Viscosity of Binary and Ternary Aqueous Systems of NaH₂PO₄, Na₂HPO₄, Na₃PO₄, KH₂PO₄, K₂HPO₄, and K₃PO₄

Francisco Chenlo,* Ramón Moreira, Gerardo Pereira, and María J. Vázquez

Department of Chemical Engineering, University of Santiago de Compostela, 15706 Santiago, Spain

The kinematic viscosities of aqueous solutions of NaH_2PO_4 , Na_2HPO_4 , Na_3PO_4 , KH_2PO_4 , K_2HPO_4 , and K_3PO_4 , and of their pH-buffering ternary systems, were measured at various concentrations and at temperatures between 293.1 K and 323.1 K. Those of the single-solute solutions were correlated with concentration and temperature, and those of the ternary system with temperature, with deviations less than 1.2% and 0.5%, respectively.

Introduction

Studies of gas—liquid mass transfer are frequently facilitated by using aqueous buffers so as to be able to work at constant pH and hence simplify mathematical modeling of the results. Since knowledge of the viscosity of the liquid phase is also generally essential for modeling the experimental results, it is necessary to know the viscosities of the buffer solutions.

When the absorbed gas reacts with some component of the liquid phase, it is common to use sodium or potassium carbonate + bicarbonate buffers (Benadda et al., 1994; Alper, 1981) or sodium or potassium phosphate buffers (Joosten and Danckwerts, 1973; Alper and Deckwer, 1980). The latter are also of biotechnological relevance, being used in determining the kinetics of microbial wastewater treatments (Hunik et al., 1993) and in microbial fermentation of paper industry waste (Kitpreechavanich et al., 1984; Lindén and Hanhn-Hägerdal, 1989). In previous papers

'zquez et al., 1994a, 1994b) we reported viscosity data for sodium carbonate + bicarbonate buffers with and without a variety of sugars. Since previously published viscosity data for phosphate solutions are only sporadic, failing to provide systematic coverage of a wide range of concentrations and temperatures, we now report the kinematic viscosities of solutions of sodium and potassium phosphates.

Specifically, we studied aqueous solutions of NaH₂PO₄, HPO₄, Na₃PO₄, KH₂PO₄, K₂HPO₄, and K₃PO₄, and of

all the pH-buffering binary combinations of these salts. The concentrations of the single-solute solutions varied from 0

dm⁻³ to about 1.2 mol·dm⁻³ (or to the limit of solubility) by steps of either approximately 0.1 mol·dm⁻³ or approximately 0.2 mol·dm⁻³ (depending on solubility). The binary solutions were nominal (0.2 + 0.2) mol·dm⁻³ and (0.4 + 0.4) mol·dm⁻³ equimolar mixtures at 298.1 K (these concentrations cover the range mentioned in the literature cited above; higher concentrations are prevented by solubility limits, and lower concentrations have viscosities very close to that of water; and in any case, the pH of these buffers varies little with their concentration so long as equimolarity is maintained). All these solutions were studied at temperatures ranging in 5 K steps from 293.1 K to 323.1 K. The accuracy of the viscosity measurements was greater than that usually required in mass transfer studies.

Experimental Section

Solutions were prepared using degassed distilled water and Merck salts with nominal purities >98% (>99.7% for NaH₂PO₄, Na₂HPO₄, KH₂PO₄, and K₂HPO₄); salts were dried to constant mass (Budavari, 1989) in an A&D Instruments AD 4712 IR balance. The solutions were prepared by mass using a Mettler AJ 150 balance with a precision of ± 0.0001 g and were filtered before use (maximum deviations from nominal values were less than 0.1%).

Kinematic viscosities were determined in a Schott-Geräte AVS 350 automatic Ubbelohde viscosimeter, using the experimental protocol described elsewhere (Vázquez et al., 1994a, 1994b). All measurements were quintuplicated, and values deviating by more than 0.2% from the mean were discarded. Densities were measured at 298.1 K in a Bosch S2000/30 densitometric balance with an accuracy of ± 0.0001 g·cm⁻³ (maximum deviations from nominal values were less than 0.02%), and pH was measured at the same temperature with a Schott-Geräte CG841 pH-meter with a precision of ± 0.001 units (maximum deviations from nominal values were less than 0.2%). The precision of the temperature control in all measurements was ± 0.1 K).

Results

Table 1 lists the measured kinematic viscosities of aqueous solutions of NaH_2PO_4 , Na_2HPO_4 , Na_3PO_4 , KH_2 -PO₄, K_2HPO_4 , and K_3PO_4 at various concentrations (expressed as mass fractions *w*) and temperatures. Densities measured at 298.1 K are included in Table 2.

Table 3 lists the measured kinematic viscosities of the ternary systems $Na_3PO_4 + Na_2HPO_4$, $Na_3PO_4 + NaH_2PO_4$, $Na_3PO_4 + K_2HPO_4$, $Na_3PO_4 + K_2PO_4$, $Na_2HPO_4 + NaH_2PO_4$, $Na_2HPO_4 + K_3PO_4$, $Na_2HPO_4 + K_3PO_4$, $NaH_2PO_4 + K_3PO_4$, $NaH_2PO_4 + K_3PO_4$, $NaH_2PO_4 + K_2HPO_4$, $K_3PO_4 + K_2HPO_4$, $K_3PO_4 + KH_2PO_4$, and $K_2HPO_4 + KH_2PO_4$ in water, at two different concentrations and various temperatures. pH at 298.1 K are also included. Densities measured at 298.1 K are included in Table 2.

The viscosity data for each single-solute solution were correlated with their mass concentration and temperature by means of the equation

ν

$$= \nu_0 + A \mathrm{e}^{\mathrm{B}/T^{\mathrm{m}}} w^n \tag{1}$$

Table 1. Kinematic Viscosities v (10⁻⁶ m²·s⁻¹) of Binary Systems of Various Mass Fractions w of Salts at **Temperatures** T

Tabla 9	Dansitias of Binary and Tarnary Systems a	4
I able 2.	Densities of Dinary and Ternary Systems of	L
Various	Mass Fractions w at 298.1 K	

