference between the two sides of the chamber.		

Performance Measures	Results	
6. Calculate the WBC count.	P	F
a. Add the total number of WBCs in both counting chambers.		
b. Divide the sum by two to get the average number of cells counted.		
c. Multiply the average number of cells by the "K" factor and by 10^6 to obtain the WBCs/L.		

Formula: Avg # cells counted x "K" factor x 10^6 = WBCs/L

K Factor:
Dilution factor = 100
Area factor = 0.111
Depth factor = 10

K factor = dilution factor x area factor x depth factor
= 100 x 0.111 x 10
= 111

7. Report and record the results as WBCs/L in the logbook and on the laboratory request form.	P	F

Normal Values: Adult 4.0 to 11.0 x 10^9 WBCs/L
Newborn 10.0 to 30.0 x 10^9 WBCs/L

REFERENCES:	***Required***	***Related***
	None	Product Insert for Unopettes

081-821-1083

PERFORM A WRIGHT'S STAIN USING CAMCO QUIK STAIN

CONDITIONS

You have a properly collected blood sample and a laboratory request form. Necessary materials and equipment: Wright's stain (Camco Quik Stain), glass slides, capillary tubes, a staining rack, distilled water, a microscope, immersion oil, and 95 percent methanol.

STANDARDS

The blood smear has buff pink colored RBCs, orange-red eosinophils, blue lymphocytes, and pink granules in the neutrophils with no precipitate and is stained with sufficient color.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	Results
1. Prepare the glass slides by cleaning them in 95 percent methanol.	P F
2. Prepare the blood smear.	P F

a. Place a drop at a point midway between the sides of the slide and a short distance from one end.

b. Place the edge of the spreader slide on the specimen slide at a 30° angle.

c. Pull the spreader slide toward the drop of blood until contact is made.

d. Push the spreader slide toward the opposite end of the specimen slide, drawing the blood behind it into a thin film.

e. Allow the smear to air-dry. The smear should have three areas represented.

(1) The thick area has--

(a) An increase of smaller cells with rouleaux formation.

(b) Poor cellular characteristics.

Performance Measures **Results**

(2) The thin area has--

(a) An area of choice for reading a differential.

(b) Cellular characteristics which are at their best.

(c) RBCs that are touching without overlapping.

(3) The feathered edge has--

(a) An increase in larger cells.

(b) Cellular distortion with gaps between the RBCs.

3. Write the name or identification number of the patient with a lead pencil in the thick area of the smear or on the frosted end of the slide. P F

4. Stain the slide. P F

NOTE: For best results, blood smears should be stained within 2 hours after they are prepared.

a. Fix the smear and let it air-dry.

b. Cover the slide with Wright's stain and allow it to remain on the smear for 5 to 10 seconds. The Wright's stain is polychromatic; dyes in the stain will produce multiple colors when applied to cells. The stain is composed of two main parts, Methylene-blue and eosin.

(1) Methylene-blue is an alkaline dye that has an affinity for the acidic portions of the cell-DNA in the nucleus and RNA in the cytoplasm. It stains varying shades of blue to purple.

(2) Eosin is the acidic portion of the dye that has an affinity for the basic portions of the cell. It stains in varying shades from orange to pink.

NOTE: The stain should cover the slide but should not be allowed to overflow the edges. A blue-green metallic sheen should be on the surface. The exact time that the stain is applied may vary with each batch of stain.

c. Rinse the slide thoroughly with distilled water for 15 to 20 seconds.

d. Wipe the stain from under the slide and allow it to air-dry.

5. Examine the smear under the oil immersion objective. P F

Performance Measures	**Results**	
6. Recognize discrepancies with staining and the way to correct those discrepancies.	P	F
a. For darker stained leukocytes, dip the slide in distilled water for 1 minute or more after staining.		
b. For lighter stained leukocytes, decrease the Wright's stain time.		
7. Ensure that the staining reactions are sufficient.	P	F
a. RBCs appear buff pink to orange.		
b. WBCs have a blue nucleus with a lighter stained cytoplasm.		
8. Report and record the results on the laboratory request form.	P	F

REFERENCES:	***Required***	***Related***
	None	Product Insert for Camco Quik Stain

081-821-1039

PERFORM A WBC DIFFERENTIAL COUNT

CONDITIONS

You have a properly Wright's stained blood smear and a laboratory request form. Necessary materials and equipment: a tally counter, a microscope, and immersion oil.

STANDARDS

WBCs are counted and classified, RBC morphology is reported, and the number of platelets on the blood smear is estimated.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Inspect the smear under low-power magnification and locate the thin area on the smear where there is no overlapping of RBCs.	P F
2. Switch to oil immersion (100x) for the count.	P F

a. Identify and count 100 consecutive WBCs.

NOTE: If the WBC count is between 2.0 x 10^9 and 5.0 x 10^9 WBCs/L, classify 300 WBCs. When the count is greater than 5.0 x 10^9 WBCs/L, classify 500 WBCs.

b. Record each cell type separately on the differential tally counter.

(1) Lymphocyte.

(2) Monocyte.

(3) Neutrophilic band.

(4) Segmented neutrophil.

(5) Eosinophil.

(6) Basophil.

c. Express the number of each cell counted as a percentage.

Performance Measures	**Results**
3. Identify and report morphological variations of WBCs/RBCs/platelets.	P F
a. Rouleaux formation.	
b. Signs of immaturity.	
c. Hemoglobin variation.	
d. Size and shape.	
e. Staining characteristics and inclusions.	
f. Nucleated RBCs (NRBC) are reported as the number per 100 WBCs counted.	

NOTE: The WBC count may have to be corrected if the number of NRBCs is five or more per 100 WBCs.

Formula: $\frac{\#WBCs/L \times 100}{100 + \#NRBCs\ counted} = Corrected\ WBCs/L$

4. Perform a qualitative platelet estimate.	P F
a. Adequate--8 to 20 per oil immersion field.	
b. Increased--greater than 20 per oil immersion field.	
c. Decreased--less than 8 per oil immersion field.	
5. Report and record the results on the laboratory request form.	P F

REFERENCES: None

081-821-1040

PERFORM A MICROHEMATOCRIT DETERMINATION

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: a control, a logbook, **and** either a microhematocrit centrifuge (calibrated to 10,000 rpm), microhematocrit reader, sealing putty, and capillary tubes **or** a Compur M1100 minicentrifuge, capillary tubes, and operator's manual.

STANDARDS

Duplicate hematocrit determinations are performed with the control reading being within ±2 percent of the known reading, and the unknown samples being within ±2 percent of each other.

TRAINING/EVALUATION

Training Information Outline

NOTE: The hematocrit is the ratio of red blood cells to plasma expressed as a percent of whole blood.

1. Microhematocrit Centrifuge/Reader Method, if applicable.

   a. Prepare the blood specimen collected in EDTA tubes.

NOTE: If blood was collected in capillary tubes, remove them from the reverse side of the laboratory request form and proceed to step 1b.

   (1) Mix the control or specimen by gently inverting the tube several times before removing the stopper.

   (2) Fill two capillary tubes 3/4 full without bubbles.

NOTE: The test should be performed in duplicate to correlate the results and to balance the centrifuge.

   (3) Seal the tubes by plunging the dry ends into a putty pad.

   b. Centrifuge the capillary tubes.

   (1) Put one tube opposite the other with the sealed ends toward the rubber gasket.

   (2) Centrifuge the tubes for 5 minutes.

   c. Read the results by using the microhematocrit reader.

(1) Place the tube in the groove of the plastic holder with the sealed end toward the center and the black index line intersecting the red blood cell-clay interface.

(2) Match the red vertical line on the plastic holder with the numeral "100" on the outer circle of the microhematocrit reader.

(3) Rotate the inner circle while holding the outer circle stationary until the black spiral indicator line matches the plasma/air interface line within the tube.

(4) Rotate both the inner and outer circles of the reader clockwise simultaneously until the black spiral indicator line matches the RBC plasma interface line excluding the buffy coat.

(5) Run the control and unknown in duplicate.

(6) Report and record the results in percentage on the laboratory request form and in the logbook.

2. Compur M1100 Method, if applicable.

a. Prepare the blood specimen collected in the EDTA tubes.

(1) Mix the control/specimen by gently inverting the tube several times before removing the stopper.

(2) Completely fill two M1100 capillary pipets with blood.

b. Centrifuge the capillary tubes.

(1) Raise the minicentrifuge rotor center post to the upper position by pressing in the lock release levers.

(2) Place the tubes in the rotor with their lower, outer ends against the seals and the inner ends resting against the center post.

(3) Seal the tubes into place by pressing the center post down until it locks into position.

(4) Close the cover.

(5) Start the rotor by sliding the ON/OFF switch to the right; it will automatically shut off when complete.

(6) Allow the rotor to stop.

c. Read the results.

(1) Read the hematocrit values through the clear window in the cover directly on the percent scales marked on the rotor next to the capillary tubes.

(2) Slide the ON/OFF switch to the left.

(3) Press the cover, release the button, and raise the cover.

(4) Raise the rotor center post.

(5) Remove the capillary tubes and discard.

(6) Report and record the results in percentages on the laboratory request form and in the logbook.

Normal Values:

Males:	40 to 54 percent Volume Packed Red Cells (mean 47 percent VPRC)
Females:	37 to 47 percent Volume Packed Red Cells (mean 42 percent VPRC)

NOTE: Critical values are less than 18 percent or greater than 61 percent.

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the blood specimen.	P	F
2. Centrifuge the capillary tubes in duplicate.	P	F
3. Read the results.	P	F
4. Report and record the results in percentages.	P	F

REFERENCES:	***Required***	***Related***
	Operator's Manual for COMPUR M1100	None

081-821-1041

PERFORM A ONE STAGE PROTHROMBIN TIME TEST

CONDITIONS

You have a patient specimen collected in tubes of 3.8 percent sodium citrate and a laboratory request form. Necessary materials and equipment: test tubes, a normal control, thromboplastin reagents, a heating block or waterbath, a stopwatch, a centrifuge (2000 rpm), pipets, and a logbook.

STANDARDS

Test results are within ±2 standard deviations. Control results are within the limits of the value chart.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Inspect the equipment.	P	F
a. Ensure that the stopwatch is operable.		
b. Ensure that the heating block or waterbath is operable and contains sufficient water at 37° C.		
2. Prepare the blood for testing.	P	F
a. Centrifuge the blood sample for 5 minutes.		
b. Remove the plasma from the blood sample and refrigerate it until ready to use.		

CAUTION

Plasma must be tested within 4 hours.

3. Reconstitute the thromboplastin reagent using themanufacturer's instructions.	P	F
4. Perform the prothrombin time.	P	F
a. Incubate the thromboplastin, patient plasma, and control for 5 minutes in a 37° C waterbath or heating block.		

Performance Measures **Results**

> **CAUTION**
>
> Do not incubate for more than 10 minutes because coagulation Factors V, VII, and VIII are heat labile and may be destroyed.

b. Pipet 0.2 ml of thromboplastin into the desired number of labelled tubes.

c. Pipet 0.1 ml of patient or control plasma into the appropriate tube and start the stopwatch simultaneously.

d. Incubate the test tubes at 37° C for 5 to 6 seconds.

e. Wipe the tube dry, if needed, and hold it toward an adequate light source.

f. Tilt the tube repeatedly and look for the fibrin web which is the end point. Stop the stopwatch immediately.

g. Run the test in triplicate.

5. Verify that the test was performed properly. P F

a. Ensure that at least two of the tubes agree within:

	PT	Variation
(1)	12 to 20 seconds	0.5 second
(2)	20 to 30 seconds	1.0 second
(3)	Over 30 seconds	2.0 seconds

b. Average the three values for the final result.

c. Compare the control to the assayed value chart.

NOTE: If the unknowns do not agree, or if the control is not within the expected values, repeat the procedure.

6. Report the results in seconds. P F

NOTE: The results must be within ±2 standard deviations.

Performance Measures	Results	
7. Report the control result with every patient.	P	F
8. Record the results in the logbook and on the laboratory request form.	P	F

REFERENCES: None

081-821-1046

PERFORM A COMPLETE BLOOD COUNT (CBC) USING THE QBC II CENTRIFUGAL HEMATOLOGY SYSTEM

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: a QBC II analyzer, a QBC II centrifuge, a QBC work station, a venous blood pipette, QBC II blood tube reagents, wipes, a logbook, and a QBC II operator's manual.

STANDARDS

Test results are within ±2 standard deviations.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Inspect the equipment.	P F
a. Check that the QBC II analyzer, centrifuge, work station, and pipette are in good working order.	
b. Check that the venous blood tubes have been stored correctly.	
NOTE: Venous specimens should be collected only into anticoagulants disodium or tripotassium EDTA.	
c. Ensure that all necessary materials are available.	
2. Prepare the blood for the count.	P F
NOTE: QBC II venous blood tubes must be prepared within 90 minutes of blood collection, if all QBC II parameters are required. When the platelet count is not needed, 4 hours can elapse before the QBC II venous blood tube is prepared.	
a. Insert the end of a QBC venous capillary tube which is nearest the red line into the pipette.	
(1) Aspirate the blood specimen.	
(2) Wipe the tube with a lint free tissue.	

Performance Measures **Results**

b. Press the distal end of the tube into the closure.

(1) Remove the tube from the pipette.

(2) Twist the closure.

c. Roll the tube at least 10 times between your fingers to mix the blood.

d. Slide the tube over the float.

(1) Gently push until the float is inside the tube as far as possible.

> **CAUTION**
>
> Do not touch the float with your fingers. Use forceps to handle loose or dropped floats.

(2) Carefully lift the closure end of the tube until the float is free of the tray slot.

e. Lower the tube into the slot of the centrifuge.

NOTE: The specimen should be centrifuged within 20 minutes of insertion of the float.

(1) Slide the closure against the outer rim.

(2) Install the rotor cover and close the lid.

(3) Centrifuge for 5 minutes.

NOTE: Centrifuged tubes are stable for up to 4 hours prior to reading provided they are stored vertically, closure end down, and away from heat and intense light.

3. Prepare the QBC II analyzer. P F

a. Press the POWER switch to ON and monitor the self test sequence.

b. Perform daily calibration checks.

(1) Place the analyzer in the VEN (venous) mode and insert the venous calibration check tube.

(2) Align the first interface (black to pale green) with the reticle arrow and press ENTER.

Performance Measures	Results

(3) Continue reading the second through the sixth interfaces in the same manner.

(4) Record the venous calibration check values displayed for each of the seven QBC II parameters, and then remove the tube.

(5) Select the CAP (capillary) mode and insert the capillary calibration check tube. Repeat the reading procedure including the seventh interface.

(6) Record the capillary calibration check values displayed for each of the seven QBC II parameters, and then remove the tube.

(7) Compare the venous and capillary mode values with the reference values and tolerances recorded on the package inserts of the calibration check tubes.

4. Perform the complete blood count (CBC). P F

a. Select the correct mode (venous VEN/capillary CAP).

b. Insert the blood tube into the analyzer.

c. Move the tube inward until the cursor tip is at the interface between the green closure and the bottom of the red cells.

d. Press ENTER. The white tube lamp will then light up.

e. Move the tube inward until the cursor tip is at the interface between the dark red and light red layers.

f. Press ENTER again. The white tube lamp will then turn off.

g. Move the tube inward until the cursor tip is at the interface between the light red and orange-yellow layers.

h. Press ENTER again.

i. Move the tube inward until the cursor tip is at the interface between the orange-yellow and the bottom of the dark band.

j. Press ENTER again.

k. Move the tube inward until the cursor tip is at the interface between the bright green and the pale yellow layers.

Performance Measures	**Results**
l. Press ENTER again.	
m. Move the tube inward until the cursor tip is at the interface between the pale yellow layer and the translucent green plasma.	
n. Press ENTER again.	
o. In venous mode, record the seven hematological values from the panel readout on the QBC II.	
p. In capillary mode, move the tube inward until the reticle arrow is at the meniscus of the translucent green plasma column. Press ENTER. Record the values from the readout.	
5. Report and record the results of the complete blood count on the laboratory request form.	P F

REFERENCES:	***Required***	***Related***
	Operator's Manual for QBC II Analyzer	None

081-821-1049

PERFORM A MANUAL PLATELET COUNT

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: a platelet unopette, a hemacytometer with coverslip, a microscope, a tally counter, lens paper, lint free wipes, a Petri dish, and a logbook.

STANDARDS

The count difference between the two chambers does not exceed ±10 cells.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Inspect the equipment.	P F
a. Check the hemacytometer and coverslip for nicks, scratches, and cleanliness. Replace, if necessary.	
b. Ensure that the proper unopette reservoir and pipet are being used.	
c. Ensure that the tally counter is operable; if not, replace it.	
2. Prepare the blood for the count.	P F
a. Puncture the unopette reservoir with the pipet cap.	
b. Touch the tip of the unopette capillary pipet to the blood specimen and allow the pipet to fill.	
NOTE: The blood capillary bore must be free of bubbles.	
c. Wipe the excess blood from the outside of the pipet.	
d. Squeeze the reservoir slightly, cover the large opening of the capillary pipet with your index finger, and insert the capillary pipet into the reservoir.	
e. Simultaneously remove your finger from the capillary pipet and release pressure from the reservoir.	