			ı	VA		
<i>T</i> /K	0 024 27	0 046 38	0 069 02	0 089 76	0 107 20	0 131 01
	0.024 21	0.040 00	0.000 02	0.000 70	0.107 20	0.101 01
		NaH_2	$PO_4(A) +$	$-H_2O(B)$		
202.1	1 0628	1 1220	1 2056	1 9927	1 2796	1 4794
293.1	1.0028	1.1330	1.2000	1.4007	1.3720	1.4734
298.1	0.9533	1.0095	1.0740	1.1432	1.2113	1.2985
303.1	0.8584	0.9040	0.9626	1.0178	1.0852	1.1591
308.1	0.7739	0.8215	0.8695	0.9255	0.9785	1.0442
313.1	0.7011	0.7459	0.7895	0.8314	0.8842	0.9418
318.1	0.6430	0.6819	0.7253	0.7607	0.8056	0.8584
323.1	0.5849	0.6286	0.6644	0.6962	0.7425	0.7851
020.1	0.0010	0.0200	0.0011	0.0002	0.7 120	0.7001
				WA		
				17A		
T/\mathbf{K}	0.014 4	5 0.028	3 04 0.0	42 50 (0.055 23	0.067 73
		NaoH	$PO_{4}(\Lambda) +$	- H ₀ O (B)		
		I Vazi I	1 04 (A)	1120 (D)		
293.1	1.0495	5 1.10	09 1.	1612	1.2160	1.2758
298.1	0.9409) 0.98	02 1.	0335	1.0874	1.1482
303.1	0.8410	0.88	16 0.	9315	0.9800	1.0331
308.1	0.7640	0.79	89 0.	8388	0.8807	0.9330
313 1	0.6930) () 79	36 0	7574	0.7960	0.8437
319.1	0.0000) 0.72	14 0	6904	0 7236	0 7670
299.1	0.0000	, 0.00 / 0.00	17 U. 66 A	6333	0.7200	0.7073
323.1	0.3837	0.60	υυ U.	0000	0.0000	0.7043
				11/.		
				WA		
/K	0.016 4	4 0.031	95 0.0	47 58	0.062 04	0.075 84
		Na ₃ ł	$O_4(A) +$	$H_2O(B)$		
293.1	1.0849) 1.16	95 1.	2686	1.3771	1.5054
298 1	0 9652	2 1.03	72 1	1274	1 2220	1 3341
303 1	0.8671	0.92	82 1	0001	1 0947	1 1860
200.1	0.0071	0.32	52 I.	0001	0.0775	1.1000
308.1	0.7840	0.83	53 0.	9019	0.9775	1.0651
313.1	0.7114	0.76	81 0.	8224	0.8867	0.9654
318.1	0.6514	l 0.69	30 0 .	7463	0.8082	0.8783
323.1	0.5980	0.63	48 0.	6832	0.7382	0.7996
-						
			ı	VA		
/12	0.090.95	0.059.20	0.077.40	0 101 50	0 194 00	0 1 4 7 1 1
/K	0.020 85	0.052 59	0.077 40	0.101 50	0.124 09	0.147 11
		KH_2	$PO_4(A) +$	$H_2O(B)$		
909.1	1 0452	1 00 4 9	1 1 9 0 9	1 1 7 9 0	1 9975	1 9976
293.1	1.0455	1.0643	1.1292	1.1730	1.2273	1.2070
298.1	0.9329	0.9675	1.0054	1.0509	1.0952	1.1501
303.1	0.8347	0.8689	0.9019	0.9429	0.9882	1.0325
308.1	0.7560	0.7865	0.8190	0.8513	0.8911	0.9329
313.1	0.6866	0.7164	0.7439	0.7769	0.8129	0.8459
318.1	0.6303	0.6563	0.6790	0.7101	0.7442	0.7746
323.1	0.5749	0.5968	0.6259	0.6524	0.6859	0.7140
02011	010110	0.0000	0.0200	0.0021	010000	011110
			τ	WΔ		
			,	· A		
_/K	0.033 91	0.066 31	0.097 46	0.126 21	0.153 89	0.181 00
		K°HI	$PO_4(A) +$	H ₂ O (R)		
o.c		152111		1120 (D)		
293.1	1.0604	1.1151	1.1821	1.2551	1.3361	1.4357
298.1	0.9464	0.9974	1.0599	1.1243	1.1954	1.2818
303.1	0.8510	0.9002	0.9502	1.0100	1.0828	1.1529
308.1	0.7699	0.8130	0.8621	0.9153	0.9787	1.0492
313.1	0 6993	0 7411	0 7886	0 8326	0 8932	0 9532
319.1	0.0000	0.7411	0.7000	0.0020	0.0002	0.0002
292 1	0.0410	0.0000	0.1211	0.7034	0.0133	0.0120
323.1	0.5671	0.0237	0.0042	0.7047	0.7348	0.0007
			-	I /.		
			I	νA		
<i>T</i> /K	0.041 38	0.079 74	0.115 80	0.148 29	0.179 10	0.209 41
		17 5			-	
		K ₃ P	O_4 (A) + 1	H ₂ O (B)		
293.1	1.0754	1.1728	1.2863	1.4117	1.5617	1.7403
298.1	0.9585	1.0491	1.1401	1.2580	1.3855	1.5542
303.1	0.8608	0 9443	1 0301	1 1 2 1 5	1 2554	1 3080
303.1	0.0000	0.0440	0.0301	1 0969	1 1 2 9 6	1 9640
JUO.1	0.7790	0.004/	0.9339	1.0202	1.1320	1.2040
313.1	0.7094	0.7780	0.8483	0.9354	1.0303	1.1499
318.1	0.6483	0.7123	0.7722	0.8574	0.9457	1.0521
323.1	0.5966	0.6558	0.7165	0.7904	0.8701	0.9649

WA	$ ho/{ m kg}{ m \cdot}{ m m}^{-3}$	WA	$ ho/{ m kg}{ m \cdot}{ m m}^{-3}$
NaH ₂ P	$O_4(A) + H_2O(B)$	Na ₂ HPO	$_{4}$ (A) + H ₂ O (B)
0.024 27	1017.1	0.014 45	1012.0
0.046 38	1033.7	0.028 04	1025.3
0.069 02	1050.8	0.042 50	1039.9
0.089 76	1067.1	0.055 23	1053.0
0.107 20	1080.7	0.067 73	1064.9
0.131 01	1096.5		
	(A) + H O (D)	VII DO	(Λ) + U (Ω)
	$J_4(A) + H_2 U(B)$	KH2PU4	$(A) + H_2 U (B)$
0.016 44	1018.8	0.026 85	1018.8
0.031 95	1038.1	0.052 39	1037.9
0.047 58	1056.1	0.077 46	1056.2
0.062 04	1072.3	0.101 50	1074.1
0.075 84	1088.5	0.124 69	1090.9
		0.147 11	1109.2
K ₂ HP0	$O_4(A) + H_2O(B)$	K ₃ PO ₄	$(A) + H_2O(B)$
0.033 91	1029.8	0.041 38	1044.9
0.066 31	1056.6	0.079 74	1083.7
0.097 46	1084.9	0.115 80	1123.0
0.126 21	1111.7	0.148 29	1158.5
0.153 89	1137.6	0.179 10	1195.6
0.181 00	1163.5	0.209 41	1231.3
WA	$w_{\rm B}$ $ ho/{\rm kg}\cdot{\rm m}^{-3}$	WA	$w_{\rm B}$ $ ho/{\rm kg}\cdot{\rm m}^{-3}$
	$Na_{2}PO_{4}(A) + Na_{2}H$	$PO_4(B) + H_2$	0 (C)
0.029 33	0.025 39 1061.3	0.058 66 0	.050 78 1118.2
	Na_3PO_4 (A) + NaH_2	PO_4 (B) + H ₂	20 (C)
0.029 88	0.021 87 1052.3	0.059 76 0	.043 74 1097.6
	$Na_3PO_4 (A) + K_2HI$	PO_4 (B) + H_2	0 (C)
0.029 21	0.031 03 1064.7	0.058 41 0	.062 06 1122.8
	Na_3PO_4 (A) + KH_2I	PO_4 (B) + H_2	0 (C)
0.029 69	0.024 64 1052.0	0.059 37 0	.049 28 1104.6
	$Na_{2}HPO_{4}(A) + NaH$	$_{2}PO_{4}(B) + H$	[2O (C)
0.026 28	0.022 21 1041.7	0.052 56 0	.044 43 1080.4
	$Na_{2}HPO_{4}(A) + K_{3}$	PO₄ (B) + H₀	O (C)
0.025 23	0.047 33 1065.5	0.050 46 0	.094 67 1125.4
	N_{2} , $UDO_{1}(\Lambda) \perp KU_{1}$	$\mathbf{DO}_{\mathbf{r}}(\mathbf{P}) \perp \mathbf{U}$	$-\Omega(\mathbf{C})$
0 026 21	0.025 12 1043 7	0.052.42 0	050 25 1083 4
0.020 21			
0 091 60	$NaH_2PO_4 (A) + K_3I$	$PO_4 (B) + H_2 = 0$	U (C)
0.021 09	0.036 36 1033.1	0.043 5 0	.070 70 1100.0
	$NaH_2PO_4 (A) + K_2H$	IPO_4 (B) + H ₂	₂ O (C)
0.022 10	0.032 08 1045.2	0.044 19 0	.064 16 1086.2
	K_3PO_4 (A) + K_2HP	PO_4 (B) + H ₂ C) (C)
0.037 62	0.030 86 1067.3	0.075 23 0	.061 72 1129.0
	$K_{2}PO_{4}(A) + KH_{2}P$	PO_4 (B) + H _a () (C)
0 038 30	0 024 55 1057 0	0 076 60 0	049 10 1108 8
0.000.00	$K_2HPO_4 (A) + KH_2$	PO_4 (B) + H_2	U (C)
0.032 02	0.025 02 1046.0	0.064 05 0	.050 04 1087.9