Performance Measures	Results	
f. Squeeze the reservoir several times to rinse the pipet and to mix.		
g. Let the reservoir stand for 10 minutes to allow the red blood cells to hemolyze.		
3. Prepare the diluted specimen for the count.	P	F
a. Mix the diluted blood by inverting the reservoir to resuspend the cells.		
b. Convert to a dropper assembly by withdrawing the pipet from the reservoir and reseating it securely in the reverse position.		
c. Clean the capillary bore by inverting the reservoir and gently squeezing the sides to discard the first 3 or 4 drops.		
4. Prepare the hemacytometer.	P	F
a. Charge both sides of the hemacytometer by gently squeezing the sides of the reservoir to expel the contents until the chambers are properly filled.		
b. Place the hemacytometer in a moist chamber (Petri dish with wet gauze).		
c. Allow the cells to settle for 15 to 20 minutes.		
5. Perform a platelet count.	P	F
a. Use the high dry objective and decreased light.		
NOTE: Platelets appear as oval or round refractile bodies.		
b. Count the center 1 square millimeter on both sides of the hemacytometer.		
NOTE: The total number of platelets on each side should agree with each other within ±10.		
6. Calculate the platelet count.	P	F

Performance Measures **Results**

Formula: Platelets/L = # cells counted x "K" factor x 10^9

K Factor:

Dilution factor = 100
Area factor = 1
Depth factor = 10

K factor = dilution factor x area factor x depth factor
= 100 x 1 x 10
= 1000

7. Record and report the results as PLTs/L in the logbook and on the laboratory request form. P F

Normal Values: Adults: 150 to 400 x 10^9 PLTs/L
Neonates: 100 to 350 x 10^9 PLTs/L

REFERENCES: None

081-821-1076

PERFORM A PROTHROMBIN TIME (PT) TEST USING THE MLA ELECTRA 750

CONDITIONS

You have a properly collected patient specimen (sodium citrate) and a laboratory request form. Necessary materials and equipment: a centrifuge, MLA Electra 750 with operator's manual, thromboplastin C, normal and abnormal controls, purified water, 0.2 ml pipet, 0.1 ml pipet, pipet tips, and MLA cuvettes.

STANDARDS

Duplicate normal patient results agree within 0.5 seconds and results of the controls are within the established range of acceptance.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the MLA Electra 750.	P	F
a. Turn on the instrument and allow a 5 minute warm-up period or until the AT TEMP indicator lights up, whichever is longer.		
b. Check that the LAMP LEVEL switch is in the "B" (middle) position.		
c. Set the Mode Switch to PT.		
2. Prepare thromboplastin C and controls.	P	F
a. Reconstitute with purified water according to the manufacturer's instructions.		
b. Record the expiration date and time on the label (24 hours).		
c. Mix well and allow to stand 15 minutes. Mix again before using.		
d. Prewarm thromboplastin in the REAGENT reservoir with the magnetic stirring bar for agitation for at least 1 minute or until the reagent has reached 37° C.		

NOTE: Store prepared thromboplastin C and controls at 2° to 8° C. Before testing, allow 20 minutes for 10 ml of refrigerated reagent to warm to the analyzer temperature of 37° C.

Performance Measures	Results
3. Perform the prothrombin time.	P F

a. Pipet 0.1 ml of controls and test plasma, in duplicate, into the bottom of test cuvettes and place the cuvettes in the heating block.

NOTE: Patient plasma should not be incubated longer than 5 minutes.

b. Set the timer for 4 minutes.

c. At the end of 4 minutes place the first cuvette to be tested in the test station.

d. Use the 0.2 ml (red top) instrument pipet to aspirate 0.2 ml of warm thromboplastin and align the pipette over the test station.

e. Push the pipet plunger firmly and hold it down for 1 second to start the test.

f. When the timer stops, record the clot time.

g. Repeat steps 3d through 3f for the remaining cuvettes.

NOTE: Controls and specimens are tested in duplicate. For times less than 30 seconds the two results should agree within 0.5 seconds. For times greater than 30 seconds the two results should agree within 2.0 seconds. If the times do not agree, run a second set of two cuvettes.

h. Average the two PT results and report to the nearest tenth.

4. Record the results on the laboratory request form. P F

NOTE: The normal range for prothrombin time is 10 to 13 seconds; however, each laboratory should determine what is normal based on the population served. Critical values are greater than 27 seconds and require immediate physician notification and documentation.

REFERENCES:	***Required***	***Related***
	Operator's Manual for MLA Electra 750	None

081-821-1077

PERFORM AN ACTIVATED PARTIAL THROMBOPLASTIN TIME (APTT) TEST USING THE MLA ELECTRA 750

CONDITIONS

You have a properly collected patient specimen (sodium citrate) and a laboratory request form. Necessary materials and equipment: a centrifuge, an MLA Electra 750 with operator's manual, actin-activated cephaloplastin, calcium chloride 0.02M, normal and abnormal controls, purified water, 0.2 ml pipet, 0.1 ml pipet, pipet tips, and MLA cuvettes.

STANDARDS

Duplicate normal patient results agree within 2.0 seconds and the results of the controls are within the established range of acceptance.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the MLA Electra 750.	P	F
a. Turn on the instrument and allow a 5 minute warm-up period or until the AT TEMP indicator lights up, whichever is longer.		
b. Check that the LAMP LEVEL switch is in the "B" (middle) position.		
c. Set the Mode Switch to APTT.		
2. Prepare reagents and controls.	P	F
a. Reconstitute with purified water according to the manufacturer's instructions.		
b. Record the expiration date and time on the label (24 hours).		
c. Mix well and allow to stand for 15 minutes. Mix again before using.		
d. Prewarm calcium chloride in the CALCIUM reservoir for at least 5 minutes or until the reagent has reached 37° C.		

NOTE: Store prepared actin activated cephaloplastin and controls at 2° to 8° C. Before testing, allow 20 minutes for 10 ml of refrigerated reagent to warm to the analyzer temperature of 37° C.

Performance Measures	Results
3. Perform the activated partial thromboplastin time.	P F

a. Place two cuvettes in the heating block for each control and specimen and add 0.1 ml of actin to each.

b. Add 0.1 ml of control or patient's plasma to each tube and mix.

NOTE: Patient plasma should not be incubated longer than 5 minutes.

c. Set the timer for 5 minutes.

d. At the end of 5 minutes place the first cuvette to be tested in the test station.

e. Use the 0.1 ml (blue top) instrument pipet to dispense 0.1 ml of calcium chloride into the cuvette holding actin and control or plasma.

f. Push the pipet plunger firmly and hold it down for 1 second to start the test.

g. When the timer stops, record the clot time.

h. Repeat steps 3e through 3g for the remaining cuvettes.

NOTE: Controls and specimens are tested in duplicate. The results should agree within 2 seconds. If not, run a second set of two cuvettes.

i. Average the two APTT results to the nearest second and report along with the normal range.

4. Record the results on the laboratory request form. P F

NOTE: The normal range for activated partial thromboplastin time is 24 to 45 seconds; however, each laboratory should determine what is normal based on the population served. Critical values are greater than 68 seconds and require immediate physician notification and documentation.

REFERENCES:	***Required***	***Related***
	Operator's Manual for MLA Electra 750	None

081-821-1078

PERFORM A FIBRINOGEN LEVEL DETERMINATION

CONDITIONS

You have a properly collected patient specimen (sodium citrate) and a laboratory request form. Necessary materials and equipment: an MLA Electra 750 with operator's manual, thrombin reagent, distilled water, Owren's veronal buffer pH 7.35 (sodium barbital 0.028M), fibrinogen calibration reference plasma, plastic pipets (0.1, 0.2, 0.5, and 1.0 ml), test cuvettes, 2 x 2 cycle logarithmic graph paper, normal and abnormal control plasma, and a stopwatch.

STANDARDS

Fibrinogen levels are determined for duplicate test specimens with a C.V. of <7 percent.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Turn on the MLA Electra 750.	P	F
a. Turn on the instrument and allow a 5 minute warm-up period or until the AT TEMP indicator lights up, whichever is longer.		
b. Perform an abbreviated OCT according to manufacturer's instructions.		
c. Set the Mode Switch to thrombin.		
d. Set the lamp level to B.		
2. Prepare a calibration curve.	P	F

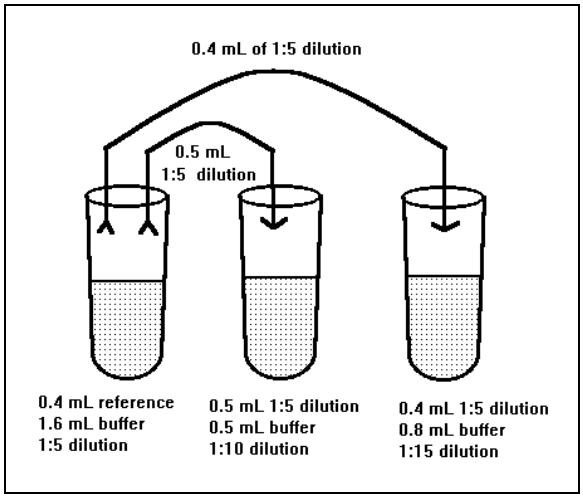
NOTE: This must be done when the procedure is first set up, when a new lot of thrombin is opened, or when any changes are made that affect the test results.

a. Reconstitute the thrombin reagent and calibration standard.

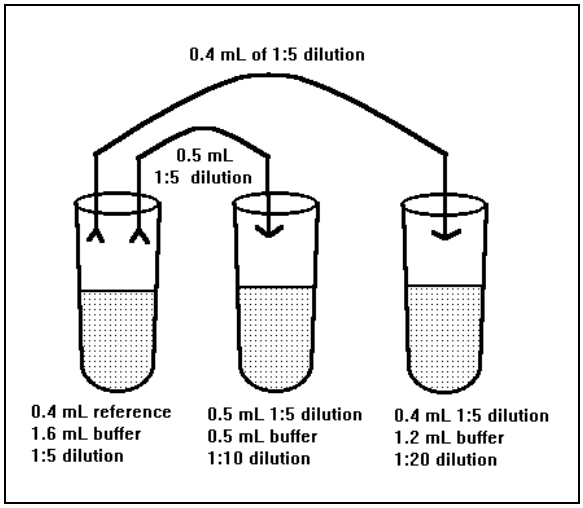
b. Label test tubes #1a-c through #5a-c. Testing is done in triplicate for a calibration standard curve.

c. Pipet buffer (room temperature) and calibration standard into test tubes according to the assay value.

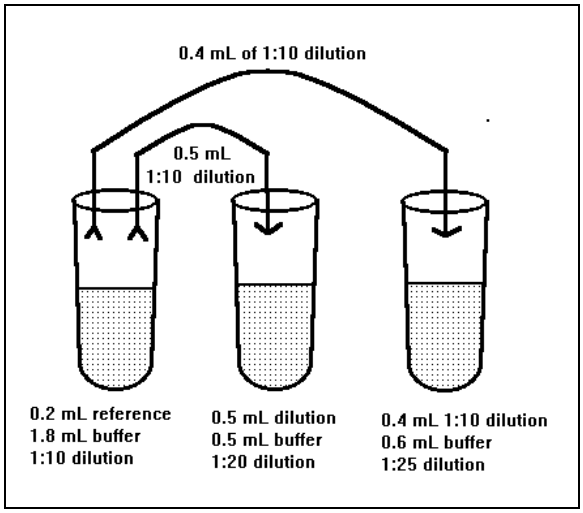
Performance Measures **Results**



ASSAY VALUE 210-280



ASSAY VALUE 280-350



ASSAY VALUE 350-450

d. Pipet 0.2 ml of dilutions into separate cuvettes.

e. Place the first specimen into incubation #1 and begin timing. Place the remaining specimens in incubation stations at 30 second intervals until the first specimen has reached a 3 minute incubation.

f. Place the first dilution in the test well, add 0.1 ml of unheated thrombin reagent, and start the timer by firmly pushing the plunger and holding it down for 1 second.

Performance Measures **Results**

g. Record the time when clotting occurred.

h. Repeat steps 2f and 2g at 30 second intervals as each dilution reaches 3 minute incubations.

> **CAUTION**
>
> Use a clean pipette for each dilution to prevent carry over contamination.

i. Average the three clot times obtained for each dilution.

j. Calculate fibrinogen values for each dilution.

(1) Assay value is assigned to 1:10 dilution.

(2) Multiply the assay value by the factor assigned for each dilution to obtain fibrinogen values.

DILUTION	FACTOR
1:5	2.0
1:10	1.0
1:15	0.67
1:20	0.5
1:25	0.4

k. Graph the results on 2 x 2 logarithmic graph paper or the graph paper supplied by MLA (Catalog No. 9041).

l. Validate the fibrinogen curve by testing normal and abnormal controls which should check within ±15 percent of assayed value.

NOTE: Repeat the calibration curve procedure if controls exceed the limits.

3. Centrifuge patient specimens for 15 minutes at 2500 rpm. P F

4. Label two test tubes for each specimen and control. P F

5. Pipet 0.9 ml of Owren's veronal buffer into each test tube. P F

6. Pipet 0.1 ml of plasma or control into the appropriate test tube and mix gently. P F

Performance Measures	Results	
7. Pipet 0.2 ml of each specimen into test cuvettes at30 second intervals until the first specimen reaches a 3 minute incubation.	P	F
8. Place the first specimen in the test well and add 0.1 ml of thrombin reagent and start the timer.	P	F
9. Record the time when clotting occurred.	P	F
10. Repeat the test for each specimen and control.	P	F
11. Average the two results for each specimen and control referring to the calibration curve chart for the fibrinogen level.	P	F
12. Record and report the fibrinogen level on the laboratory request form.	P	F

REFERENCES:	*Required*	*Related*
	Operator's Manual for MLA Electra 750	None

081-821-1079

PERFORM A FIBRIN/FIBRINOGEN DEGRADATION PRODUCTS (FDP) TEST USING THROMBO-WELLCOTEST LATEX TEST

CONDITIONS

You have a properly collected patient specimen and a laboratory request form. Necessary materials and equipment: test tubes, saline, a timer, and a Thrombo-Wellcotest kit (NSN 6550-01-141-0644) which contains a latex suspension, positive and negative control sera, sample collection tubes, glycine saline buffer, a test slide, disposable pipettes, mixing rods, a rubber bulb, and the product insert.

STANDARDS

The test is performed accurately and the results are correctly interpreted.

TRAINING/EVALUATION

Training Information Outline

NOTE: This kit is authorized for DEPMEDS issue and should be standardized through supply channels.

1. Prepare the patient sample.

    a. Using the Vacutainer system, draw 2 ml of blood into a sample tube provided in the kit.

NOTE: A dry syringe may be used without prolonged venous occlusion. Then immediately transfer 2 ml to a sample tube.

    b. Label the sample tube with the patient's identification.

    c. Gently invert the sample tube several times to allow the blood to clot firmly.

    d. Ring the clot and allow the sample to stand at room temperature for 30 to 60 minutes.

NOTE: Centrifugation is not required but may be used to hasten the separation or clarify the serum.

    e. The clear serum sample may be stored at 2° to 8° C for up to a week before testing.

2. Prepare the equipment.

    a. Warm all reagents to room temperature before use.

    b. Label two test tubes 1 and 2 for each patient sample.

c. Label two rings on the test slide 1 and 2 for each patient sample and one positive and one negative control ring.

3. Perform the test.

a. Place 0.75 ml of glycine saline buffer in each test tube.

b. Use a pipette and a bulb from the kit to add 5 drops of the serum sample to test tube 1 and 1 drop to test tube 2. These are now approximately 1/5 and 1/20 dilutions respectively.

c. Mix the contents of each test tube.

d. Rinse the pipette with saline.

e. Transfer 1 drop from test tube 2 to ring 2 on the slide. Then transfer 1 drop from test tube 1 to ring 1 on the slide.

NOTE: Be sure to pipette the dilutions in the correct order.

f. Place 1 drop of positive and negative control sera in the respective circles on the test slide.

NOTE: Controls need not be tested with each batch. Consult your local SOP.

g. Thoroughly mix the latex suspension by shaking vigorously three or four times.

h. Add 1 drop of the latex suspension to each position on the slide.

i. Use a mixing rod to stir the serum/latex mixture starting with ring 2 again. Stir each control also.

j. Spread each mixture to fill the circle.

k. Rock the slide in a figure eight motion for exactly 2 minutes and immediately observe for macroscopic agglutination.

NOTE: False positives may occur due to drying on the slide.

4. Read and interpret the results.

NOTE: All numerical values are considered to be approximate.

a. Observe the positive and negative control rings for agglutination. The positive ring must show agglutination and the negative ring must not show agglutination to demonstrate the reagents stability.

b. Agglutination in slide 1 (dilution 1/5) indicates that FDP were present in the original specimen at a concentration greater than 10 µg.

c. Agglutination in slide 2 (dilution 1/20) indicates that FDP were present in the original specimen at a concentration greater than 40 µg.