where the temperature dependence of v_0 , the kinematic viscosity of water, is given (Vázquez et al., 1994a) by

$$\nu_0/\mathrm{m}^2 \cdot \mathrm{s}^{-1} = 9.7734 \times 10^{-8} \mathrm{e}^{5.8662 \times 10^{7/(77\mathrm{K})^3}}$$
 (2)

The parameters *A*, *B*, and *n* in eq 1 were optimized using the Nelder-Mead algorithm and are listed in Table 4. The deviations between the experimental data and the predictions of eq 1 are all less than 1.2%.

The viscosity data for the ternary systems were correlated with temperature by means of the equation (Vázquez et al., 1994a)

$$\nu = C \mathrm{e}^{D/T^{\mathrm{m}}} \tag{3}$$

Table 3. Kinematic Viscosities ν (10⁻⁶ m²·s⁻¹) and *pH* (at 298.1 K) of the Ternary Systems at Various Temperatures

	$\mathrm{Na_{3}PO_{4}}\left(\mathrm{A} ight)+\mathrm{Na_{2}HPO_{4}}\left(\mathrm{B} ight)+\mathrm{H_{2}O}\left(\mathrm{C} ight)$		Na_3PO_4 (A) + NaH_2PO_4 (B) + H_2O (C)	
<i>T</i> /K	$\frac{1}{W_{\rm A} = 0.029 \ 33} \\ W_{\rm B} = 0.025 \ 39$	$w_{\rm A} = 0.058\ 66$ $w_{\rm B} = 0.050\ 78$	$\frac{1}{W_{\rm A} = 0.029 \ 88}_{W_{\rm B} = 0.021 \ 87}$	$w_{\rm A} = 0.059\ 76$ $w_{\rm B} = 0.043\ 74$
293.1	1.2825	1.7557	1.2061	1.5387
298.1	1.1339	1.5487	1.0724	1.3534
303.1	1.0144	1.3767	0.9636	1.2027
308.1	0.9144	1.2312	0.8699	1.0807
313.1	0.8299	1.1074	0.7904	0.9792
318.1 323.1	0.7558 0.6940	0.9163	0.7217 0.6624	0.8922 0.8230
pН	11.28	11.13	10.23	10.05
	Na ₃ PO K ₂ HPO ₄ (B)	$_{4}(A) + H_{2}O(C)$	Na ₃ PO KH ₂ PO ₄ (B)	$_{4}(A) + H_{2}O(C)$
<i>T</i> /K	$w_{\rm A} = 0.029\ 21$ $w_{\rm B} = 0.031\ 03$	$w_{\rm A} = 0.058 \ 41$ $w_{\rm B} = 0.062 \ 06$	$w_{\rm A} = 0.029\ 69 \\ w_{\rm B} = 0.024\ 64$	$w_{\rm A} = 0.059 \ 37$ $w_{\rm B} = 0.049 \ 28$
293.1	1.2289	1.5839	1.2042	1.4765
298.1	1.0872	1.3960	1.0705	1.3063
303.1	0.9735	1.2049	0.9630	1.1003
313.1	0.8022	1.0253	0.7925	0.9569
318.1	0.7350	0.9306	0.7243	0.8747
323.1	0.6739	0.8512	0.6675	0.8119
	11.39	11.30	10.25	10.12
	Na ₂ HPO NaH ₂ PO ₄ (E	$D_4 (A) + B_2 + H_2 O (C)$	Na ₂ HPO K ₃ PO ₄ (B)	$D_4 (A) + H_2O (C)$
	$w_{\rm A} = 0.026\ 28$ $w_{\rm B} = 0.022\ 21$	$w_{\rm A} = 0.052\ 56$ $w_{\rm B} = 0.044\ 43$	$w_{\rm A} = 0.025\ 23$ $w_{\rm B} = 0.047\ 33$	$w_{\rm A} = 0.050 \ 46 \\ w_{\rm B} = 0.094 \ 67$
293.1	1.1761	1.3976	1.1964	1.4673
298.1	1.0486	1.2435	1.0627	1.3015
303.1	0.9428	0 9987	0.9534	1.1030
313.1	0.7755	0.9047	0.7864	0.9551
318.1	0.7093	0.8271	0.7196	0.8678
323.1	0.6474	0.7551	0.6606	0.7993
	0 - 0	0 07	11 / 1	11 00
	6.52	6.37	11.41	11.32
	6.52 Na ₂ HPO KH ₂ PO ₄ (B)	$\begin{array}{c} 6.37 \\ \hline D_4 (A) + \\ 0 + H_2 O (C) \end{array}$	11.41 NaH ₂ PO K ₃ PO ₄ (B)	$ \begin{array}{r} 11.32 \\ D_4 (A) + \\ + H_2O (C) \end{array} $
	$6.52 \\ Na_2HPO \\ KH_2PO_4 (B) \\ W_A = 0.026 21 \\ W_B = 0.025 12 \\ 0 \\ W_B = 0.025 12 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ 0 \\ $	6.37 $D_4 (A) +$ $) + H_2O (C)$ $w_A = 0.052 \ 42$ $w_B = 0.050 \ 25$	$\frac{11.41}{\begin{array}{c} NaH_2PO} \\ K_3PO_4 (B) \\ \hline \\ w_A = 0.021 69 \\ w_B = 0.038 38 \end{array}}$	$ \begin{array}{r} 11.32 \\ \hline D_4 (A) + \\ + H_2 O (C) \\ \hline w_A = 0.043 39 \\ w_B = 0.076 76 \\ \hline \hline \end{array} $
293.1		$ \begin{array}{r} 6.37 \\ 0_4 (A) + \\ 0 + H_2 O (C) \\ \overline{W_A = 0.052 \ 42} \\ \overline{W_B = 0.050 \ 25} \\ 1.3245 \\ 1.1709 \end{array} $	$ \begin{array}{r} $	$ \begin{array}{r} 11.32 \\ D_4 (A) + \\ + H_2O (C) \\ \overline{W_A = 0.043 39} \\ \overline{W_B = 0.076 76} \\ 1.3101 \\ 11714 11714 $
293.1 298.1 303 1			$\frac{11.41}{\begin{array}{c} NaH_2PO} \\ K_3PO_4 (B) \\ \hline \\ \hline \\ \hline \\ \hline \\ \\ \hline \\ \\ \\ \hline \\ \\ \\ \\ $	
293.1 298.1 303.1 308.1	$\begin{array}{r} 6.52\\ \hline \\ Na_2HPO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\end{array}$	$\begin{array}{r} 6.37\\\hline D_4 (A) +\\ 0 + H_2 O (C)\\\hline w_A = 0.052 \ 42\\ w_B = 0.050 \ 25\\\hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\\hline \end{array}$	$\frac{11.41}{\begin{array}{c} NaH_2PO} \\ K_3PO_4 (B) \\ \hline \\ \hline \\ \hline \\ w_A = 0.021 \ 69 \\ w_B = 0.038 \ 38 \\ \hline \\ 1.1416 \\ 1.0214 \\ 0.9235 \\ 0.8369 \\ \end{array}}$	$\begin{array}{r} 11.32\\\hline\\D_4 (A) +\\ + H_2 O (C)\\\hline\\w_A = 0.043 39\\w_B = 0.076 76\\\hline\\1.3101\\1.1714\\1.0515\\0.9515\\\end{array}$
293.1 298.1 303.1 308.1 313.1	$\begin{array}{r} 6.52\\ \hline \\ Na_2HPO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ \hline \\ w_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ \end{array}$	$\begin{array}{r} 6.37\\ \hline D_4 (A) +\\ 0 + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ \end{array}$	$\frac{11.41}{NaH_2PO}\\ \frac{NaH_2PO}{K_3PO_4 (B)}\\ \frac{W_A = 0.021 \ 69}{W_B = 0.038 \ 38}\\ \frac{1.1416}{1.0214}\\ 0.9235\\ 0.8369\\ 0.7593 \\ \end{array}$	$\begin{array}{r} 11.32\\\hline\\D_4 (A) +\\ + H_2 O (C)\\\hline\\w_A = 0.043 39\\ w_B = 0.076 76\\\hline\\1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\\hline\end{array}$