NOTE: Sensitivity of the Thrombo-Wellcotest is adjusted to 2 µg per ml which is multiplied by the dilution when agglutination is present. If agglutination is present in slide 2, it must be present in slide 1. If not, the test has been performed incorrectly and must be repeated.

5. Perform additional testing as required.

NOTE: Qualitative urine samples, semi-quantitative serum samples, and semi-quantitative urine samples may be requested. Refer to the manufacturer's instructions for these tests.

6. Record and report the results.

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the patient sample.	P	F
2. Prepare the equipment.	P	F
3. Perform the test.	P	F
4. Read and interpret the results.	P	F
5. Perform additional testing as required.	P	F
6. Record and report the results.	P	F

REFERENCES:	***Required***	***Related***
	Product Insert for Thrombo-Wellcotest FDP Kit	None

SECTION II
SKILL LEVEL 3 TASKS

081-821-1080

PERFORM A BLOOD GAS ANALYSIS USING THE GEMStat BLOOD GAS ANALYZER

CONDITIONS

You have a patient blood sample collected in heparin and a laboratory request form. Necessary materials and equipment: a GEMStat Blood Gas Analyzer with operator's manual, a GEMStat Pak, GEMStat samplers, control reagents, and report paper.

STANDARDS

The results of a patient's blood gases are obtained after verifying the proper functioning of the instrument.

TRAINING/EVALUATION

Training Information Outline

1. Prepare the GEMStat Blood Gas Analyzer.

   a. Turn on the analyzer using the switch at the rear of the machine.

   b. Install printer paper, if necessary.

   c. Set the date and time at the message "INSERT CART" by pressing the SHIFT key, then the 8/MENU key.

NOTE: The date and time can only be set when the "INSERT CART" message is displayed and no cartridge is in place.

   d. Use the numeric keypad and the ENTER key to adjust the date and time.

   e. Set the mandatory identification option ON for patient or operator ID numbers by pressing SAMPLE.

   f. Set the mandatory quality control option to MAND QC ON so that a message prompt will appear reminding you to do quality control sampling on every new cartridge.

   g. Set the SAMP LBL ON to prompt you to identify whether the sample is venous or arterial blood.

   h. Set the analytes to be measured to GASES/HCT, GAS/LYTE/HCT, or LYTES/HCT.

i. Set the measurement units to MM MERCURY or KILO-PASCALS.

j. Set the format for the date to DATE FMT (US) or DATE FMT (INT').

k. Set the automatic printing of calibration statistics to CAL STAT OFF or CAL STAT ON.

l. Verify that the GEMStat Pak cartridge has not expired according to the date on the outer package.

m. Remove the cartridge from the protective wrapper and inspect it for moisture. Do not use it if there are any signs of moisture.

n. Open the door on the front left side of the instrument by turning the small knob counterclockwise.

o. Remove the plastic cover from the end of the cartridge and immediately insert the cartridge into the compartment making sure the label is to the far left and the sample connector is to the front.

p. The display will read "CLOSE DOOR" once the cartridge is inserted.

q. Close the door by turning the knob clockwise. The lock will automatically set and the display will show "WARMUP MM:SS" to indicate the remaining time for warmup.

2. Verify the GEMStat's performance by running control samples.

a. The display must read "READY."

b. Press the SHIFT key, then the 3/QC key.

c. Enter your operator number and press ENTER.

d. Enter the lot number printed on the ampule and press ENTER.

e. The display indicates "Q-C READY." The sample must be processed within 1 minute or the display will change to "READY."

f. Gently mix the ampoule by agitation before snapping off the top. Use a gauze pad to protect against skin puncture.

g. Place the sampler tube into the ampoule and press SAMPLE.

h. Compare the obtained results with the expected results printed on the package insert. Be sure to use the GEMStat values. If the values are outside of the expected range, refer to the technical manual.

3. Perform a blood gas analysis on a patient sample.

a. Press SAMPLE and enter the patient's ID number. (If you have selected the MAND ID OFF option, press IDENT.) Press the ENTER key after the patient ID is entered.

b. Enter the operator identification and press ENTER.

c. Select arterial mode (=1) or venous mode (=2). If you have selected the SAMP LBL OFF option, proceed to step 3d.

d. Insert the sampler tube into the Stat Pak cartridge inlet as far as it will go. This is indicated when the STOP line is flush with the opening.

e. Place the open end of the sampler tube into the heparinized specimen far enough to aspirate 0.5 cc of blood.

f. Press SAMPLE and do not remove the specimen until the display reads "PROCESS 1:50."

CAUTION

If air is accidentally introduced into the system, the results will be erroneous. Immediately stop the analysis by pressing CANCEL.

g. A printout will be made indicating the results.

4. Enter standby mode by pressing SHIFT, and then 1/STDBY.

NOTE: The life of the cartridge pack is 24 hours active phase and 48 hours standby phase. After the 24 hour active phase is used, the cartridge must be replaced. Judicious use of the standby mode can prolong the cartridge life up to 72 hours.

5. Record and report the results.

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the GEMStat Blood Gas Analyzer.	P	F
2. Verify the GEMStat's performance by running control samples.	P	F
3. Perform a blood gas analysis on a patient sample.	P	F
4. Enter standby mode by pressing SHIFT, and then 1/STDBY.	P	F
5. Record and report the results.	P	F

REFERENCES:	***Required***	***Related***
	Operator's Manual for the GEMStat Blood Gas Analyzer	None

081-821-1081

DETERMINE THE CLINICAL SIGNIFICANCE OF A ROUTINE URINALYSIS

CONDITIONS

You have a laboratory report form with the results of a routine urinalysis.

STANDARDS

Test results are correct and abnormal results are identified.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	Results	
1. Review the report form and determine if the requested tests were performed.	P	F
2. Ensure that confirmation tests were performed, if necessary.	P	F
3. Identify abnormal results.	P	F
4. Identify the clinical significance of abnormal results.	P	F
a. Proteinuria.		
(1) Renal damage/disease.		
(2) Multiple myeloma (specifically Bence Jones protein).		
(3) Strenuous exercise.		
b. Glycosuria.		
(1) Diabetes mellitus.		
(2) Central nervous system damage.		
(3) Pregnancy with undiagnosed diabetes mellitus.		
(4) Metabolism disorders.		

Performance Measures **Results**

c. Ketonuria.

(1) Starvation.

(2) Diabetic acidosis.

d. Blood.

(1) Hematuria-intact RBCs.

(a) Renal disease or calculi.

(b) Exposure to toxic drugs or chemicals.

(c) Trauma.

(d) Strenuous exercise or menstruation.

(2) Hemoglobinuria-lysed RBCs.

(a) Severe burns.

(b) Transfusion reactions.

(c) Infections.

(d) Strenuous exercise.

(3) Myoglobinuria-protein found in muscle tissue.

(a) Muscular trauma.

(b) Lengthy coma.

(c) Muscle-wasting diseases.

(d) Extreme muscular exertion.

e. Bilirubinuria.

(1) Cirrhosis.

(2) Hepatitis.

Performance Measures	Results	
f. Increased urobilinogen.		
(1) Liver disease.		
(2) Hemolytic disorders.		
g. Nitrites. Some bacteria reduce nitrate to nitrite which is not a normal constituent of urine.		
(1) Cystitis.		
(2) Antibiotic therapy.		
(3) Urinary tract infections.		
(4) Specimen contamination from improper preservation.		
h. Specific gravity.		
(1) Diabetes insipidus (S.G. < 1.003).		
(2) Hydration (normal S.G.) and dehydration (S.G. > 1.033).		
i. Leukocytes--urinary tract infections.		
5. Ensure that the technician has signed or initialed and dated the report form.	P	F
6. Sign or initial that you have reviewed the results and that they are correct.	P	F
7. Return the result form to the requesting physician.	P	F

REFERENCES: None

081-821-1025

ISSUE AND RECEIVE UNUSED BLOOD

CONDITIONS

You have a completed SF 518. Necessary materials and equipment: precrossmatched blood for transfusion, a blood bank logbook, and a refrigerator.

STANDARDS

Donor units which are issued have been properly inspected. Returned units have either been quarantined or put back on the shelf for reissue.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Verify that the SF 518, the logbook, and the compatibility tag are correctly completed.	P	F
a. Check the name and ID number of the recipient.		
b. Check the ABO group and Rh type.		
c. Match the number on the blood bag to the number on the SF 518 and the number on the compatibility tag.		
2. Check the color and appearance of the blood.	P	F
3. Instruct the individual signing for the blood to verify that all the information on the forms and in the logbook is correct.	P	F
NOTE: The oldest units should be selected first. Units should not be allowed to expire on the shelf.		
4. Instruct the individual to sign the logbook indicating receipt.	P	F
5. Issue units of blood in urgent situations.	P	F
a. If blood must be issued prior to completion of the crossmatch, the records must contain a signed emergency release statement from the requesting physician.		

Performance Measures	Results
b. If the ABO group and Rh type are known, the recipient should receive ABO group and Rh type specific blood.	
c. If the ABO group and Rh type are not known, it is advisable to give Group O RBCs, preferably Rh (D) negative.	
d. The crossmatch should be completed promptly.	
6. Accept unused blood.	P F
a. Verify that the blood has not been at room temperature for more than 30 minutes.	
b. Verify that the original transfusion request form is returned with the blood.	
c. Check and match the number on the SF 518, the blood bag, the compatibility tag, and the logbook.	
d. Sign or initial the logbook.	
e. Witness that the person returning the blood signs or initials the logbook.	
7. Store the blood in the refrigerator with the other crossmatched blood IAW local SOP.	P F

WARNING

Blood units that are questionable for any reason should be quarantined until the responsible person decides their disposition. Blood that has been returned to the blood bank must not be reissued for transfusion until it has been verified that: (1) sterility has been maintained and (2) the unit has been kept in a monitored refrigerator from 1° to 6° C.

REFERENCES:	***Required***	***Related***
	None	TM 8-227-3

081-821-1026

PREPARE BLOOD FOR SHIPMENT

CONDITIONS

Necessary materials and equipment: local SOP, a standard shipping container, DD Form 573, plastic bags, donor units, wet ice, and a temperature monitor.

STANDARDS

Donor units are properly iced and packed for shipment.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Gather the materials for shipping the blood.	P F
a. Standard shipping container.	
b. Fourteen pounds of double-bagged wet ice.	

CAUTION

Super cooled cubed ice, canned ice, and dry ice should not be used for shipping or storing whole blood or red blood cells because the low temperature may cause the red cells to hemolyze. Frozen components, however, may be shipped with dry ice as they must be maintained at or below the required storage temperature. Granulocyte concentrates and platelets should be maintained at 20° to 24° C during shipment.

c. Three copies of DD Form 573.

2. Pack the blood for shipment. P F

a. Remove the blood bags from the refrigerator and document the following on the DD Form 573: unit identification numbers, expiration date, type of product, blood groups, Rh types, and other necessary information.

Performance Measures	Results

b. Pack the standard shipping container with--

(1) 20 units of whole blood or 12 units of whole blood plus administering sets.

(2) 30 units of packed RBCs or 20 units of packed RBCs plus administering sets.

c. Fill out three copies of DD Form 573.

d. Insert a locally approved temperature monitor into the container.

e. Place double-bagged wet ice above the units (cool air moves downward).

NOTE: For long hot shipments, there should be minimal separation between the ice and blood bags to maintain coolness. In **very hot** weather, ice should be placed above and below the blood bags.

f. Ensure that the temperature range in the container is between 1° and 10° C.

g. Seal the box.

3. Complete the shipping preparation. P F

a. Write the time iced in the spaces provided and add 24 hours to show the time for re-icing.

b. Alert the personnel receiving the shipment.

c. Send two copies of DD Form 573 with each container and retain one copy for the laboratory files.

REFERENCES:	***Required***	***Related***
	None	TM 8-227-3

081-821-1027

PREPARE PACKED CELLS

CONDITIONS

You have a blood bag with satellite bags or a transfer set and a completed SF 518. Necessary materials and equipment: a plasma expressor, crimper clamps and a crimper tool, scissors, pregummed labels, and hemostatic forceps.

STANDARDS

Blood is properly centrifuged, if needed. Plasma is separated from the cells with a minimal amount of cross-contamination.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Ensure that the physician has requested packed cells by checking the SF 518.	P	F
2. Centrifuge the blood bag if the cells are not settled on the bottom. Centrifuge at "heavy" spin (5000 rpm for 5 minutes, with a temperature setting of 5° C).	P	F
3. Place the blood bag in the plasma expressor.	P	F

a. Use the satellite bag technique, if applicable.

(1) Gently release the spring, allowing the plate of the expressor to contact the bag.

(2) Clamp the tubing between the primary and satellite bags with a hemostat.

(3) Penetrate the closure of the primary bag and release the hemostat to allow plasma to flow into the satellite bag.

(4) Reapply the hemostat when the desired amount of plasma has entered the satellite bag.

(5) Seal the tubing between the primary bag and satellite bag in two places.

b. Use the transfer set technique, if applicable.

(1) Apply a hemostat to the tubing of a sterile transfer bag.

Performance Measures **Results**

> **CAUTION**
>
> The seals must not have been broken or damaged prior to use of the transfer set.

(2) Aseptically insert the cannula of the transfer bag into the outlet port of the bag of blood.

(3) Release the hemostat and allow the faceplate to make contact with the blood bag to express the plasma.

(4) Clamp the tube and release the faceplate when the desired amount of plasma has entered the transfer bag.

(5) Seal the tubing in two places between the primary bag and the transfer bag.

4. Check that the satellite bag or transfer bag has the same donor number as that on the primary bag. P F

5. Cut the tubing between the two seals. P F

6. Label the component bag with the expiration date and contents. P F

7. Change the expiration date on the blood bag to 24 hours from the time of entry if the transfer set technique is used. P F

NOTE: The satellite bag technique does not require that you penetrate the closed system; therefore, the expiration date remains the same for the blood bag.

8. Place the unit in the refrigerator until ready to be picked up. P F

REFERENCES:	***Required***	***Related***
	None	TM 8-227-3

081-821-1031

COLLECT DONOR BLOOD

CONDITIONS

You have a blood donor who has an initiated DD Form 572. Necessary materials and equipment: a phlebotomy couch, a table or equipment stand, a sterile collection bag containing anticoagulant with integrally attached tubing and needle, numbered sticker labels, a balance system to monitor volume of blood drawn, a hemostat, scissors, cleansing materials, dressing tape, sterile gauze, a rubber ball, a constricting band or blood pressure cuff, a clock, test tubes (pilot tubes), a roller clamp, a dielectric sealer or crimper clamp with clamps, rubber bands, and an AABB Technical Manual (TM 8-227-3).

STANDARDS

A unit of blood is properly collected without causing injury to the donor.

TRAINING/EVALUATION

Training Information Outline

1. Prepare for a phlebotomy.

   a. Check the donor's identity by--

      (1) Having the donor state his or her name.

      (2) Checking the DD Form 572.

   b. Make the donor comfortable.

   c. Inspect the blood bag and tubing for defects and contamination and replace if any are noted.

      (1) Apply pressure to check for leaks.

      (2) Inspect the anticoagulant and additive solution for clarity and get a new bag if the fluid is cloudy or precipitated.

   d. Verify that the protective sleeve is intact over the needle.

   e. Check that the labels on the blood bag, pilot tubes, and donor history card have identical numbers.

   f. Record the blood bag integral tubing number on the donor history card.

g. Ensure that the counterweight is properly balanced on the automatic balance system using a preweighed bag.

h. Verify that the trip clamp works.

i. Hang the bag low enough to allow gravity collection (below the level of the donor's arm).

j. Attach a hemostat 6 to 8 inches from the needle and then break the seal between the tube and the bag.

k. Wash your hands.

2. Identify the site for the phlebotomy. (See task 081-833-0032, steps 6 through 12.) Release the constricting band.

3. Prepare the phlebotomy site.

a. Clean the site and surrounding 2 to 3 inches for 30 seconds with 0.7 percent aqueous scrub solution of iodophor compound.

b. Remove excess foam.

c. Apply iodophor complex solution and let it stand for 30 seconds.

NOTE: This solution contains only 1 percent free iodine and need not be removed before completing the venipuncture.

d. Cover the area with dry sterile gauze until ready to perform the venipuncture.

4. Perform the phlebotomy.

a. Reapply the constricting band or blood pressure cuff. Instruct the donor to lightly squeeze and release the rubber ball until the vein is again prominent.

b. Locate the site.

c. Remove the protective cap from the needle. Have the donor maintain a steady squeeze on the rubber ball.

d. Anchor the vein. (Do not contaminate the puncture site by palpating.)

e. Perform a quick puncture. A clean, skillful venipuncture is essential for a full, clot-free unit.

f. Open the hemostat to allow the blood to flow into the bag.

g. Tape the hub of the needle and the tubing to the donor's arm and cover the site with gauze. The donor should squeeze and release the rubber ball every 3 to 5 seconds.

5. Monitor blood collection.

CAUTION

The donor should never be left unattended during or immediately after donation.

a. Mix the blood and anticoagulant in the bag by inverting it once a minute during collection. This may be done carefully by hand if a mechanical agitator is not available.

b. Write the procedure start time on DD Form 572.

c. Ensure that the blood and the anticoagulant are mixed together as the collection is taking place.

6. Discontinue collection.

a. Discontinue collection when the trip clamp device activates and the balance falls.

b. Clamp the tubing near the venipuncture using a hemostat, metal clamp, or other temporary clamp.

c. Release the constricting band or deflate the blood pressure cuff.

d. Place a crimper clamp on the tubing between the hemostat (or other temporary clamp) and the bag.

e. Cut the tubing between the clamp and the hemostat and fill the pilot tubes.

f. Remove the needle, apply pressure with gauze, and have the donor raise his or her arm.

g. Record on DD Form 572 the time collection stopped.

7. Prepare the blood bag for processing.

a. Strip the tubing into the bag as completely as possible and invert the bag to prevent clotting. Repeat a second time.

NOTE: Steps 7b through 7d are normally completed by a separate team so that the donor is not left unattended.

b. Crimp, clamp, or seal the integral tubing into segments leaving a complete number visible on each segment.

c. Wrap a rubber band around the pilot tubes and blood bag and reinspect the container for defects. Discard the bag if any defects are found which compromise the sterility of the blood and account for this in accordance with local policy.

d. Refrigerate the blood immediately in the unprocessed blood section if components are not being made. Maintain at 20° to 24° C if platelets are to be harvested.

NOTE: Platelets must be separated within 8 hours after collection of whole blood.

8. Instruct the patient in postoperative care.

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the patient and the equipment for the phlebotomy.	P	F
2. Identify and prepare the site.	P	F
3. Perform the phlebotomy.	P	F
4. Monitor blood collection	P	F
5. Discontinue collection.	P	F
6. Prepare the bag for processing.	P	F
7. Instruct the patient in postoperative care.	P	F

REFERENCES:	***Required***	***Related***
	TM 8-227-3	None

081-821-1032

PROCESS DONOR BLOOD

CONDITIONS

Necessary materials and equipment: test tubes, a test tube rack, an indelible marker, disposable transfer pipets, reagents, a worksheet, and bag labels.

STANDARDS

A unit's acceptability for transfusion is correctly determined.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Prepare the blood tubes for processing.	P	F
a. Obtain three identically numbered pilot tubes and a blood bag from the refrigerator.		

NOTE: The number of pilot tubes drawn will vary from installation to installation. Follow the appropriate local SOP.

b. Verify that the numbers on the tubes and the blood bag are identical.

c. Remove a segment from the blood bag for serological testing and replace the blood bag in the refrigerator in the unprocessed blood section.

d. Centrifuge the pilot tubes.

e. Decant the serum into appropriately labeled test tubes with identical numbers.

f. Place the tubes in a test tube rack.

g. Prepare a 2 to 5 percent cell suspension from the blood bag segment.

2. Perform ABO grouping. (See task 081-821-1018.)	P	F
3. Perform Rh typing. (See task 081-821-1019.)	P	F

NOTE: If the results for Anti-D are negative, perform the test for weak D antigen. (See task 081-821-1020.)

Performance Measures	Results
4. Perform the test for detection of antibodies. (See task 081-821-1021.)	P F
5. Perform infectious disease testing.	P F

a. HBsAg (Hepatitis B Surface Antigen).

b. Anti-HIV-1/2 (Antibodies to HIV-1 Antigen or HIV-2 Antigen).

c. Anti-HTLV-I/II (Antibodies to HTLV-I/II Antigen).

d. Anti-HBc (Antibodies to Hepatitis B Core Antigen).

e. Anti-HCV (Antibodies to Hepatitis C Virus).

f. STS (Serologic Test for Syphilis).

WARNING

Whole blood or components may not be used for transfusion if any of the above tests are positive. If transfusion is necessary in an emergency, the requesting physician must sign an emergency release form indicating that the use of untested or partially tested blood is to sustain or save the patient's life. If a test is later found positive, the recipient's physician **must** be notified.

g. ALT (Alanine Aminotransferase).

WARNING

Whole blood or components may not be used for transfusion if these results are outside of established limits. If a transfusion is necessary in an emergency, and the test is later found to exceed limits, the recipient's physician **must** be notified.

6. Label the donor blood bag.	P F

a. Remove the blood bag from the refrigerator and match the identification number.

b. Refer to the worksheet for information to label the blood bag.

(1) ABO blood group.

(2) Rh type.

Performance Measures	Results

(3) Results of the antibody screen.

(4) Results of the tests for infectious disease.

c. Confirm the label information by ABO and Rh typing of the segment.

7. Place the blood bag back in the refrigerator in theappropriate section for issue or quarantine. P F

REFERENCES:	*Required*	*Related*
	None	TM 8-227-3

081-821-1038

PERFORM A DIFFERENTIAL AND A WHITE BLOOD CELL COUNT ON CEREBROSPINAL FLUID (CSF)

CONDITIONS

You have a properly collected blood specimen and a laboratory request form. Necessary materials and equipment: a hemacytometer with coverslip, a tally counter, a differential cell counter, Wright's stain, capillary pipets, a microscope, a timer, a centrifuge, and a logbook.

STANDARDS

The absence or presence and number of WBCs in the CSF are determined and the WBCs are differentiated.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**
1. Perform the total cell count on CSF.	P F

a. Fill the hemacytometer with well-mixed, undiluted CSF using a pipet and allow the cells to settle for 5 minutes.

NOTE: If this cannot be performed within 1 hour, refrigerate the specimen to delay cell destruction.

b. Examine the entire ruled area (9 sq mm) for cells.

c. Note the condition of the RBCs while counting all cells.

(1) Crenated--old blood.

(2) Normal--fresh blood.

Formula for calculation:

cells/µL = # cells x depth (10) x dilution (1) x area (1/9)
= # cells x 1.1

Example: 15 cells counted

15 x 1.1 = 16.5 or 17 total cells/µL.

Performance Measures	**Results**	
d. Repeat the procedure counting only the WBCs for the WBC count.		
e. Calculate the RBC count by subtracting the WBC count from the total cell count.		
Example: 17 total cells/µL - 12 WBCs/µL = 5 RBCs/µL		
2. Perform a WBC differential cell count on CSF.	P	F
a. Centrifuge the remaining specimen for 5 minutes at 5000 rpm to obtain the cell button.		
b. Prepare a thin smear with the cell button, and stain it with Wright's stain.		
c. Perform a differential cell count in the usual manner.		
3. Record the results in the logbook and on the laboratory request form.	P	F

Normal values:

RBCs: 0 RBCs/µL

WBCs: 0 to 5 WBCs/µL

NOTE: Greater than 10 WBCs/µL is evidence of infection. The main source of error in this procedure is improper use of the hemacytometer.

REFERENCES: None

081-821-1043

DETERMINE BLOOD DONOR ELIGIBILITY

CONDITIONS

Necessary materials and equipment: DD Form 572, a thermometer, a stethoscope, a sphygmomanometer, a watch with a second hand, capillary tubes, alcohol wipes, a lancet, sterile gauze, copper sulfate (1.053 specific gravity), sealing clay, a microhematocrit centrifuge, a microhematocrit reader, and an AABB Technical Manual (TM 8-227-3).

STANDARD

A donor medical history is taken and a partial physical examination is completed to determine donor eligibility based on the data obtained.

TRAINING/EVALUATION

Training Information Outline

1. Ascertain and record donor demographic information.

2. Initiate and review the donor medical history.

   a. Verify that the last donation was at least 8 weeks ago.

   b. Question the donor on the following to determine acceptability:

   (1) Present state of health. Pain, sore throat, headache, nausea, cough, dizziness, menstrual cramps, or extreme nervousness may be cause for deferral.

   (2) Previous deferrals and/or notification of abnormal results after donation.

   (3) Surgical procedures and major illnesses. Donors who have undergone major surgical procedures should be deferred for at least 12 months if they have received a transfusion of blood, blood components, or a clotting factor concentrate. Uncomplicated surgery is disqualifying only until healing is complete and full activity has been resumed.

   (4) History of various diseases.

   (a) Heart disease. Heart disease with a history of known residual damage is cause for deferral unless evaluated and approved by the Blood Bank physician. A single episode of rheumatic fever or pericarditis, a heart murmur, or successful repair of a congenital defect does not necessarily disqualify a donor.

(b) Lung disease. Active pulmonary tuberculosis, or any active pulmonary disease, is cause for deferral. Previous tuberculosis, successfully treated and no longer active, need not disqualify a donor. Donors with a history of reactive tuberculin skin tests may be accepted after evaluation by a physician.

(c) Liver disease. An active inflammatory or chronic disease of the liver, or one that might impair organ function, is cause for deferral of the donor. Chronic conditions must be evaluated by a physician.

(d) Cancer. Donors who have had cancer (other than localized skin cancer) or carcinoma-in-situ of the cervix, should be evaluated by a qualified physician before being accepted as a blood donor. Individuals who have had definitive therapy and are free of disease for at least 5 years may be acceptable donors. Donors who have or have had leukemia or lymphoma must be permanently deferred.

(5) Injections, vaccinations, and inoculations. Donors who had injections of human pituitary-derivative growth hormone (pit-hGH) administered between 1958 and 1986 should be permanently deferred as a precaution for the recipient. Deferral is not required if it was a recombinant growth hormone. Refer to the AABB Technical Manual for specific deferral times for vaccinations and inoculations received during the previous 12 months.

(6) Drugs and medications. In general, medications taken by a donor are not harmful to the recipient. Most donors taking medications, even prescription medications, are acceptable blood donors. Deferral for most drugs is based on the nature of the disease process, not for properties of the drug itself. When evaluating a medication taken by a donor, refer to a donor medication book or SOP that has been approved by the Blood Bank physician.

(7) Pregnancy. Defer the donor during and for 6 weeks following the conclusion of pregnancy. An exception may be made by the Blood Bank physician if the woman's blood is intended for transfusion of her infant.

(8) Abnormal bleeding tendencies. An abnormal bleeding tendency may be cause for deferral subject to evaluation by the Blood Bank physician. Individuals with such a history may experience excessive bleeding at the venipuncture site and may require special care following donation.

(9) Hepatitis. The hepatitis virus cannot be detected with certainty by any means currently available so it is crucial that the donor is adequately questioned regarding possible exposure to protect the recipient. Previous illness, intimate contact with a person with hepatitis, recent tattoos or ear-piercing, acupuncture or electrolysis, intravenous drug abuse, and health care personnel who have had needlestick injuries or exposure to blood from an unknown source should all be carefully evaluated before donation is accepted. Defer indefinitely donors who have any of the following:

(a) A history of viral hepatitis after the 11th birthday.

(b) A history of hepatitis B or a confirmed positive test for HBsAg, or a repeatedly reactive anti-HBc on more than one occasion.

(c) Present or past clinical or laboratory evidence of infection with hepatitis C, HTLV-I/II, or HIV viruses.

(d) A high alanine aminotransferase (ALT) level on one occasion or ALT levels above the highest acceptable values for blood release on more than one occasion.

(e) Used intravenous drugs (check both arms for evidence of needle use).

(f) Donated the only unit of blood or blood component transfused to a patient who developed transfusion-associated hepatitis, HIV, or HTLV-I/II.

(g) Been involved in two or more transfusion-associated hepatitis cases with results in a cumulative probability value greater than 0.4.

(10) Acquired Immune Deficiency Syndrome (AIDS). Donors who have signs or symptoms of AIDS must be permanently deferred. These include night sweats, unexplained fevers, unexpected weight loss, persistent diarrhea, generalized lymph node enlargement, and unusual skin lesions, especially purple bumps under the skin that seem to spread locally or to be present in widely separated areas. Prospective donors must be given education material informing them of high risk activities for AIDS and the necessity of refraining from donating blood, if at risk. Direct oral questions regarding HIV high risk activities in a setting which affords privacy must be done on each donation. Donors should be informed that there is a time early after exposure to HIV during which the test for antibodies, done on all donations, may not detect infection. Persons who are not suitable as donors, but desire to learn their antibody status should be given instructions about alternate mechanisms to obtain testing. All donors must be asked if they have read and understood the educational material informing potential donors that persons at increased risk of AIDS should refrain from donating blood. Donors must also sign a consent statement recommended by the Food and Drug Administration (FDA). All donors must also be given the opportunity to indicate confidentially whether their unit of blood "is" or "is not" suitable for transfusion. Confidential unit exclusion (CUE) may be performed either in a private interview with a suitably trained person, or in a manner that provides strict confidentiality of the decision, such as a "ballot" or bar coded system.

(11) Malaria. Prospective donors (travelers, immigrants, refugees, citizens, or residents) who have visited or come from an endemic area, and who have had malaria or taken antimalarial prophylaxis, must be deferred for 3 years after cessation of therapy, or after departure from the malarial area, if they have been asymptomatic in the interim. Travelers who have been to a malaria endemic area may be accepted as a regular blood donor 6 months after return to the nonendemic area,
providing they have been free of unexplained febrile illnesses and have not taken antimalarial drugs.

(12) Babesiosis or Chagas' disease. Donors with a history of disease caused by either Babesia species or Trypanosoma cruzi must be indefinitely deferred. Persons who originate from endemic areas, such as certain rural parts of Latin America, may have chronic Chagas' disease without evidence of an acute episode in the past. For this reason, they should also be indefinitely deferred.

3. Record the donor's weight. The minimum weight for donating a full unit is 50 kg (110 lb). A full unit is 450 ml ±45 ml plus 30 ml for the processing tubes.

4. Record the donor's temperature. (See task 081-831-0013.) It must not exceed 99.5° F.

5. Record the donor's pulse rate. (See task 081-831-0011.) Acceptable range: 50 to 100 beats per minute.

6. Record the donor's blood pressure. (See task 081-831-0012.) The systolic reading should be no higher than 180 mm Hg and the diastolic should be no higher than 100 mm Hg.

7. Assess the donor for skin disorders.

a. Check the venipuncture site for lesions which would interfere with the procedure. If present, defer the donor.

b. Check for boils or severe skin infections and defer, if necessary.

8. Perform a hemoglobin (Hgb) or hematocrit (Hct) determination.

a. Perform the manual hemoglobin test using the copper sulfate method. The acceptable range for males and females is greater than 12.5 g/dl Hgb (specific gravity equal to or greater than 1.053).

b. Perform a microhematocrit determination. (See task 081-821-1040.) The Hct must be equal to or greater than 38 percent.

9. Sign or initial the DD Form 572.

Evaluation Guide

Performance Measures	**Results**	
1. Record donor demographic information.	P	F
2. Review donor medical history to determine eligibility.	P	F
3. Measure the patient's vital signs to determine eligibility.	P	F
4. Assess the patient's skin for disorders to determine eligibility.	P	F
5. Assess the patient's blood work to determine eligibility.	P	F
6. Sign or initial the DD Form 572.	P	F

REFERENCES:	***Required***	***Related***
	TM 8-227-3	None

081-821-1082

THAW FRESH FROZEN PLASMA

CONDITIONS

Necessary materials and equipment: 37° C circulating water bath, plastic bags, a thermometer, SF 518, and a frozen specimen.

STANDARDS

Plasma is completely thawed and issued with correct documentation on the SF 518.

TRAINING/EVALUATION

Evaluation Guide

Performance Measures	**Results**	
1. Upon receipt of SF 518, enter the request in the blood bank log book and assign a transfusion number on the SF 518.	P	F
2. Select the oldest unexpired unit of ABO group specific plasma from the inventory freezer. AB plasma may be used if group specific is not available.	P	F
NOTE: A crossmatch is not necessary for fresh frozen plasma.		
3. Place the unit in a plastic bag ensuring that the ports are free of water, and place it in the circulating water bath at 37° C.	P	F
4. Check the plasma after 15 to 20 minutes. Disperse the ice crystals by gentle agitation. Continue to check the plasma at 5 to 10 minute intervals until completely thawed.	P	F
5. Change the expiration time to 24 hours from the time of thawing.	P	F
6. Remove a segment from the plasma bag and perform an ABO serum grouping. If the results match the label on the bag, record them and the donor number on the SF 518. In the Remarks section of the SF 518, record "Crossmatch not required."	P	F
NOTE: If the results differ from that on the label, notify the Blood Bank NCOIC immediately.		
7. Store in a refrigerator between 1° and 6° C until ready for issue.	P	F
8. Requestor must verify patient information in the blood bank log book, SF 518, and the unit label and sign the log book entering the date and time of issue.	P	F

Performance Measures **Results**

NOTE: Units not used within 24 hours of thawing should be discarded.