293.1 298.1 303.1 308.1 313.1 313.1 318.1	$\begin{array}{r} 6.52\\ \hline & \text{Na}_2\text{HPO}_4 \text{ (B)}\\ \hline & \text{KH}_2\text{PO}_4 \text{ (B)}\\ \hline & w_{\text{A}} = 0.026\ 21\\ \hline & w_{\text{B}} = 0.025\ 12\\ \hline & 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ \end{array}$	$\begin{array}{r} 6.37\\ \hline D_4 (A) +\\ 0 + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ \end{array}$	$\frac{11.41}{NaH_2PO}\\ \frac{NaH_2PO}{K_3PO_4 (B)}\\ \frac{W_A = 0.021 \ 69}{W_B = 0.038 \ 38}\\ \frac{1.1416}{1.0214}\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958 \\ \end{array}$	$\begin{array}{c} 11.32\\\hline\\ D_4 (A) +\\ + H_2 O (C)\\\hline\\ w_A = 0.043 \ 39\\ w_B = 0.076 \ 76\\\hline\\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\\hline\end{array}$
293.1 298.1 303.1 308.1 313.1 318.1 323.1	$\begin{array}{r} 6.52\\ \hline & Na_2HPO_4 (B)\\ \hline & KH_2PO_4 (B)\\ \hline & w_A = 0.026\ 21\\ \hline & w_B = 0.025\ 12\\ \hline & 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \end{array}$	$\begin{array}{r} 6.37\\ \hline D_4 (A) +\\ 0 + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \end{array}$	$\frac{11.41}{NaH_2PO}\\ \frac{NaH_2PO}{K_3PO_4 (B)}\\ \frac{W_A = 0.021 \ 69}{W_B = 0.038 \ 38}\\ \frac{1.1416}{1.0214}\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404 \\ \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ D_4 (A) + \\ + H_2 O (C)\\ \hline \\ w_A = 0.043 \ 39\\ w_B = 0.076 \ 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \end{array}$
293.1 298.1 303.1 308.1 313.1 318.1 323.1 pH	$\begin{array}{c} 6.52\\ \hline & Na_2HP0\\ KH_2PO_4 (B)\\ \hline w_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6382\\ 6.55\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline \\ D_4 (A) +\\ 0 + H_2 O (C)\\ \hline \\ w_A = 0.052 \ 42\\ w_B = 0.050 \ 25\\ \hline \\ 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline \\ 6.43\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ \hline \\ NaH_2PO\\ K_3PO_4 (B)\\ \hline \\ w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline \\ 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline \\ 9.28\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2 O (C)\\ \hline \\ w_A = 0.043 \ 39\\ w_B = 0.076 \ 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \end{array}$
293.1 298.1 303.1 308.1 313.1 318.1 323.1 pH	$\begin{array}{r} 6.52\\ \hline & Na_2HPC\\ KH_2PO_4 (B)\\ \hline w_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6382\\ 6.55\\ \hline & NaH_2PC\\ K_2HPO_4 (B)\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ 0 + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ 0 + H_2 O (C)\\ \hline \end{array}$	$\begin{array}{r} 11.41\\ \hline \\ NaH_2PO\\ K_3PO_4 (B)\\ \hline \\ w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline \\ 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline \\ 9.28\\ \hline \\ K_3PO_4\\ K_2HPO_4 (B)\\ \hline \\ \hline \\ \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ \hline \\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\ 0 + H_2O (C)\\ \hline \\ 0.055 0.6\\ \hline \\ 0.055 0.6\\$
293.1 298.1 303.1 308.1 313.1 318.1 323.1 pH	$\begin{array}{c} 6.52\\ \hline & Na_2HPO_4 (B)\\ \hline & W_A = 0.026\ 21\\ \hline & W_B = 0.025\ 12\\ \hline & 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6322\\ 6.55\\ \hline & Value \\ \hline & Value \\ & Value \\ \hline & Value \\ \hline & W_A = 0.022\ 10\\ \hline & W_B = 0.032\ 08\\ \hline & 1.1021\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ w_B = 0.064 \ 16\\ \hline 1.8707\\ \hline \end{array}$	$\frac{11.41}{NaH_2PO} \\ \frac{NaH_2PO}{K_3PO_4 (B)} \\ \hline w_A = 0.021 69 \\ w_B = 0.038 38 \\ \hline 1.1416 \\ 1.0214 \\ 0.9235 \\ 0.8369 \\ 0.7593 \\ 0.6958 \\ 0.6404 \\ 9.28 \\ \hline K_2HPO_4 (B) \\ \hline w_A = 0.037 62 \\ w_B = 0.030 86 \\ \hline 1.1414 \\ \hline 0.0214 \\ 0.9235 \\ 0.8369 \\ 0.7593 \\ 0.6958 \\ 0.6404 \\ 0.28 \\ \hline 0.6404 \\ 0.28$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ \hline \\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ 1 \\ (A) +\\ 0 + H_2O (C)\\ \hline \\ \hline \\ w_A = 0.075 23\\ \hline \\ w_B = 0.061 72\\ \hline \\ 1 \\ 2020\\ \hline \end{array}$
293.1 298.1 303.1 308.1 313.1 313.1 323.1 pH	$\begin{array}{c} 6.52\\ \hline & Na_2HPC\\ KH_2PO_4 (B)\\ \hline w_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline & NaH_2PC\\ K_2HPO_4 (B)\\ \hline w_A = 0.022\ 10\\ w_B = 0.032\ 08\\ \hline 1.1301\\ 1\ 0069\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2O (C)\\ \hline w_A = 0.052 \ 42\\ w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2O (C)\\ \hline w_A = 0.044 \ 19\\ w_B = 0.064 \ 16\\ \hline 1.2707\\ 1 \ 12707\\ 1 \ 1277\\ \end{array}$	$\frac{11.41}{NaH_2PC} \\ \frac{NaH_2PC}{K_3PO_4 (B)} \\ \hline w_A = 0.021 \ 69 \\ w_B = 0.038 \ 38 \\ \hline 1.1416 \\ 1.0214 \\ 0.9235 \\ 0.8369 \\ 0.7593 \\ 0.6958 \\ 0.6404 \\ \hline 9.28 \\ \hline K_2HPO_4 (B) \\ \hline w_A = 0.037 \ 62 \\ w_B = 0.030 \ 86 \\ \hline 1.1414 \\ 1.0234 \\ \hline 1.0234 \\ \hline 0.031 \ 62 \\ \hline 0.030 \ 86 \\ \hline 0.030 \ 8$	$\begin{array}{c} 11.32\\ \hline 11.32\\ \hline 0_4 (A) +\\ + H_2O (C)\\ \hline w_A = 0.043 39\\ \hline w_B = 0.076 76\\ \hline 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline 9.26\\ \hline 1.420\\ \hline 0.7247\\ \hline 9.26\\ \hline 0.7247\\ \hline 0.7247\\ \hline 1.420 (C)\\ \hline w_A = 0.075 23\\ \hline w_B = 0.061 72\\ \hline 1.3200\\ \hline 1.1803\\ \hline 0.1802\\ $