REFERENCES:	***Required***	***Related***
	None	TM 8-227-3

FIELD EXPEDIENT SQUAD BOOK
For use of this form, see AR 350-37; the proponent agency is DCSOPS

SHEET OF

USER APPLICATION

SOLDIER'S NAME

TASK NUMBER AND SHORT TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-831-0010, Measure a Patient's Respirations																		
081-831-0011, Measure a Patient's Pulse																		
081-831-0012, Measure a Patient's Blood Pressure																		
081-831-0013, Measure a Patient's Temperature																		
081-831-0007, Perform a Patient Care Handwash																		
081-831-0008, Put On Sterile Gloves																		
081-831-0037, Disinfect Water for Drinking																		
081-831-0018, Open the Airway																		
081-831-0019, Clear an Upper Airway Obstruction																		
081-831-0048, Perform Rescue Breathing																		
081-831-0046, Administer External Chest Compressions																		
081-831-0035, Manage Convulsive/Seizing Patient																		
081-831-0038, Treat a Casualty for a Heat Injury																		

DA FORM 5165-R, SEP 85 EDITION OF DEC 82 TO BE USED

FIELD EXPEDIENT SQUAD BOOK
For use of this form, see AR 350-37; the proponent agency is DCSOPS

SHEET OF

USER APPLICATION	SOLDIER'S NAME									

TASK NUMBER AND SHORT TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-831-0039, Treat a Casualty for a Cold Injury																		
081-821-1017, Perform a Routine Urinalysis																		
081-821-1052, Perform Lab Tests Using Kodak DT60																		
081-821-1063, Perform Na/K Determ - CIBA Corning 614																		
081-821-1013, Perform a Gram Stain																		
081-821-1014, Perform Giemsa Stain for Malarial Parasites																		
081-821-1066, Perform Concen Techniq - Ova/Parasites																		
081-821-1042, Perform Macro Exam of Feces/Occult Blood																		
081-821-1056, Perform KOH (NaOH) Prep Skin Scrapings																		
081-821-1065, Perform Micro Exam of Pinworm Prep																		
081-821-1067, Perform Urine Culture/Colony Count/Suscep																		
081-821-1068, Perform Wound Culture and Suscept Test																		
081-821-1069, Perform Blood Culture and Suscept Test																		

DA FORM 5165-R, SEP 85 EDITION OF DEC 82 TO BE USED

FIELD EXPEDIENT SQUAD BOOK
For use of this form, see AR 350-37; the proponent agency is DCSOPS

SHEET OF

USER APPLICATION

SOLDIER'S NAME

TASK NUMBER AND SHORT TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-821-1070, Perform Sputum Culture and Suscept Test																		
081-821-1071, Perform Stool Culture and Suscept Test																		
081-821-1072, Perform CSF Culture and Suscept Test																		
081-821-1073, Perform Culture/Suscept Test - Gonorrhea																		
081-821-1074, Perform Throat Culture and Suscept Test																		
081-821-1053, Perform Disk Diffusion Antibiot Suscep Test																		
081-821-1075, Perform Micro Exam for Acid-Fast Bacilli																		
081-821-1033, Perform RPR Test																		
081-821-1058, Perform Sero Test for Infect Mononucleosis																		
081-821-1064, Perform Qualitative HCG Test																		
081-821-1018, Perform ABO Grouping and Confirm Tests																		
081-821-1019, Perform Rh Typing																		
081-821-1020, Perform Test for Rh Variant (Weak D)																		

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	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-821-1021, Perform Antibody Screen																		
081-821-1022, Perform Direct Antiglobulin Tests																		
081-821-1023, Perform Crossmatch Procedure																		
081-821-1024, Store Blood																		
081-821-1034, Obtain Blood - Capillary Puncture																		
081-833-0032, Obtain Blood Using Vacutainer																		
081-821-1036, Perform WBC Count on Whole Blood																		
081-821-1083, Perform Wright's Stain - Camco Quik Stain																		
081-821-1039, Perform WBC Differential Count																		
081-821-1040, Perform Microhematocrit Determination																		
081-821-1041, Perform One Stage Prothrombin Time																		
081-821-1046, Perform CBC Using QBC II																		
081-821-1049, Perform Manual Platelet Count																		

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SOLDIER'S NAME

TASK NUMBER AND SHORT TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-821-1076, Perform PT Test Using MLA Electra 750																		
081-821-1077, Perform APTT Test Using MLA Electra 750																		
081-821-1078, Perform Fibrinogen Level Determination																		
081-821-1079, Perform Fibrin/FDP Test																		
081-821-1080, Perform Blood Gas Analysis Using GEMStat																		
081-821-1081, Determ Clinical Signif of Urinalysis																		
081-821-1025, Issue/Receive Unused Blood																		
081-821-1026, Prepare Blood for Shipment																		
081-821-1027, Prepare Packed Cells																		
081-821-1031, Collect Donor Blood																		
081-821-1032, Process Donor Blood																		
081-821-1038, Perform Differen and WBC Count on CSF																		
081-821-1043, Determine Blood Donor Eligibility																		

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SHEET OF

USER APPLICATION	SOLDIER'S NAME									

TASK NUMBER AND SHORT TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
081-821-1082, Thaw Fresh Frozen Plasma																		

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APPENDIX B

Operate a Binocular Bright-field Microscope

1. Clean all lenses using lens paper. Clean the oil immersion lens last.

2. Plug the microscope cord into the appropriate outlet and turn on the power control to a comfortable brightness.

3. Turn the field diaphragm knob to the fully open position.

4. Turn the neutral density filter knob to position the filter in the light path.

5. Open the condenser diaphragm about halfway.

6. Use the condenser height adjustment knob to move the condenser to the fully up position.

7. Place a prepared specimen slide onto the stage and move the slide over the condenser.

8. Rotate the 10X (low power) objective lens into place over the specimen.

9. Adjust the width of the eyepieces between your eyes so that the image merges into one. Use the thumb wheel and do not pull or push the eyepieces as this may damage them.

10. Adjust the coarse adjustment knob to bring the specimen into focus. Obtain a fine focus using the fine focus knob.

11. Rotate the desired objective into place using the knurled ring. Place a drop of oil on the slide if using the 100X oil immersion lens. Refocus using the fine focus and increase the light intensity if necessary.

NOTE: Each eyepiece is independently focusable in Nikon microscopes so you must adjust the diopter rings to the white line or midpoint. Cover the left eye or eyepiece with a card or a piece of paper, and use the fine focus to adjust for the right eye. Then repeat for the left eye.

12. Turn the field diaphragm knob so that light fills about 75% of the field of view.

13. Center the light in the field of view by using the thumb screws on the Abbe condenser.

14. Adjust the condenser height so that the edges of the field diaphragm are in the sharpest focus.

NOTE: Setting the proper height of the condenser is the single most critical step in preparing the microscope for use, and the height should not be moved once it is properly set for a given lens.

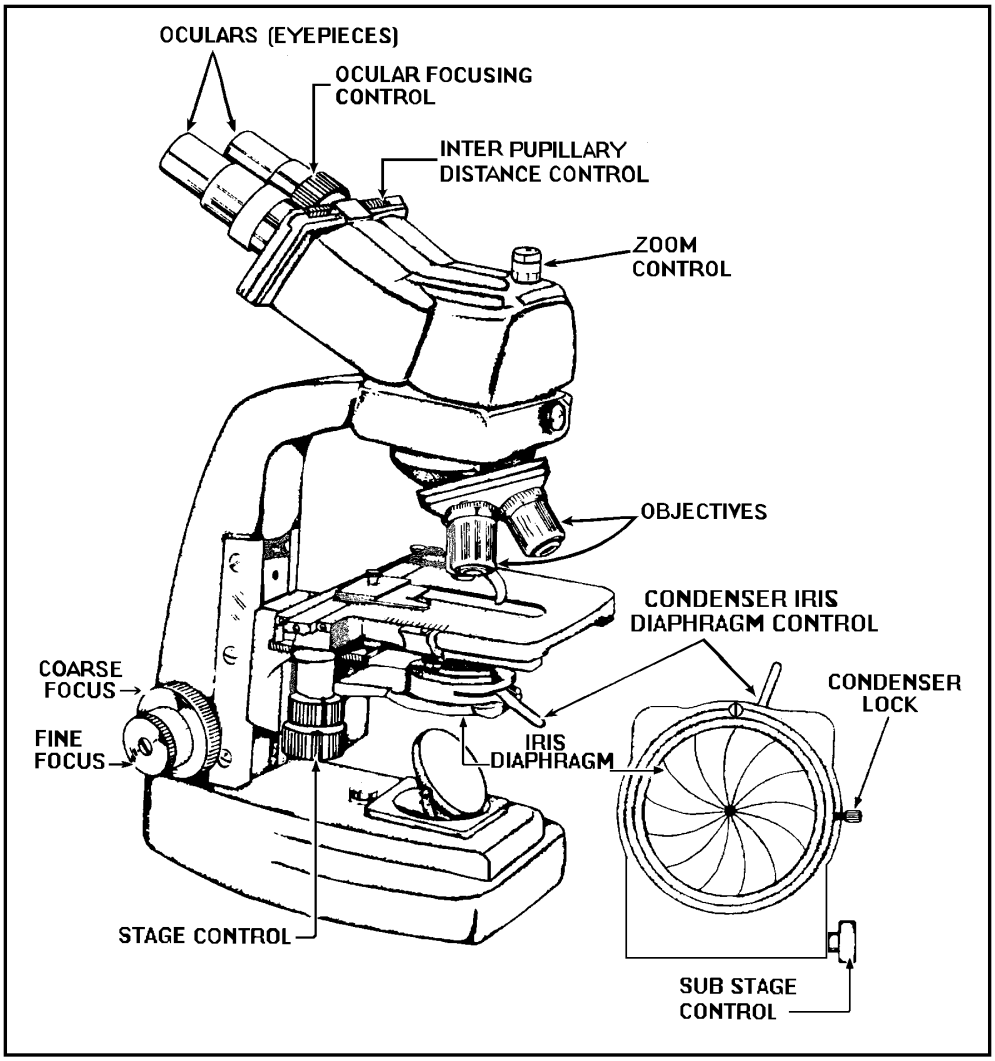
15. Open the field diaphragm until the light slightly exceeds the field of view.

16. Carefully close the condenser diaphragm just until the background begins to darken.

17. The three choices in order to control the light intensity are the neutral density filter, the variable light intensity control, and the condenser diaphragm. Do not use the height of the Abbe condenser as a method to control the light intensity.

18. Use the lower light intensity with the neutral density filter in place for the low power objectives, and the higher light intensity for the high power objectives. The neutral density filter is not required when using the oil immersion lens.

19. Clean all lenses with lens paper before storing the microscope. Clean the oil immersion lens last. Wrap the power cord loosely around the arm of the microscope. Place the dust cover over the microscope and carefully place the microscope into the cabinet.



Convert Metric Values

1. The metric system is based on powers of ten and nonchangeable physical constants. This makes it a much easier system than the English where the units are inconsistent.

2. The basic unit of length is the meter which is defined as how far light will travel in 1/299,792,458ths of a second.

3. The basic unit of volume is the liter which is the volume occupied by one kilogram of water at four degrees Celsius.

4. The basic unit of mass is the gram which is 1/1000th of the weight of the international prototype kilogram (1889 - a block of platinum-iridium alloy stored under noncorrosive conditions by the International Bureau of Weights and Measures in a vault in Sevres, France).

5. Common metric conversion values:

Metric Prefix	Symbol	Numerical Value
Giga-	G	1,000,000,000
Mega-	M	1,000,000
Kilo-	k	1,000
Hecto-	h	100
Deca-	da	10
Unity-		1
Deci-	d	0.1
Centi-	c	0.01
Milli-	m	0.001
Micro-	µ	0.000001

Convert Between Temperature Scales

1. Common temperature scales are Fahrenheit and Celsius. The Kelvin scale defines absolute zero as the temperature where all molecular motion stops.

2. Conversion formulas.

CONVERSION FORMULAS

°F = (1.8 x °C) + 32

°C = (°F - 32) ÷ 1.8

°K = °C + 273

Convert Large Numbers to Scientific Notation

1. An extremely large or small number can be expressed in scientific notation for ease in calculations.

2. A number written in scientific notation consists of two parts multiplied together ($1.23 \times 10^5 = 123,000$).

a. The first part (the **digit term** 1.23) has all the significant figures expressed as a number having one place to the left of the decimal point.

b. The second part (the **exponential term** 10^5) is written as a power of ten that restores the original value to the number.

3. To convert a number **greater than one** to scientific notation, count the number of places required to move the decimal point to obtain a number having one place to the left of the decimal point. That number will be the correct positive power of 10. (123,000 to 1.23 multiplied by 10^5, since five moves were made to obtain 1.23).

4. To convert a number **less than one** to scientific notation, count the number of zeros and the first whole number to which the decimal point has been moved to the right to obtain a number having one place to the left of the decimal point. That number will be the correct negative power of 10. (0.0000123 to 1.23 multiplied by 10^{-5}, since five moves to the right were necessary to obtain 1.23).

5. When multiplying with scientific notation, multiply the digit terms and then add the exponents of the exponential terms.

6. When dividing with scientific notation, divide the digit terms and then subtract the exponents of the exponential terms.

Calculate Percent Concentration

1. Concentration is an expression of the relative amount of solute and solvent present as a ratio.

   a. Weight per unit volume (w/v): g/dL (%), mg/dL (mg%).

   b. Volume per unit volume (v/v): mL/dL (%).

   c. Weight per unit weight (w/w): g/dg (%). Weight per weight solutions are not commonly used in the clinical laboratory.

2. Calculate weight/volume concentration.

   a. **EXAMPLE** Determine how much NaCl is needed to make 2.0 liters of a 3.0 g/dL NaCl solution.

      (1) Convert to common units.

$$2.0\ \text{L} \times \frac{10\ \text{dL}}{\text{L}} = 20\ \text{dL}$$

FORMULA

g = (dL)(g/dL)

= (20 dL)(3.0 g/dL)

= 60 g

(2) Multiply the volume by the percent concentration to obtain the grams of NaCl contained in 2.0 liters of a 3.0 g/dL solution.

$$20\ \text{dL} \times \frac{3.0\ \text{g}}{\text{dL}} = 60\ \text{g}$$

b. **EXAMPLE** Determine the % concentration of a solution that was prepared by adding 50.0 g $CaCO_3$ to a 250.0 mL flask and adjusting the volume to the mark.

(1) Convert to common units.

$$250.0 \text{ mL} \quad X \quad \frac{1 \text{ dL}}{100 \text{ mL}} \quad = 2.5 \text{ dL}$$

FORMULA

$$g = (g/dL)(dL)$$

$$50 \text{ g} = (g/dL)(2.5 \text{dL})$$

$$\frac{50 \text{ g}}{2.5 \text{ dL}} = g/dL$$

$$= 20.0 \text{ g/dL}$$

(2) Substitute values and express as weight per volume ratio and evaluate the numerical data.

$$50 \text{ g} = (g/dL)(2.5 \text{ dL})$$

$$\frac{50 \text{ g}}{2.5 \text{ dL}} = 20.0 \text{ g/dL}$$

(3) The same result could be obtained by using ratio and proportion.

$$\frac{50.0 \text{ g}}{2.5 \text{ dL}} = \frac{x \text{ g}}{1 \text{ dL}}$$

$$(50.0 \text{ g}) (1\text{dL}) = (2.50 \text{ dL}) (x \text{ g})$$

$$x \text{ g} = \frac{(50.0 \text{ g}((1 \text{ dL})}{2.50 \text{ dL}} = 20.0 \text{ g}$$

(4) Then substitute for x in the original expression which yields the correct answer in % concentration.

$$\frac{x \text{ g}}{1 \text{ dL}} = \frac{20.0 \text{ g}}{1 \text{ dL}} = 20.0 \text{ g/dL}$$

3. Calculate volume/volume concentration.

a. **EXAMPLE** Determine how much water must be added to 15.0 mL of HCl in order to prepare a 5.00 mL/dL HCl solution.

FORMULA

mL = (mL/dL)(dL)

15 mL = (5 mL/dL)(dL)

3 dL = 300 mL - 15 mL

= 285 mL

In this formula, mL = solute and dL = total volume.

(1) Use ratio and proportion as an alternate method to calculate the total volume of solution.

$$\frac{5.00\ \text{mL}}{1\ \text{dL}} = \frac{15.0\ \text{mL}}{x\ \text{dL}}$$

$$(5.00\ \text{mL})(x\ \text{dL}) = (15.0\ \text{mL})(1\ \text{dL})$$

$$x\ \text{dL} = \frac{(15.0\ \text{mL})(1\ \text{dL})}{5.00\ \text{mL}} = 3.00\ \text{dL}$$

(2) The amount of water can be determined by subtracting the volume of the solute from the total volume of solution.

$$3.00\ \text{dL} \times \frac{100\ \text{mL}}{1\ \text{dL}} = 300\ \text{mL}$$

300 mL - 15.0 mL = 285 mL H_2O must be added

b. **EXAMPLE** Determine the volume of methanol required to make 1.00 liter of a 20.0 mL/dL methanol solution.

(1) Convert to common units.

$$1.00\ \text{L} \times \frac{10\ \text{dL}}{1\ \text{L}} = 10.0\ \text{dL}$$

FORMULA

mL = (mL/dL)(dL)

= (20 mL/dL)(10 dL)

= 200 mL

(2) Multiply the volume in deciliters by the percent concentration to determine the volume of solute needed to prepare the solution.

$$10.0\ \text{dL} \times \frac{20.0\ \text{mL}}{1\ \text{dL}} = 200\ \text{mL}$$

4. Calculate percent solutions prepared from hydrates.

a. Each molecule of a hydrate is associated with a given number of water molecules where the water contributes to the molecular weight of the salt. Equal amounts of anhydrous salt and one of its hydrates will not yield equal amounts of the desired chemical, however, the ratio between the two may be used as a factor in calculations.

b. **EXAMPLE** Determine how much $Fe_2(SO_4)_3 \cdot 4H_2O$ is needed to prepare 500.0 mL of a 200.0 mg/dL $Fe_2(SO_4)_3$ solution.