293.1 298.1 303.1 308.1 313.1 313.1 313.1 323.1 pH 293.1 293.1 293.1	$\begin{array}{r} 6.52\\ \hline & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ \hline \end{array}$	$\begin{array}{r} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1329\\ 1.0199\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ \hline \\ NaH_2PO\\ K_3PO_4 (B)\\ \hline \\ w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline \\ 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline \\ 9.28\\ \hline \\ K_2HPO_4 (B)\\ \hline \\ w_A = 0.037 \ 62\\ \hline \\ w_B = 0.030 \ 86\\ \hline \\ 1.1414\\ 1.0234\\ 0.9244\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline 11.32\\ \hline 0_4 (A) +\\ + H_2O (C)\\ \hline w_A = 0.043 39\\ \hline w_B = 0.076 76\\ \hline 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline 9.26\\ \hline (A) +\\ + H_2O (C)\\ \hline w_A = 0.075 23\\ \hline w_B = 0.061 72\\ \hline 1.3200\\ 1.1803\\ 1.0642\\ \end{array}$
293.1 298.1 303.1 308.1 313.1 313.1 313.1 323.1 pH 293.1 293.1 293.1 303.1	$\begin{array}{c} 6.52\\ \hline \\ Na_2HPC\\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline \\ 6.55\\ \hline \\ NaH_2PC\\ K_2HPO_4 (B)\\ \hline \\ W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline \\ 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ \hline \end{array}$	$\begin{array}{r} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ \end{array}$	$\begin{array}{c} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline & \text{K}_2\text{HPO}_4 \ (\text{B})\\ \hline & w_{\text{B}} = 0.037 \ 62\\ & w_{\text{B}} = 0.030 \ 86\\ \hline 1.1414\\ 1.0234\\ & 0.9244\\ 0.8401\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2 O (C)\\ \hline \\ w_A = 0.043 39\\ \hline \\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\) + H_2 O (C)\\ \hline \\ \hline \\ w_A = 0.075 23\\ \hline \\ w_B = 0.061 72\\ \hline \\ 1.3200\\ 1.1803\\ 1.0642\\ 0.9612\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 pH 293.1 293.1 293.1 303.1 303.1 303.1 303.1	$\begin{array}{c} 6.52\\ \hline \\ Na_2HPC\\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline \\ 6.55\\ \hline \\ NaH_2PC\\ K_2HPO_4 (B)\\ \hline \\ W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline \\ 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ \hline \end{array}$	$\begin{array}{r} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline \text{K}_2\text{HPO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.037 \ 62\\ w_{\text{B}} = 0.030 \ 86\\ \hline 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ \hline \\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\) + H_2O (C)\\ \hline \\ w_A = 0.075 23\\ \hline \\ w_B = 0.061 72\\ \hline \\ 1.3200\\ 1.1803\\ 1.0642\\ 0.9612\\ 0.8776\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 323.1 pH 293.1 298.1 308.1 313.1 318.1	$\begin{array}{c} 6.52\\ \hline & Na_2HPO_4 (B)\\ \hline & KH_2PO_4 (B)\\ \hline & w_A = 0.026\ 21\\ \hline & w_B = 0.025\ 12\\ \hline & 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline & 6.55\\ \hline & NaH_2PO_4 (B)\\ \hline & w_A = 0.022\ 10\\ \hline & w_B = 0.032\ 08\\ \hline & 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ \hline & 0.6$	$\begin{array}{r} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7682\\ \hline 0.7682\\ 0.7682\\ \hline 0.7682\\ 0.7682\\ \hline 0.7682\\ 0.7682\\ \hline 0.7682\\ \hline$	$\begin{array}{c} 11.41\\ & NaH_2PO\\ K_3PO_4 (B)\\ \hline w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline K_2HPO_4 (B)\\ \hline w_A = 0.037 \ 62\\ w_B = 0.030 \ 86\\ \hline 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ 0.7019\\ 0.7019\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\ 0 + H_2O (C)\\ \hline \\ w_A = 0.075 23\\ w_B = 0.061 72\\ \hline \\ 1.3200\\ 1.1803\\ 1.0642\\ 0.9612\\ 0.8776\\ 0.8054\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 313.1 308.1 303.1 308.1 313.1 313.1 313.1 313.1 313.1 323.1	$\begin{array}{c} 6.52\\ \hline & Na_2HPC\\ KH_2PO_4 (B)\\ \hline w_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ 6.55\\ \hline & NaH_2PC\\ K_2HPO_4 (B)\\ \hline w_A = 0.022\ 10\\ w_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline & 6\ 50\\ \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \end{array}$	$\begin{array}{c} 11.41\\ \hline \\ NaH_2PC\\ K_3PO_4 (B)\\ \hline \\ w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline \\ 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline \\ 9.28\\ \hline \\ K_2HPO_4 (B)\\ \hline \\ w_A = 0.037 \ 62\\ w_B = 0.030 \ 86\\ \hline \\ 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ 0.7019\\ 0.6492\\ 11.51\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ \hline \\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.075 23\\ \hline \\ w_B = 0.061 72\\ \hline \\ 1.3200\\ 1.1803\\ 1.0642\\ 0.9612\\ 0.8776\\ 0.8054\\ 0.7412\\ 11 50\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 313.1 pH 293.1 293.1 293.1 303.1 303.1 313.1 313.1 313.1 313.1 313.1 312.1 1	$\begin{array}{c} 6.52\\ & Na_2HPO_4 (B)\\ \hline & KH_2PO_4 (B)\\ \hline & w_A = 0.026\ 21\\ \hline & w_B = 0.025\ 12\\ \hline & 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ 6.55\\ \hline & NaH_2PO_4 (B)\\ \hline & w_A = 0.022\ 10\\ \hline & w_B = 0.032\ 08\\ \hline & 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ 6.59\\ \hline & K_3PO_4\\ KU PO^{-1}_{2}(B)\\ \hline & K_3PO_4\\ KU PO^{-1}_{2}(B)\\ \hline & K_3PO_4\\ KU PO^{-1}_{2}(B)\\ \hline & K_3PO_4\\ \hline & K_4PO_4\\ \hline &$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_O (C)\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & NaH_2PC\\ K_3PO_4 (B)\\ \hline \\ \hline$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.043 39\\ w_B = 0.076 76\\ \hline \\ 1.3101\\ 1.1714\\ 1.0516\\ 0.9515\\ 0.8631\\ 0.7907\\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\ + H_2O (C)\\ \hline \\ w_A = 0.075 23\\ w_B = 0.061 72\\ \hline \\ 1.3200\\ 1.1803\\ 1.0642\\ 0.9612\\ 0.8776\\ 0.8054\\ 0.7412\\ \hline \\ 11.50\\ \hline \\ 0_4 (A) +\\ + H_2O (C)\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 313.1 293.1 293.1 293.1 303.1 303.1 313.1 313.1 313.1 313.1 313.1 313.1	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline w_A = 0.022\ 10\\ w_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline 6.59\\ \hline K_3PO_4 (B)\\ \hline K_4B_2O_4 (B)\\ \hline$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.0199\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline \end{array}$	$\begin{array}{r} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ 9.28\\ \hline & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline & \text{w}_{\text{B}} = 0.037 \ 62\\ w_{\text{B}} = 0.037 \ 62\\ \hline & w_{\text{B}} =$	$\begin{array}{c} 11.32\\ \hline \\ 11.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0516\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.7907\\ \hline \\ 0.7247\\ \hline \\ 9.26\\ \hline \\ (A) +\\ +\\ +\\ H_2O (C)\\ \hline \\ \hline \\ 1.3200\\ \hline \\ 0.854\\ \hline \\ 0.7412\\ \hline \\ 1.50\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 1.50\\ \hline \\ 0.8054\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 1.50\\ \hline \\ 0.8054\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 1.50\\ \hline \\ 0.8054\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 0.8054\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 0.8054\\ \hline 0.8054\\ \hline \\ 0.8054\\ \hline 0.8054\\$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 313.1 293.1 293.1 293.1 303.1 303.1 313.1 313.1 313.1 318.1 323.1 pH	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ w_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline w_A = 0.022\ 10\\ w_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6883\\ 0.6282\\ \hline 6.59\\ \hline K_3PO_4\\ KH_2PO_4 (B)\\ \hline w_A = 0.038\ 30\\ \hline w_B = 0.024\ 55\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline w_{\text{A}} = 0.037 \ 62\\ \hline w_{\text{B}} = 0.032 \ 62\\ \hline w_{\text{B}} = 0.032 \ 02\\ \hline w_{\text{B}} = 0.025 \ 02\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 0_4 (A) + \\ + H_2O (C) \\ \hline \\ w_A = 0.043 39 \\ w_B = 0.076 76 \\ \hline \\ 1.3101 \\ 1.1714 \\ 1.0516 \\ 0.9515 \\ 0.8631 \\ 0.7907 \\ 0.7247 \\ 9.26 \\ \hline \\ (A) + \\ + H_2O (C) \\ \hline \\ w_A = 0.075 23 \\ w_B = 0.061 72 \\ \hline \\ 1.3200 \\ 1.1803 \\ 1.0642 \\ 0.9612 \\ 0.8776 \\ 0.8054 \\ 0.7412 \\ \hline \\ 11.50 \\ \hline \\ 0_4 (A) + \\ + \\ + H_2O (C) \\ \hline \\ w_A = 0.064 05 \\ w_B = 0.050 04 \\ \hline \end{array}$
293.1 298.1 303.1 313.1 318.1 323.1 pH 293.1 298.1 303.1 308.1 313.1 318.1 323.1 pH 77K 293.1	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline 6.59\\ \hline KH_2PO_4 (B)\\ \hline W_A = 0.038\ 30\\ \hline W_B = 0.024\ 55\\ \hline 1.1015\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ \hline 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline 1.2493\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & NaH_2PO\\ K_3PO_4 (B)\\ \hline w_A = 0.021 \ 69\\ w_B = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline K_2HPO_4 (B)\\ \hline w_A = 0.037 \ 62\\ \hline w_B = 0.030 \ 86\\ \hline 1.1414\\ 1.0234\\ 0.9244\\ \hline 0.8401\\ 0.7649\\ 0.7019\\ 0.6492\\ \hline 11.51\\ \hline K_2HPO_4 (B)\\ \hline w_A = 0.032 \ 02\\ \hline w_B = 0.025 \ 02\\ \hline w_B = 0.025 \ 02\\ \hline 1.0844\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.31\\ \hline \\ 11.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0516\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.7907\\ \hline \\ 0.7247\\ \hline \\ 9.26\\ \hline \\ 1.3200\\ \hline \\ 1.403\\ \hline \\ 1.3200\\ \hline 1.3200\\ \hline \\ 1.3200\\ \hline 1.3200\\ \hline \\ 1.3200\\ \hline 1.3200\\ \hline \\ 1$
293.1 298.1 303.1 313.1 318.1 323.1 pH 293.1 298.1 303.1 308.1 313.1 318.1 313.1 318.1 313.1 318.1 323.1 pH 77K 293.1 293.1	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ \hline W_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline W_A = 0.022\ 10\\ \hline W_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline 6.59\\ \hline K_3PO_4 (B)\\ \hline W_A = 0.038\ 30\\ \hline W_B = 0.024\ 55\\ \hline 1.1015\\ 0.9795\\ 0.9059\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline 1.2493\\ 1.1290\\ 1.2493\\ 1.1290\\ 1.2493\\ 1.1290\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline & w_{\text{A}} = 0.037 \ 62\\ w_{\text{B}} = 0.030 \ 86\\ \hline & 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ 0.7019\\ 0.6492\\ \hline & 11.51\\ \hline & \text{K}_2\text{HPO}_4 \ (\text{B})\\ \hline & w_{\text{A}} = 0.032 \ 02\\ \hline & w_{\text{B}} = 0.025 \ 02\\ \hline & 1.0844\\ 0.9659\\ 0.7072\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0716\\ \hline \\ 1.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0516\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.7907\\ \hline \\ 0.7247\\ \hline \\ 9.26\\ \hline \\ 1.3200\\ \hline \\ 1.803\\ \hline \\ 1.0642\\ \hline \\ 0.9612\\ \hline \\ 0.8776\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 1.50\\ \hline \\ 1.50\\ \hline \\ 1.50\\ \hline \\ 1.1998\\ \hline \\ 1.0726\\ \hline \\ 0.6020\\ \hline \\ 1.1998\\ \hline \\ 1.0726\\ \hline \\ 0.6020\\ \hline \end{array}$