FORMULA

mg = (mg/dL)(dL)(GMW hydrate/GMW anhydrate)

= (200 mg/dL)(5 dL)(471.9 g/399.9 g)

= 1180 mg

(1) Another way to solve this problem is to determine the amount of anhydrous salt needed.

$$500.0 \text{ mL} \times \frac{1 \text{ dL}}{100 \text{ mL}} \times \frac{200.0 \text{ mg}}{1 \text{ dL}} = 1000 \text{ mg}$$

(2) Calculate the gram molecular weight (GMW) of each substance.

$Fe_2(SO_4)_3$

Fe	55.8	X 2	=	111.6
S	32.1	X 3	=	96.3
O	16.0	X 12	=	+ 192.0
				399.9 g/mol

$Fe_2(SO_4)_3 \cdot 4 H_2O$

Fe	55.8	X 2	=	111.6
S	32.1	X 3	=	96.3
O	16.0	X 12	=	192.0
H	1.0	X 8	=	8.0
O	16.0	X 4	=	+ 64.0
				471.9 g/mol

(3) Use ratio and proportion to determine the amount of hydrate needed.

$$\frac{\text{x mg hydrate}}{1000 \text{ mg anhydrous}} = \frac{471.9 \text{ g/mol hydrate}}{399.9 \text{ g/mol anhydrous}}$$

$$\text{x mg hydrate} = \frac{(1000 \text{ mg anhydrous})(471.9 \text{ g/mol hydrate})}{399.9 \text{ g/mol anhydrous}}$$

x mg hydrate = 1180 mg

5. Calculate percent solutions involving partial molecules.

a. It may be necessary to prepare a percent solution that requires only part of the entire molecule. Ratio and proportion will have to be used based on the molecular weights of the entire molecule and element(s) required for the standard solution.

b. **EXAMPLE** Determine how many mg of Na_2CO_3 are needed to prepare 100 mL of a 10.00 mg/dL sodium standard.

FORMULA

Na_2CO_3

Na 23.0 x 2 = 46.0
C 12.0 x 1 = 12.0
O 16.0 x 3 = + 48.0
106.0 g/mole

mg = (mg/dL)(dL)(GMW compound/GMW element)

= (10mg/dL)(1 dL)(106 g/mole/46 g/mole)

= 23.0 mg

Calculations Involving Molarity

1. Molarity is the number of moles of a substance per liter of solution. A one molar solution of any given substance contains one Avogadro's number (6.02×10^{23}) of particles in a liter of solution. Molar concentration is expressed as moles per liter (mol/L).

2. **EXAMPLE** Determine how much Na_2SO_4 is needed to prepare 300 mL of a 2.00 mol/L Na_2SO_4 solution.

FORMULA
g = (L)(mol/L)(GMW)

a. Calculate the gram molecular weight.

Na_2SO_4

Na	23.0	X 2	=	46.0
S	32.1	X 1	=	32.1
O	16.0	X 4	=	+ 64.0
				142.1 g/mol

b. Express the desired volume in liters.

$$300 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.300 \text{ L}$$

c. Multiply the volume expressed in liters by the molar concentration by the gram molecular weight to determine the amount of salt, in grams, needed to prepare the solution.

$$.300 \text{ L} \times \frac{2.00 \text{ mol}}{\text{L}} \times \frac{142.1 \text{ g}}{\text{mol}} = 85.3 \text{ g}$$

3. Calculations Involving Millimoles/Liter

a. A millimole per liter solution contains one millimolecular weight of solute per liter of solution (mmol/L). A millimole = 0.001 mole and one mole = 1000 millimoles. A millimole has the same numerical value as one molecular weight, expressed in mg/mmol.

b. **EXAMPLE** Convert 0.250 mol/L to mmol/L concentration.

$$\frac{0.250 \text{ mol}}{\text{L}} \times \frac{1000 \text{ mmol}}{1 \text{ mol}} = 250 \text{ mmol/L}$$

c. **EXAMPLE** Convert 2000 mmol/L to mol/L concentration.

$$\frac{2000 \text{ mmol}}{\text{L}} \times \frac{1 \text{ mol}}{1000 \text{ mmol}} = \frac{2.000 \text{ mol}}{\text{L}}$$

d. **EXAMPLE** Determine the amount of NaCl needed to make 250 mL of a 300 mmol/L solution.

FORMULA

g = (mol/L)(GMW)(L)

(1) Determine the millimolar weight (GMW) of the compound.

NaCl

Na 23.0
Cl + 35.5
58.5 mg/mmol = 58.5 g/mol

(2) Express the desired volume of solution in liters.

$$250 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} = 0.250 \text{ L}$$

(3) Multiply the desired volume in liters times the molar concentration times the molecular weight to determine the amount of salt needed to prepare the solution.

$$0.250 \text{ L} \times \frac{.300 \text{ mol}}{\text{L}} \times \frac{58.5 \text{ g}}{\text{mol}} = 4.3875 \text{ g}$$

4. Calculate molarity solutions involving hydrates

   No extra calculations are necessary as for every mole of hydrate there is one mole of anhydrate.

FORMULA
g = (mol/L)(GMW)(L)

5. Calculate molarity solutions involving standard solutions.

The first step is to set up a ratio showing that for every mole of the compound there are a certain number of moles of the required element. For example, for every mole of Na_2HPO_4 there are two moles of sodium.

FORMULA
g = (mol/L)(GMW)(L)(# moles compound/# moles element)

Calculations Involving Normal Solutions

1. Normality is defined as the number of equivalents per liter of solution (Eq/L) and accounts for the varying degrees of reactivity of chemicals. One gram equivalent weight of a substance will react exactly with one gram equivalent weight of another substance.

a. **EXAMPLE** Determine the amount of NaOH needed to prepare 400 mL of a 10.0 Eq/L NaOH solution.

FORMULA
g = (Eq/L)(GEW)(L)

(1) Calculate the gram equivalent weight (GEW). This is equal to the gram molecular weight (GMW) of a compound expressed in grams per mole (g/mol) multiplied by the conversion factor expressing the total positive ionic valence (TPIV) which demonstrates that for every mole of a compound there are a certain number of equivalents (mole/Eq).

$$GEW = \frac{GMW\ (g/mol)}{TPIV\ (Eq/mole)} = g/mol\ X\ mole/Eq = g/Eq$$

NaOH

Na 23.0
O 16.0
H + 1.0
40.0 g/mol

$$\frac{40.0\ g}{mol}\ X\ \frac{mol}{1\ Eq} = 40.0\ g/Eq$$

NOTE: In the above equation the TPIV equals 1 Eq/mole.

(2) Express the desired volume in liters.

$$400\ mL\ X\ \frac{1\ L}{1000\ mL} = 0.400\ L$$

(3) Multiply the normal concentration by the gram equivalent weight (GEW) and by the volume expressed in liters to determine the amount of solute needed to prepare the solution.

$$\frac{10\ \text{Eq}}{\text{L}} \times \frac{40.0\ \text{g}}{\text{Eq}} \times 0.400\ \text{L} = 160\ \text{g}$$

b. **EXAMPLE** Determine the Eq/L concentration of an $AlPO_4$ solution that was prepared by adding 120.0 grams of $AlPO_4$ to a 250 mL flask and adjusting the volume to the mark?

(1) Calculate the gram equivalent weight.

$AlPO_4$

Al	27.0 X 1 =	27.0
P	31.0 X 1 =	31.0
O	16.0 X 4 =	+ 64.0
		122.0 g/mol

$$\frac{122.0\ \text{g}}{\text{mol}} \times \frac{\text{mol}}{3\ \text{Eq}} = 40.67\ \text{g/Eq}$$

NOTE: In this equation the TPIV equals 3 Eq/mole.

(2) Use the appropriate conversion factor to express the grams of solute as equivalents.

$$120.0\ \text{g} \times \frac{\text{Eq}}{40.67\ \text{g}} = 2.951\ \text{Eq}$$

(3) Express the desired volume in liters.

$$250\ \text{mL} \times \frac{1\ \text{L}}{1000\ \text{mL}} = 0.250\ \text{L}$$

(4) Concentration is an expression of the relative amounts of solute and solvent present, a ratio. Express the equivalents per liter and simplify the expression.

$$\frac{2.951\ \text{Eq}}{0.250\ \text{L}} = 11.8\ \text{Eq/L}$$

FORMULA

g = (Eq/L)(GEW)(L)
120 g = (Eq/L)(40.67 g/Eq)(.25 L)
120 g = (10.1675)(Eq/L)
= 11.8 Eq/L

3. When solving normal problems involving hydrates, use the gram equivalent weight of the substance being weighed in the preparation of the solution. The gram molecular weight includes the water (HOH) molecules, however, the total positive ionic valence (TPIV) does not include the water molecules.

EXAMPLE Determine how much $CuSO_4 \cdot 5HOH$ is required to prepare 500 mL of a 1.5 Eq/L $CuSO_4$ solution.

a. Calculate the GEW.

$CuSO_4 \cdot 5HOH$

Cu	63.5	X	1	=	63.5
S	32.1	X	1	=	32.1
O	16.0	X	4	=	64.0
HOH	18.0	X	5	=	+ 90.0
					249.6 g/mol

$$\frac{249.6\ g}{mol} \times \frac{mol}{2\ Eq} = 124.8\ g/Eq$$

NOTE: The TPIV in this example is 2 Eq/mol and is derived from the anhydrate molecule as the water molecule is not used for TPIV calculation when computing normality problems with hydrates.

b. Use the appropriate factors to determine the grams of hydrate needed.

$$\frac{1.50\ Eq}{L} \times \frac{124.8\ g}{Eq} \times 0.500\ L = 93.6\ g$$

FORMULA

g = (Eq/L)(GEW)(L)

= (1.5 Eq/L)(124.8 g/Eq)(.5 L)

= 93.6 g

4. When calculating normality problems which involve only a part of a molecule there are no additional steps which must be taken and the above formulas may be used.

Dilutions and Preparing a Working Solution from a Stock Solution

1. Dilutions are required in the laboratory when the concentration of an unknown is greater than the limits of linearity of a given quantitative methodology or when a working solution must be prepared from a stock solution or reagent.

2. Dilutions of unknowns (patient samples) are expressed as a ratio between the volume of the unknown and the total volume of the final solution.

a. **EXAMPLE** A specimen is diluted by combining 100 µl of serum with 400 µl of saline. Determine the dilution of the serum.

(1) Find the total volume.

100 µl (sample)
+400 µl (diluent)
500 µl (total volume)

(2) Express as a ratio. Sample : total volume.

100 µl:500 µl

(3) Simplify when possible.

1:5 dilution (Dividing both by 100.)

b. After the above dilution was made a glucose determination was performed. The concentration of this diluted specimen was determined to be 100 mg/dL by instrument read out. Determine the concentration of the undiluted (original) serum.

The dilution factor (5) is the reciprocal of the dilution (1:5) and is used to calculate the original concentration.

100 mg/dL X 5 = 500 mg/dL (original concentration)

3. Serial dilutions.

EXAMPLE A serum specimen was diluted 1:10, 3:5, 2:15, and again 1:2. Determine the final dilution of the specimen.

a. Multiply dilutions.

1/10 X 3/5 X 2/15 X 1/2 = 6/1500

b. Simplify.

6/1500 = 1:250 dilution

4. Stock solutions are diluted to prepare working solutions and a basic relationship is observed between the two based on the fact that the amount of solute remains constant in both solutions.

5. The volume of the given solution multiplied by the concentration of that solution equals the volume of the resulting solution multiplied by the concentration of the resulting solution.

FORMULA

$C_1V_1 = C_2V_2$

Where:

C_1 = Concentration of the stock solution
V_1 = Volume of the stock solution
C_2 = Concentration of the working solution
V_2 = Volume of the working solution

6. Several basic rules must be followed when solving $C_1V_1 = C_2V_2$ problems.

a. Three of the four values must be known.

b. The units of volume and concentration must be the same respectively.

c. The volume and concentration that relate to one another must be identified.

d. Any unit of volume or concentration may be used.

7. **EXAMPLE** Determine how much 30.0% alcohol is required to make 100 mL of a 3.0% alcohol solution.

a. Ensure that the concentration and volume units are the same respectively.

b. Substitute the given values into the formula.

$C_1V_1 = C_2V_2$

$(30.0\%)V_1 = (3.0\%)(100\ mL)$

c. Solve for the unknown quantity.

$$V_1 = \frac{(3.0\%)(100mL)}{10.0\%} = 10 \text{ mL}$$

d. 10 mL of 30.0% alcohol must be added to a 100 mL volumetric flask and q.s. to the mark with water in order to attain a concentration of 3.0%.

Preparing Solutions Using Concentrated Acids and Bases

1. Calculating concentrations using density (g/mL) or specific gravity (S.G.) and percent assay (%A) may sometimes be required. Most chemical companies express concentration in one of these ways.

a. **EXAMPLE** Determine how many milliliters of nitric acid (HNO_3) with a density of 1.42 g/mL and 70.0 %A are needed to prepare 500 mL of a 20.0 g/dL HNO_3 solution.

NOTE: Density may also be expressed by the manufacturer as specific gravity and would then have to be converted.

(1) Calculate the grams of solute needed.

$$\frac{20.0\ g}{dL} \times \frac{500\ mL}{1} \times \frac{dL}{100\ mL} = 100\ g\ HNO_3 \text{ needed}$$

(2) Calculate the grams of HNO_3 per milliliter of stock solution.

$$\frac{1.42\ g}{mL} \times \frac{70}{100} = 0.994\ g/mL$$

(3) Multiply both calculations to determine the milliliters of stock HNO_3 required for the concentration.

$$100\ g \times \frac{mL}{0.994\ g} = 100.6 \approx 101\ mL$$

b. The same problem may be solved by using the $C_1V_1 = C_2V_2$ formula.

(1) Convert given concentration to g/dL.

$$\frac{1.42\ g}{mL} \times \frac{70}{100} \times \frac{100\ mL}{dL} = 99.4\ g/dL$$

(2) Substitute the given values into the formula.

$$(99.4\ g/dL)(mL) = (20\ g/dL)(500\ mL)$$

$$mL = \frac{(20)(500)}{99.4} = 100.6 \approx 101\ mL$$

2. Titration of acids and bases is based on reactive strength (one equivalent weight of a substance will react exactly with one equivalent weight of another substance) and is useful in the laboratory in determining unknown concentrations. For example, an acid with a known concentration can be used to determine the concentration of a base by titrating the acid with the base.

a. The correct terminology and concentration used when dealing with titration involves equivalents and Eq/L. All concentrations must be converted to Eq/L before calculations can be made.

b. **EXAMPLE** Determine the Eq/L concentration of the acid if it takes 6.5 mL of a 0.10 Eq/L NaOH solution to titrate (neutralize) 5.0 mL of an HCl solution.

FORMULA

$C_1V_1 = C_2V_2$

Where:

C_1 = Concentration of the stock acid/base
V_1 = Volume of the stock acid/base
C_2 = Concentration of the unknown acid/base
V_2 = Volume of the unknown acid/base

Substitute the given values into the formula.

(0.10 Eq/L)(6.5 mL) = (Eq/L)(5.0 mL)

$\frac{(0.10)(6.5)}{(5.0)}$ = Eq/L = 0.13 Eq/L

Converting Concentration Units

1. In working and solving problems involving concentration units, it may be necessary to convert a given concentration to another. For example, a stock reagent is given in the concentration unit of mol/L and the procedure or formula requires Eq/L.

2. **Eq/L to moles/L**

   EXAMPLE Convert 5.0 Eq/L H_2SO_4 to molarity.

FORMULA
mol/L = Eq/L X 1/TPIV

   mol/L = 5.0 Eq/L X mol/2 Eq = 2.5 mol/L

NOTE: The TPIV equals 2 Eq/mole in this example.

3. **mol/L to Eq/L**

   EXAMPLE Convert 0.70 mol/L $AuCl_3$ to normality.

FORMULA
Eq/L = mol/L X TPIV/1

   Eq/L = 0.7 mol/L X 3 Eq/mol = 2.1 Eq/L

NOTE: The TPIV equals 3 Eq/mole in this example.

4. **g/dL to mole/L**

   EXAMPLE Convert 10 g/dL NaOH to molarity.

FORMULA
mol/L = g/dL X 10 dl/L X 1/GMW

   mol/L = 10g/dL X 10 dL/L X mol/40 g = 2.5 mol/L

NOTE: $\frac{1}{GMW} = \frac{1}{g/mol} = \frac{mol}{g}$

5. **g/dL to Eq/L**

EXAMPLE Convert 1.5 g/dL $Ba(OH)_2$ to normality.