293.1 298.1 308.1 313.1 318.1 313.1 318.1 323.1 pH 293.1 298.1 308.1 313.1 318.1 318.1 318.1 318.1 318.1 318.1 318.1 318.1 318.1 318.1 308.1 308.1 308.1 308.1 308.1 308.1 308.1 308.1 308.1 308.1 308.1 293.1	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline W_A = 0.026\ 21\\ \hline W_B = 0.025\ 12\\ \hline 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline 6.55\\ \hline NaH_2PC\\ K_2HPO_4 (B)\\ \hline W_A = 0.022\ 10\\ \hline W_B = 0.032\ 08\\ \hline 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline 6.59\\ \hline KH_2PO_4 (B)\\ \hline W_A = 0.038\ 30\\ \hline W_B = 0.024\ 55\\ \hline 1.1015\\ 0.9795\\ 0.8857\\ 0.8957\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ \hline 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline 1.2493\\ 1.1290\\ 1.0147\\ 0.9294\\ \hline 0.9204\\ \hline 0.9204\\$	$\begin{array}{c} 11.41\\ & \text{NaH}_2\text{PO}\\ & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline w_{\text{A}} = 0.021 \ 69\\ w_{\text{B}} = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline & \text{K}_3\text{PO}_4 \ (\text{B})\\ \hline & w_{\text{A}} = 0.037 \ 62\\ w_{\text{B}} = 0.030 \ 86\\ \hline \\ 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ 0.7019\\ 0.6492\\ 11.51\\ \hline & \text{K}_2\text{HPO}_4 \ (\text{B})\\ \hline & w_{\text{A}} = 0.032 \ 02\\ w_{\text{B}} = 0.025 \ 02\\ \hline \\ 1.0844\\ 0.9659\\ 0.8707\\ 0.7970\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0516\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.7907\\ \hline \\ 0.7247\\ \hline \\ 9.26\\ \hline \\ 1.42\\ \hline \\ 1.420\\ \hline \\ 1.3200\\ \hline \\ 1.1803\\ \hline \\ 1.0642\\ \hline \\ 0.9612\\ \hline \\ 0.8776\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 11.50\\ \hline \\ 1.50\\ \hline \\ 1.198\\ \hline \\ 1.0726\\ \hline \\ 0.9636\\ \hline \\ 0.9726\\ \hline 0$
293.1 298.1 308.1 313.1 313.1 313.1 313.1 313.1 pH 293.1 298.1 308.1 313.1 318.1 323.1 pH 77K 293.1 298.1 303.1 308.1 313.1	$\begin{array}{c} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline \\ W_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline \\ 6.55\\ \hline \\ NaH_2PC\\ K_2HPO_4 (B)\\ \hline \\ W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline \\ 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline \\ 6.59\\ \hline \\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.032\ 08\\ \hline \\ NaH_2PC\\ (B)\\ \hline \\ W_A = 0.038\ 30\\ \hline \\ W_B = 0.024\ 55\\ \hline \\ 1.1015\\ 0.9795\\ 0.8887\\ 0.8050\\ 0.7321\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ \hline 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline 1.2493\\ 1.1290\\ 1.0147\\ 0.9204\\ 0.8417\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & NaH_2PO\\ K_3PO_4 (B)\\ \hline W_A = 0.021 \ 69\\ W_B = 0.038 \ 38\\ \hline 1.1416\\ 1.0214\\ 0.9235\\ 0.8369\\ 0.7593\\ 0.6958\\ 0.6404\\ \hline 9.28\\ \hline K_2HPO_4 (B)\\ \hline W_A = 0.037 \ 62\\ \hline W_B = 0.030 \ 86\\ \hline 1.1414\\ 1.0234\\ 0.9244\\ 0.8401\\ 0.7649\\ 0.7019\\ 0.6492\\ \hline 11.51\\ \hline K_2HPO_4 (B)\\ \hline W_A = 0.032 \ 02\\ \hline W_B = 0.032 \ 02\\ \hline W_B = 0.025 \ 02\\ \hline 1.0844\\ 0.9659\\ 0.8707\\ 0.7879\\ 0.7183\\ \hline \end{array}$	$\begin{array}{c} 11.32\\ \hline \\ 11.3101\\ \hline \\ 1.1714\\ \hline \\ 1.0516\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.9515\\ \hline \\ 0.8631\\ \hline \\ 0.7907\\ \hline \\ 0.7247\\ \hline \\ 9.26\\ \hline \\ 1.3200\\ \hline \\ 1.803\\ \hline \\ 1.0642\\ \hline \\ 0.9612\\ \hline \\ 0.8776\\ \hline \\ 0.8054\\ \hline \\ 0.7412\\ \hline \\ 11.50\\ \hline \\ 1.50\\ \hline \\ 1.198\\ \hline \\ 1.0726\\ \hline \\ 0.9636\\ \hline \\ 0.9511\\ \hline \end{array}$
293.1 298.1 303.1 313.1 313.1 313.1 313.1 313.1 313.1 293.1 293.1 308.1 313.1 318.1 313.1 318.1 303.1 303.1 303.1 303.1 303.1 303.1 303.1 303.1 313.1	$\begin{array}{r} 6.52\\ & Na_2HPC\\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.026\ 21\\ W_B = 0.025\ 12\\ \hline \\ W_B = 0.025\ 12\\ \hline \\ 1.1495\\ 1.0232\\ 0.9188\\ 0.8316\\ 0.7590\\ 0.6920\\ 0.6382\\ \hline \\ 6.55\\ \hline \\ NaH_2PC\\ K_2HPO_4 (B)\\ \hline \\ W_A = 0.022\ 10\\ W_B = 0.032\ 08\\ \hline \\ 1.1301\\ 1.0069\\ 0.9059\\ 0.8235\\ 0.7470\\ 0.6833\\ 0.6282\\ \hline \\ 6.59\\ \hline \\ KH_2PO_4 (B)\\ \hline \\ W_A = 0.038\ 30\\ \hline \\ W_B = 0.024\ 55\\ \hline \\ 1.1015\\ 0.9795\\ 0.8887\\ 0.8050\\ 0.7321\\ 0.6707\\ \hline \end{array}$	$\begin{array}{c} 6.37\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.052 \ 42\\ \hline w_B = 0.050 \ 25\\ \hline 1.3245\\ 1.1708\\ 1.0491\\ 0.9437\\ 0.8568\\ 0.7840\\ 0.7196\\ \hline 6.43\\ \hline 0_4 (A) +\\ + H_2 O (C)\\ \hline w_A = 0.044 \ 19\\ \hline w_B = 0.064 \ 16\\ \hline 1.2707\\ 1.1327\\ 1.0199\\ 0.9218\\ 0.8375\\ 0.7682\\ 0.7060\\ \hline 6.50\\ \hline (A) +\\ + H_2 O (C)\\ \hline w_A = 0.076 \ 60\\ \hline w_B = 0.049 \ 10\\ \hline 1.2493\\ 1.1290\\ 1.0147\\ 0.9204\\ 0.8417\\ 0.7724\\ \hline \end{array}$	$\begin{array}{c} 11.41\\ & NaH_2PO\\ K_3PO_4 (B)\\ \hline \\ \hline$	$\begin{array}{c} 11.32\\ \hline \\ 11.32\\ \hline \\ 11.32\\ \hline \\ 21.32\\ \hline \\ 21.3$