FORMULA
Eq/L = g/dl X 10 dL/l X TPIV/1 X 1/GMW

Eq/L = 1.5 g/dL X 10 dl/L X 2 Eq/mol X mol/171.3 g

= 0.175 Eq/L

NOTE: The TPIV equals 2 Eq/mol in this example and the GMW equals 171.3 g/mol.

6. **Specific Gravity (S.G.) to density (g/mL)**

a. Specific gravity is comparing the density of a solid or liquid to pure water at 4^{o} C to obtain a pure number (without a unit of report).

FORMULA
S.G. = $\frac{\text{density of solid/liquid}}{\text{density of water at } 4^{\circ} \text{ C}}$ Water weighs 1 g/ml = $\frac{g}{mL} \div \frac{1\ g}{mL\ H_2O\ @\ 4^{\circ}\ C}$ = g/mL X mL/g = "Pure Number"

b. **EXAMPLE** Convert S.G. 1.17 to density (g/mL).

Given the relationship established in the formula, S.G. and density can be used interchangeably.

S.G. 1.17 = 1.17 g/mL

7. **Given density (g/mL) and %A, convert to g/dL.**

   EXAMPLE Convert a 1.17 g/mL solution with percent assay of 50.0% to a g/dL concentration.

FORMULA
g/dL = g/mL X 100 ml/dL X %A

   g/dL = 1.17 g/mL X 100 mL/dL X 50/100 = 58.5 g/dL

8. **Given density (g/mL) and %A, convert to molarity.**

   EXAMPLE Convert an H_2SO_4 solution with a density of 1.87 g/mL and 98.0 %A to molarity.

FORMULA
mol/L = g/mL X 1000 mL/L X %A X 1/GMW

   mol/L = 1.87 g/mL X 1000 mL/L X 98/100 X mol/98.1 g

   = 1.868 ˜ 1.87 mol/L

Media Inoculation by Specimen Type

SPECIMEN TYPE	GRAM STAIN	BROTH MEDIA[1,2]		PLATED MEDIA[1,2]				
		THIO	TSB	BAP	SCA	TM[3]	MAC	HEK[4]
BODY FLUIDS CSF, plural, peri-cardial, peritoneal, synovial	YES	+	=	+	+	=	+	=
WOUNDS/TISSUES superficial, burns ulcers, abscesses, tissue, wounds	YES	+	=	+	=	=	+	=
EYE	YES	+	=	+	+	=	+	=
URINE[5]	NO	NONE		+	=	=	+	=
BLOOD	NO	=	+	=	=	=	=	=
STOOL[6]	NO[7]	GN or SEL		+	=	=	+	+
RESPIRATORY TRACT:								
throat	NO	NONE		+	+[8]	=	=	=
nasopharynx	NO	NONE		+	=	=	=	=
sputum	YES	NONE		+	+[8]	=	+	=
sinus	YES	NONE		+	+	=	+	=
GENITAL/URETHRAL:								
urethra	YES	NONE		+	=	+	=	=
urethra for N. gonorrhoeae only	YES	NONE		=	=	+	=	=

[1] Abbreviations: **THIO** -- Thioglycollate 135 broth; **TSB** -- Blood culture bottle; **BAP** -- Blood agar plate; **TM** -- Thayer-Martin agar; **MAC** -- MacConkey agar; **SCA** -- Supplemented chocolate agar; **HEK** -- Hektoen Enteric Agar; **GN** -- Gram negative broth; **SEL** -- Selenite F broth

[2] **SCA, TM** and **BAP** plates should be incubated at 35° C in increased CO_2 (3-5%), unless otherwise noted. All other plates and tubes are incubated at 35° C without CO_2.

[3] **TM** is set up on any source where N. gonorrhoeae is suspected by request of the physician.

[4] **XLD** -- Xylose-Lysine=Desoxycholate agar may be used as an alternative.

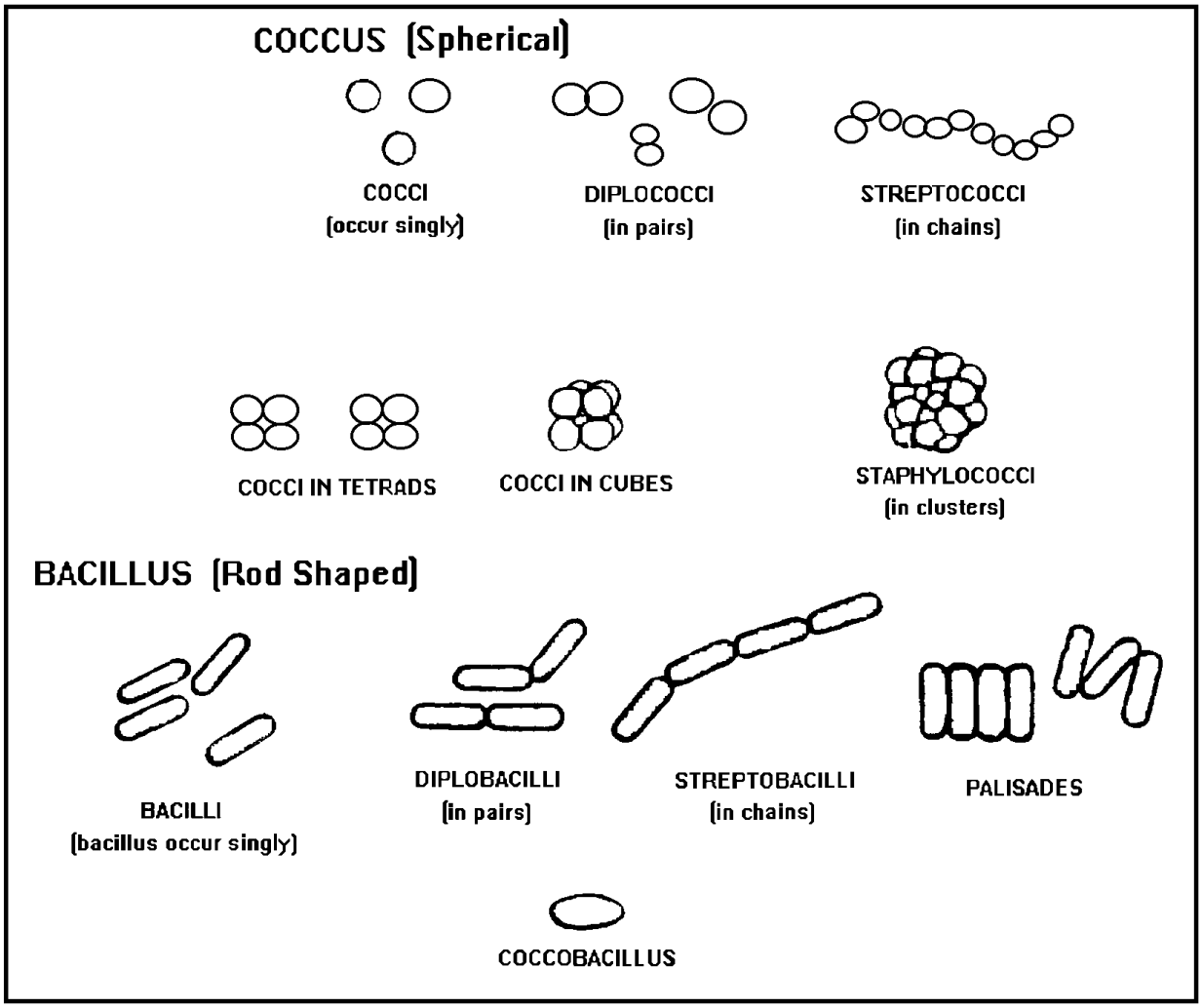
[5] A colony count should be performed on urine specimens.

[6] If Vibrio cholerae is suspected, also inoculate **TCBS** agar.

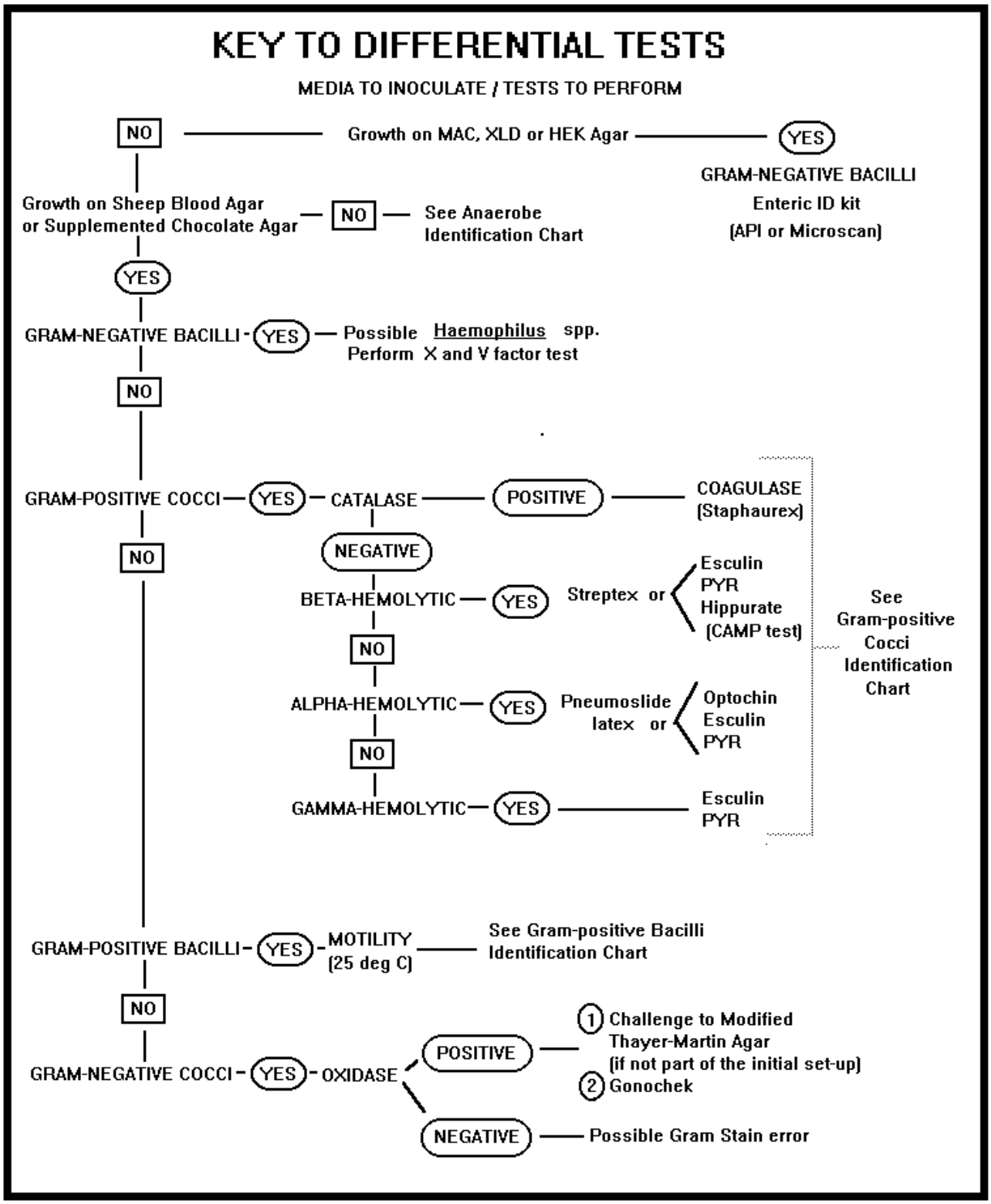
[7] A Gram stain may be helpful in detecting some infections caused by Staphylococus aureus or yeasts. Concentration techniques may be necessary to detect infections due to intestinal parasites.

[8] SCA is inoculated only for children ≤ 5 years of age.

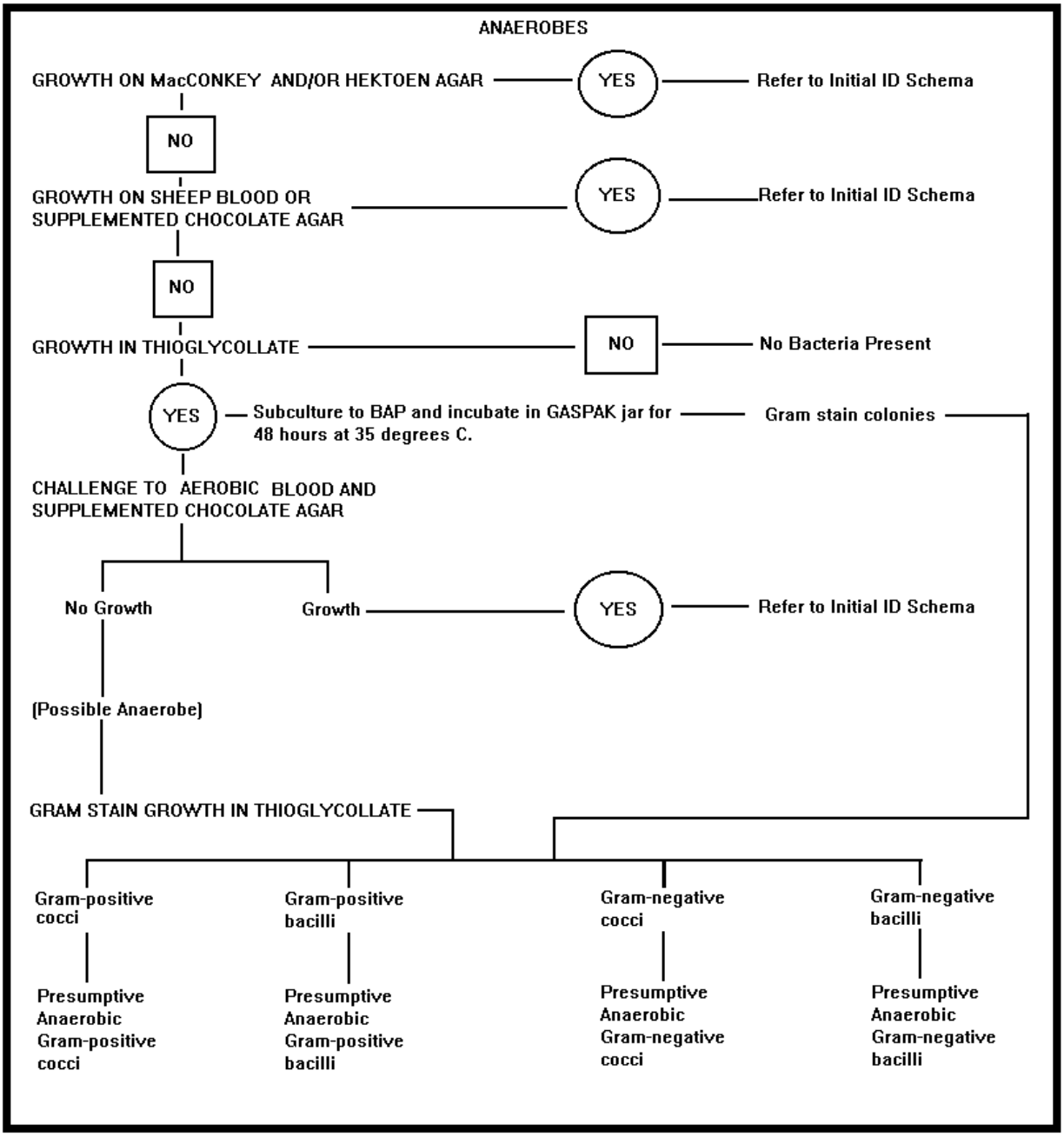
Identifying Bacteria Type and Predominant Arrangement



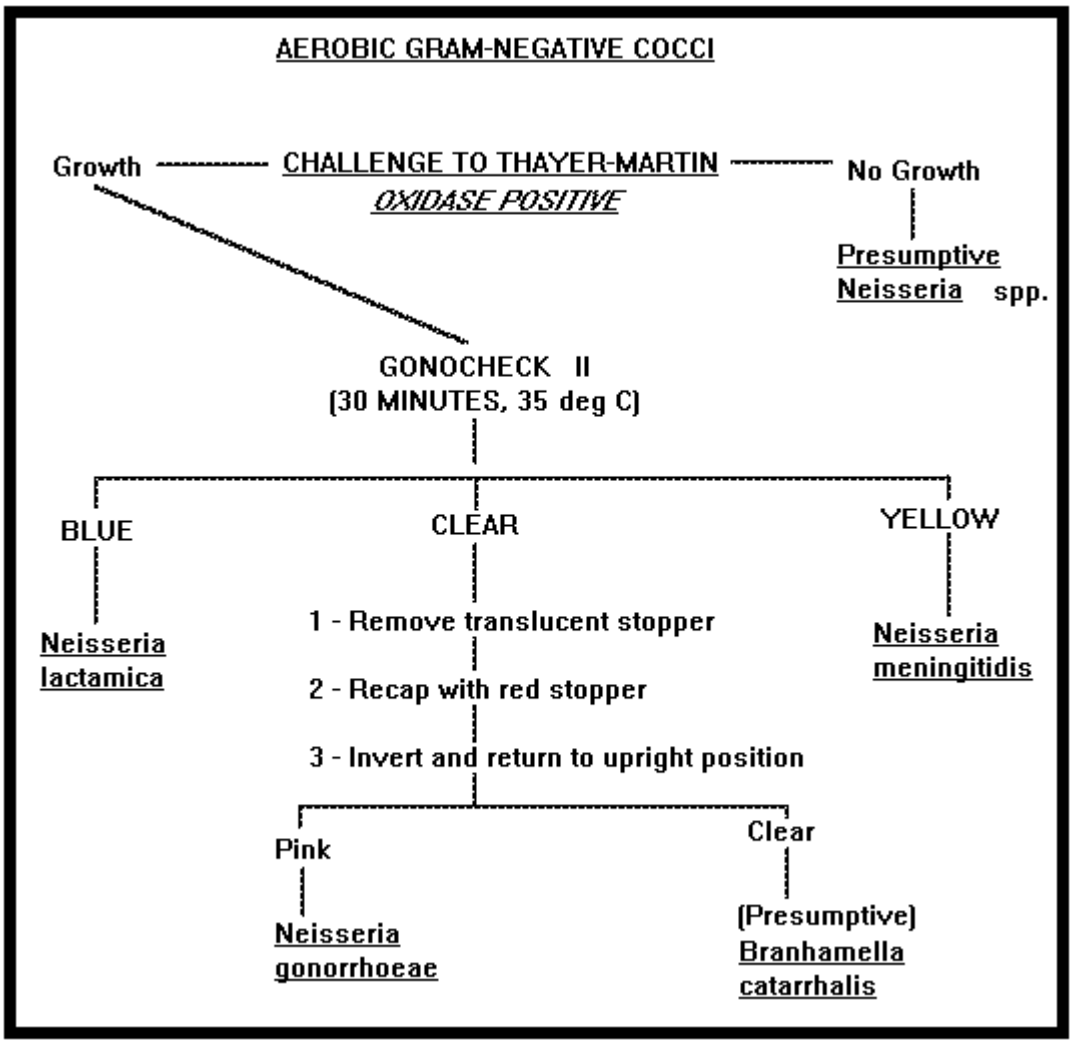
Differential Testing Schema for Bacteria Identification



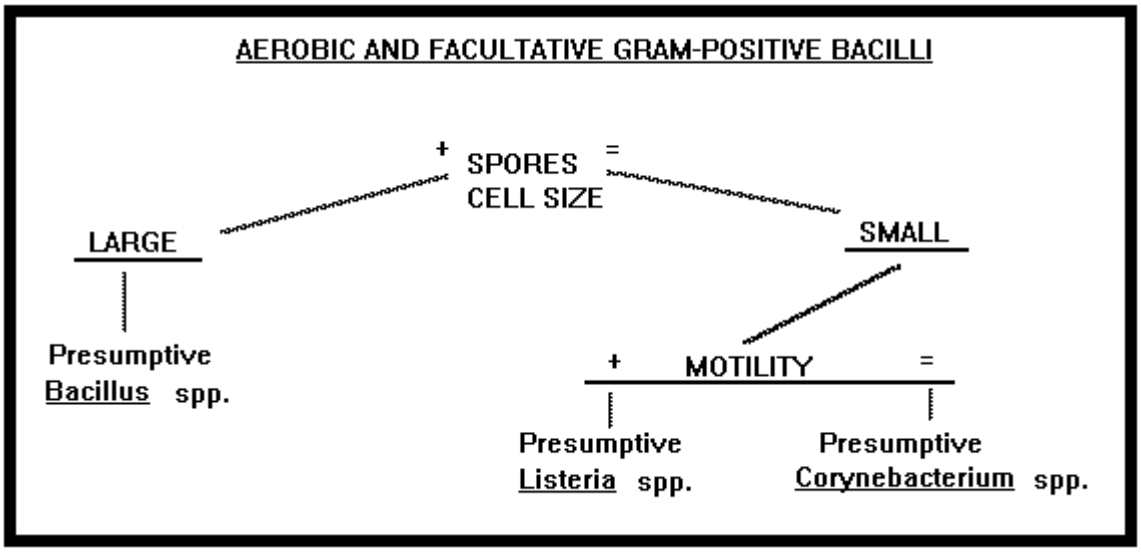
ANAEROBE IDENTIFICATION



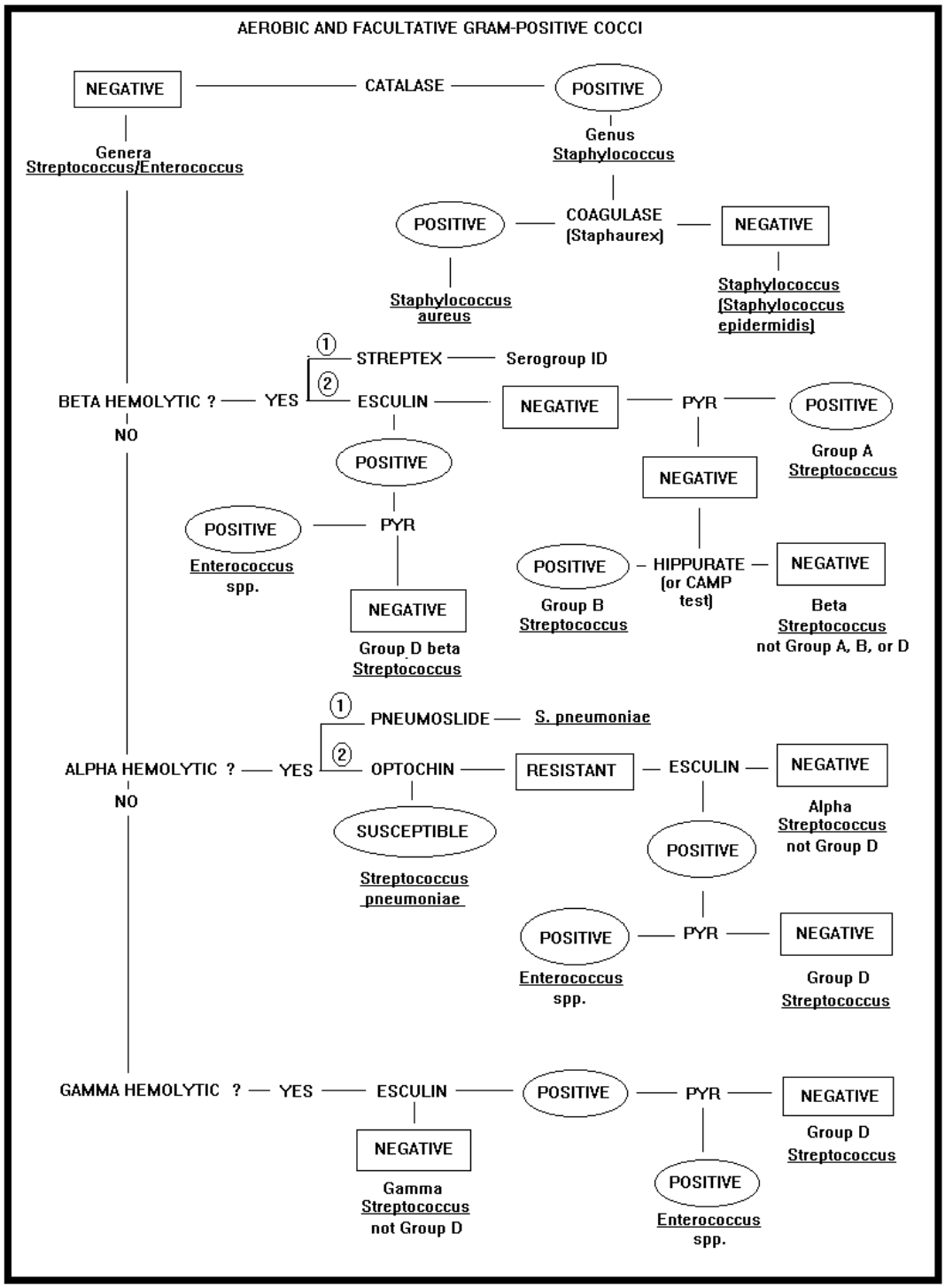
GRAM-NEGATIVE COCCI IDENTIFICATION



GRAM-POSITIVE BACILLI IDENTIFICATION



GRAM-POSITIVE COCCI IDENTIFICATION



GLOSSARY

AABB American Association of Blood Banks

ABO human blood grouping system

ACC automatic calibration control

ACCP Army Correspondence Course Program

ACD acid, citrate, dextrose anticoagulant

AFB acid-fast bacilli

AHG anti-human globulin (Coomb's)

AIT advanced individual training

ALT alanine aminotransferase testing

ANCOC advanced noncommissioned officer course

APTT activated partial thromboplastin time

Army Training and Evaluation Program (ARTEP) The Army's collective training program that establishes unit training objectives critical to unit survival and performance in combat. They combine the training and evaluation process into one integrated function. The ARTEP is a training program and not a test. The sole purpose of external evaluation under this program is to diagnose unit requirements for future training.

AST aspartate aminotransferase

ATCC American Type Culture Collection

BAP blood agar plate

battle focus A process to guide the planning, execution, and assessment of the organization's training program to ensure they train as they are going to fight.

BCT basic combat training

BM bi-monthly (every other month)

BNCOC basic noncommissioned officer course

BUN blood urea nitrogen

C centigrade/Celsius

Cal calibration

CBC complete blood count

CDC Centers for Disease Control

CK creatine kinase

cm centimeter

CO_2 carbon dioxide

collective training Training, either in institutions or units, that prepares cohesive teams and units to accomplish their combined arms and service missions on the battlefield.

common task A critical task that is performed by every soldier in a specific skill level regardless of MOS.

CP2D citrate, phosphate, dextrose (50 g/L) anticoagulant

CPD citrate, phosphate, dextrose (25 g/L) anticoagulant

CPDA-1 citrate, phosphate, dextrose, adenine anticoagulant

CPR cardiopulmonary resuscitation

critical task A collective or individual task determined to be essential to wartime mission, duty accomplishment, or survivability. Critical individual tasks are trained in the training base and/or unit, and they are reinforced in the unit.

cross training The systematic training of a soldier on tasks related to another duty position within the same military occupational specialty or tasks related to a secondary military occupational speciality at the same skill level.

CSF cerebrospinal fluid

CTRL control

cu mm cubic millimeter

drill A disciplined, repetitious exercise to teach and perfect a skill or procedure; for example, fire, man overboard, abandon ship, lifeboat, and damage control drills on Army watercraft.

DT desk-top

DTE desk-top electrolytes

DTSC desk-top special chemistry

EDTA ethylenediaminetetraacetic acid

F Fahrenheit

FDA Food and Drug Administration

FDP fibrinogen degradation products

FFP fresh frozen plasma

FMC field medical card

FTA fluorescent treponemal antibody

g/dl grams per deciliter

g grams

HBc hepatitis B core antigen

HBsAg hepatitis B surface antigen

HCG human chorionic gonadotropin hormone

HCl hydrochloric acid

Hct hematocrit

HCV hepatitis C virus

HEK hektoen agar

Hg mercury

Hgb hemoglobin

HIV human immunodeficiency virus

HPF high power field

hr hour

HTLV human T-cell lymphotropic virus

IAT indirect antiglobulin test

IAW in accordance with

ID identification

Ig immunoglobulin (five classes are IgA, IgD, IgE, IgG, and IgM)

individual training Training which prepares the soldier to perform specified duties or tasks related to the assigned duty position or subsequent duty positions and skill levels.

integration training The completion of initial entry training in skill level 1 tasks for an individual newly arrived in a unit, but limited specifically to tasks associated with the mission, organization, and equipment of the unit to which the individual is assigned. It may be conducted by the unit using training materials supplied by the school, by troop schools, or by inservice or contract mobile training teams. In all cases, this training is supported by the school proponent.

ISE ion specific electrode

K potassium

KOH potassium hydroxide

LED light emitting diode

LPF low power field

M molar concentration

MAC MacConkey agar

mEq/L milliequivalents per liter

merger training Training that prepares noncommissioned officers to supervise one or more different military occupational specialities at lower skill levels when they advance to a higher skill level in their career management field.

METL mission essential task list

mg/dl milligrams per deciliter

MIF methiolate-iodine-formaldehyde

mission essential task list A compilation of collective mission essential tasks which must be successfully performed if an organization is to accomplish its wartime mission(s).

ml milliliter

mm Hg millimeters of mercury

mm millimeter

mmol/L millimoles per liter

MOPP mission oriented protective posture

MOS military occupational specialty

MOSC military occupational specialty code

MRE meal, ready-to-eat

MTF medical treatment facility

MTP MOS training plan

Na sodium

$NaHCO_3$ sodium bicarbonate

NaOH sodium hydroxide

NBC nuclear, biological, chemical

NCO noncommissioned officer

NRBC nucleated red blood cell

NSN national stock number

OSUT one station unit training

PCS permanent change of station

pH the negative logarithm of the hydrogen ion activity which expresses the alkalinity or acidity of a solution

PLDC primary leadership development course

PLT platelet

PMN polymorphonuclear

ppm parts per million

PT prothrombin time

Pyridium phenazopyridine hydrochloride, urinary tract analgesic

q.s. quantity sufficient

QBC quantitative buffycoat analysis

QC quality control

QT quarterly

RBC red blood cell

RCF relative centrifugal force

Rh human blood typing system

rpm revolutions per minute

RPR rapid plasma reagin test

SCA supplemented chocolate agar

self-development Self-development is a planned, progressive, and sequential program followed by leaders to enhance and sustain their military competencies. Self-development consists of individual study, research, professional reading, practice, and self-assessment.

SF Standard Form

SL skill level

SM soldier's manual

SMC sergeant major course

SMCT Soldier's Manual of Common Tasks

SOP standard operating procedure

sq mm square millimeter

SSA sulfosalicylic acid

SSN social security number

STP soldier training publications

STS serologic test for syphilis

sustainment training The provision of training to maintain the minimum acceptable level of proficiency required to accomplish a critical task.

TG trainer's guide

THIO thioglycollate broth

TM Thayer Martin agar

train-up The process of increasing the skills and knowledge of an individual to a higher skill level in the appropriate MOS. It may involve certification.

µL microliter

unit training Training (individual, collective and joint or combined) conducted in a unit.

Ven venous mode

VPRC volume packed red cells

WBC white blood cell

REFERENCES

New reference material is being published all the time. Present references, as listed below, may become obsolete. To keep up-to-date, see the DA Pam 25-30 (FICHE) publications and Extension Training Materials (ETM) catalog, DA Pam 350-100. If referenced documents are not available through your unit, borrow them from your post learning center or library.

Required Publications

Miscellaneous Publications

Operator's Manual for Ciba-Corning 614 Electrolyte Analyzer
Operator's Manual for Kodak DT60 Analyzer
Operator's Manual for QBC II Analyzer
Operator's Manual for MLA Electra 750
Operator's Manual for GEMStat Blood Gas Analyzer
Operator's Manual for Compur M1100
Manufacturer's Instructions for Occult Blood Kit
Manufacturer's Instructions for Qualitative HCG Test
Manufacturer's Instructions for Con-Trate Fecal Concentration
Product Insert for Thrombo-Wellcotest FDP Kit

Department of Defense Forms (DD Form)

572	Blood Donor Record
573	Shipping Inventory of Blood Products

Standard Forms (SF)

518	Medical Record--Blood or Blood Component Transfusion

Technical Manuals (TM)

8-227-3	The Technical Manual of the American Association of Blood Banks

Related Publications

Army Training and Evaluation Programs (ARTEP)

8-026-30-MTP	Mission Training Plan for Headquarters and Co A/Support Company, Medical Battalion, Light Infantry, Airborne, and Air Assault Divisions
8-027-30-MTP	Mission Training Plan for Forward Support Medical Company, Medical Battalion, Light Infantry, Airborne, and Air Assault Divisions

8-057-30-MTP	Mission Training Plan for the Medical Company, Main Support Battalion, Heavy Division
8-058-30-MTP	Mission Training Plan for the Medical Company, Forward Battalion, Heavy Division
8-457-30-MTP	Mission Training Plan for the Area Support Medical Company
8-487-30-MTP	Mission Training Plan for the Logistics Support Company/Detachment and Distribution Company, Medical Battalion (Forward and Rear)
8-705-MTP	Mission Training Plan for the Combat Support Hospital
8-715-MTP	Mission Training Plan for the Field Hospital
8-725-MTP	Mission Training Plan for the General Hospital

Department of the Army Pamphlets (DA Pam)

351-20	Correspondence Course Program Catalog

Field Manuals (FM)

8-230	Medical Specialist
25-100	Training the Force
25-101	Battle Focused Training

Technical Manuals (TM)

8-227-3	The Technical Manual of the American Association of Blood Banks

Soldier Training Publications (STP)

21-1-SMCT	Soldier's Manual of Common Tasks (Skill Level 1)
21-24-SMCT	Soldier's Manual of Common Tasks (Skill Levels 2-4)

Miscellaneous Publications

Product Insert for Rapid Plasma Reagin Test
Product Insert for Camco Quick Stain
Product Insert for N-Multistix Reagent Strips
Product Insert for Serologic Test for Infectious Mononucleosis
Product Insert for Unopettes

Department of the Army Forms (DA Form)

2028	Recommended Changes to Publications and Blank Forms

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By Order of the Secretary of the Army:

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