Table 4.	Parameter	s of Eq 1,	Giving the	e Kinemati	C
Viscosity	of Each of	f the Bina	ry Systems	Studied a	is a
Function	of Concen	tration a	nd Temper	ature	

$10^{7}A/m^{2} \cdot s^{-1}$	$10^{-7}B/K^3$	п
3.6557	$NaH_2PO_4 (A) + H_2O (B) 6.6961$	1.198
5.5566	$Na_{2}HPO_{4} (A) + H_{2}O (B) 6.3650$	1.191
8.1425	$Na_{3}PO_{4}(A) + H_{2}O(B)$ 7.0151	1.274
3.1280	${ m KH_2PO_4}$ (A) + H ₂ O (B) 5.6371	1.227
3.0435	${ m K_{2}HPO_{4}}$ (A) + H ₂ O (B) 5.1736	1.310
8.6772	$ m K_{3}PO_{4}~(A) + H_{2}O~(B) \ 5.6288$	1.531

Table 5. Parameters of Eq 3, Giving the KinematicViscosity of Each of the Ternary Systems Studied as aFunction of Temperature

	-		
WA	WB	$10^7 C/m^2 \cdot s^{-1}$	$10^{-7}D/K^3$
	$Na_{3}PO_{4}(A) + Na_{4}$	$_{12}HPO_4$ (B) + H ₂ O (C)	
0.029 33	0.025 39	1.1420	6.0846
0.058 66	0.050 78	1.3484	6.4657
	$\mathbf{N} = \mathbf{D} \mathbf{O} \cdot (\mathbf{A}) + \mathbf{N}$		
0 000 00	$Na_{3}PO_{4}(A) + Na_{4}$	$_{11000}^{AH_2PO_4}(B) + H_2O(C)$	5 0 100
0.029 88	0.021 87	1.1388	5.9436
0.059 76	0.043 74	1.2967	6.2161
	$Na_3PO_4(A) + K$	$_{2}$ HPO ₄ (B) + H ₂ O (C)	
0.029 21	0.031 03	1.1638	5.9265
0.058 41	0.062 06	1.3860	6.1310
	$Na_{2}PO_{4}(A) + K$	$H_{2}PO_{4}(B) + H_{2}O(C)$	
0.029.69	0.024 64	1,1754	5.8562
0.059 37	0.049 28	1.3885	5.9401
0.000 0.	$N_{0} \downarrow DO (A) \downarrow N$		0.0101
0 026 28	$1 a_2 \Pi F O_4 (A) + 1 a_2 \Pi F O_4 (A)$	11200	5 0002
0.020 20	0.022 21	1.1309	5.9002 6 1192
0.052 50	0.044 43	1.2355	0.1125
	$Na_2HPO_4(A) +$	$K_{3}PO_{4}(B) + H_{2}O(C)$	
0.025 23	0.047 33	1.1592	5.8730
0.050 46	0.094 67	1.3336	6.0359
	$Na_2HPO_4(A) + H$	$(H_2PO_4 (B) + H_2O (C))$	
0.026 21	0.025 12	1.1295	5.8397
0.052 42	0.050 25	1.1963	6.0472
	NaH₀PO₄ (A) +	$K_{2}PO_{4}(B) + H_{2}O(C)$	
0 021 69	0.038.38	1 1674	5 7488
0.043 39	0.076 76	1.2729	5.8769
0.010.00	Not $\mathbf{DO}(\mathbf{A}) \perp \mathbf{I}$	$(\mathbf{U}\mathbf{D}\mathbf{O} \ (\mathbf{P}) \pm \mathbf{U} \ \mathbf{O} \ (\mathbf{C})$	010100
0 099 10	$1 A \Pi_2 \Gamma O_4 (A) + \Gamma$	$X_2 \Pi F O_4 (D) + \Pi_2 O (C)$ 1 1913	5 9199
0.022 10	0.032.08	1.1213	5.0100
0.044 15	0.004 10	1.2527	3.0340
	$K_3PO_4(A) + K_2$	HPO_4 (B) + H_2O (C)	
0.037 62	0.030 86	1.2265	5.6202
0.075 23	0.061 72	1.3558	5.7321
	$K_3PO_4(A) + KI$	H_2PO_4 (B) + H_2O (C)	
0.038 30	0.024 55	1.1287	5.7363
0.076 60	0.049 10	1.3446	5.6250
	$K_{2}HPO_{4}(A) + K$	H_2PO_4 (B) + H_2O (C)	
0.032 02	0.025 02	1.0918	5.7795
0.064 05	0.050 04	1.1954	5.8113

The values of *C* and *D* calculated by Nelder–Mead optimization are listed in Table 5. The deviations between the experimental data and the predictions of eq 3 are all less than 0.5%.

Literature Cited

- Alper, E. Kinetics of Absorption of CO₂ into Buffer Solutions Containing Arsenite: Effects of Buffer Composition. *Chim. Acta Turc.* 1981, 9, 447–458.
- Alper, E.; Deckwer, W. D. Kinetics of Absorption of CO_2 into Buffer Solutions Containing Carbonic Anhydrase. *Chem. Eng. Sci.* **1980**, *35*, 549–557.
- Benadda, B.; Prost, M.; Ismaily, S.; Bressat, R.; Otterbein, M. Validation of the Gas-Lift Capillary Bubble Column as a Simulation Device for a Reactor by the Study of CO₂ Absorption in Na₂CO₃/NaHCO₃ Solutions. *Chem. Eng. Process.* **1994**, *33*, 55–59.

pН

9.34

9.33

6.63

6.58

- Budavari, S., Ed. The Merck Index, 11th ed.; Merck & Co., Inc.: Rahway, N.J., 1989. Hunik, J. H.; Meijer, H. J. G.; Tramper, J. Kinetics of *Nitrobacter agilis*
- at Extreme Substrate, Product and Salt Concentration. Appl. Microbiol. Biotechnol. 1993, 40, 442–448.
- Joosten, G. E. H.; Danckwerts, P. V. Chemical Reaction and Effective Interfacial Areas in Gas Absorption. *Chem. Eng. Sci.* **1973**, *28*, 453– 461.
- Kitpreechavanich, V.; Hayashi, M.; Nishio, N.; Nagai, S. Conversion of D-Xylose into Xylitol by Xylose Reductase from *Candida pelli-culose* with the Oxidoreductase System of Methanogen Strain HU. Biotech. Lett. **1984**, 6, 651–656. Lindén, T.; Hanhn-Hägerdal, B. Fermentation of Lignocellulose Hy-
- drolysates with Yeast and Xylose Isomerase. *Enzyme Microb. Technol.* **1989**, *11*, 583-589.
- Vázquez, G.; Chenlo, F.; Alvarez, E.; Moreira, R.; Pardo, P. Viscosities of Solutions of Interest for Studies of Absorption Processes. J. Chem.
- vi Solutions of Interest for Studies of Absorption Processes. *J. Chem. Eng. Data* **1994a**, *39*, 87–89. Vázquez, G.; Chenlo, F.; Moreira, R.; Pardo, P. Viscosity of the Following Na₂CO₃, NaHCO₃, K₂CO₃, KHCO₃, Na₂CO₃-NaHCO₃, K₂-CO₃-KHCO₃ Solutions, Important in Absorption Processes. *Afinidad* **1994b**, *51*, 211–216.

Received for review February 21, 1996. Accepted May 1, 1996. $^{\circ}$ This work was partly financed by the Spanish DGICYT (Grant PB94-0626).

JE960074J

[®] Abstract published in Advance ACS Abstracts, June 15, 1996.