ISSN 1070-3632, Russian Journal of General Chemistry, 2013, Vol. 83, No. 6, pp. 1290–1298. © Pleiades Publishing, Ltd., 2013.
Original Russian Text © A.A. Rahoisha, V.N. Khvalyuk, 2011, published in Rossiiskii Khimicheskii Zhurnal, 2011, Vol. 55, Nos. 5–6, pp. 85–94.

Online Information Retrieval in the Experimental Round of Chemistry Olympiads

A. A. Rahoisha and V. N. Khvalyuk

Belarusian State University, pr. Nezavisimosti 4, Minsk, 220030 Belarus
e-mail: ragoisha@bsu.by; khvalyuk@bsu.by

Received April 24, 2011

Abstract—Two Olympiads for chemistry students of Belarusian institutions of higher education were held at the Chemistry Department, Belarusian State University, in the 2010/2011 academic year. The novelty of the Olympiad programs was in the special five-hour experimental rounds of online information retrieval. At that stage of the contest, competitors were tested both on their search skills and ability to analyze the content and reliability of the documents retrieved. The tasks and solutions for one of the Olympiads were presented.

DOI: 10.1134/S1070363213060492

Schoolchildren Olympiads in chemistry, whose history dates back as far as 1930s, continue to play a significant role in the natural-sciences education of young people [1]. Moreover, currently, when educational institutions strenuously attempt to introduce "innovative technologies" (centralized testing in Belarus, Unified State Exam in Russia, etc.) into the national public education system and undertake its permanent reforming [2], Olympiads provide virtually unique tool for qualitative selection of entrants best-prepared to getting higher education in chemistry. In today's situation, when young people's interest in exact sciences is steadily declining [3], Olympiads help in preserving the attraction value of chemistry as a science, promote chemical knowledge, and still provide an effective and reliable means of searching talented youth and supporting creative teachers.

Being an active and important tool in addressing modern chemical education challenges, Olympiads themselves underwent little change throughout their history (for over 80 years). At the same time, in today's rapidly changing world, the task of responding to these challenges just as effectively and withstanding the negative trends observed in this sphere requires undertaking ever increasing efforts for its accomplishing. There is a need for changes.

One reason for decline of the interest in natural sciences, shown by schoolchildren and students, lies in the information overload experienced by them. This, and some other, factors are specifically responsible for significant reduction in the level of basic, and further of higher-school, natural-sciences education. The antagonism against exact sciences learning in its classical form, exhibited by the majority of schoolchildren (and also of students, as now perfectly clear), appears as a protective response to the information overload (huge flows of dispersed and sometimes meaningless information). It should be noted that this overload is due not only to objective growth of information flows, associated with the development of science, technology, culture, and arts, but also to rapid progress in information delivery, creation, retrieval, and use technologies. The negative effect from information flows was significantly amplified by Twitter, Facebook, vkontakte.ru, iPhones, smartphones, netbooks, and media players, along with superabundant media outlets (hundreds of thousands of TV channels, newspapers, and magazines) and the Internet itself. Their appearance, invasion into everyday life of people, and mass availability caused a peculiar synergistic effect of sharp mutual enhancement of the information overload syndrome.

Another consequence (in the present context, unfavorable) of the information technology boom is less unbiased evaluation of intellectual competitions (which can be conditionally treated as a stage in knowledge and skills evaluation): Safe monitoring of unwanted information flows from the external environment into the system monitored is unfeasible. So far, no simple solution was found to this problem (certainly, if this is not about its ranking among

national security problems), which is particularly acute in the final stages of national and international Olympiads in chemistry

Some basic methodological problems are also posed by organization of the theoretical round of chemistry Olympiads. Today, the development of Olympiad assignments largely relies conceptually on the image of Olympiad participants as possessing a certain basic academic quality which allows them to solve Olympiad problems. However, this basic quality clearly varies broadly among Olympiad participants whose chances for successfully accomplishing creative tasks (by contrast to tasks based on the background knowledge) are consequently unequal a priori. Considering the complexity and diversity of modern chemistry, the Olympiad assignment developers are forced to suggest ever more complicated assignments, while the steadily declining basic quality of secondary and higher school education causes them to act in the opposite direction. In this situation, a compromise solution may be found in combining the questions intended for beginners with those intended for professionals in virtually all the theoretical round assignments. As a result, the assignment package becomes less attractive on the whole in terms of its keeping up with the current achievements of chemical science. This creates the need for fresh ideas on how to take the maximal advantage of the current negative trends for constructive purposes.

Traditional chemistry Olympiads include one, or more, theoretical rounds and one experimental round. Most clearly the differences in the basic academic quality levels of participants can be seen specifically during the experimental round of chemistry Olympiad. In this situation, the developers of the experimental round assignments are also encouraged to provide them with elements whose level ranges from that of beginners to that of professionals. It should be noted that the experimental round of a chemistry Olympiad requires appropriate equipment, glassware, and chemicals (typically expensive) and considerable funding for its conductance. It should also be noted that the contribution from the experimental round scores to the final evaluation varies in different stages of the Olympiad from minimal in the initial stages (school, district Olympiad) to very significant in the final stages (40% at the International Chemistry Olympiad). Considering the fact that chemistry is an experimental science, it seems reasonable in this situation to increase the contribution from the experimental round scores to the final evaluation of the chemistry Olympiad. This is apparently the right option which, however, is difficult to implement now, not only because of financial problems but also because of a major difference in the experimental skills possessed by Olympiad participants. Bringing the skills closer together for participants from different regions (e.g., from a big city and rural areas) appears to be a task even more complicated than that of providing finance to the experimental round.

With a view to improving young people's education, more than 30 years ago one of the authors of this study initiated introduction into the educational system (initially in higher, and subsequently, in secondary school) very promising and not yet famous in those days information technologies. Some time had passed, and it became perfectly clear that these technologies alone cannot ensure high-quality education and that the major challenge in this context will be to find the necessary information in the illimitable information space (which gets overgrown with "information trash" faster than a field with weeds). For over 10 years has this author been engaged at the Chemistry Department, Belarusian State University, in delivering comprehensive courses of retrieval of chemical information on the Internet and in databases. The other author of this study has been engaged in organizing and conducting schoolchildren Olympiads in chemistry both inside and outside Belarus for over 20 years. These two facts must have been specifically responsible for the authors' idea to undertake a natural step of integrating these seemingly incompatible spheres, Internet and Olympiads, into a unified and useful whole. Actually, this resulted in advancement of the conception of an unusual "experimental" round of online information retrieval intended as a component part of chemistry Olympiad.

Naturally, this form of intellectual competition will not cause antagonism in Olympiad participants, because it implies an activity (very familiar to them); it will actually require nothing more than their spending some time with a computer work (which unfortunately takes up most of today's young people's leisure, and not only leisure). Thereby, prospects for putting to advantage the negative realities of the information and communication boom can be opened. This fact also counted in favor of introducing online information retrieval assignments into the experimental round of chemistry Olympiad. Another benefit associated with implementation of this concept is that language

barriers in understanding the information retrieved can be virtually completely overcome due to easily accessible offline and online translators and interpreters (encyclopedias, dictionaries, and reference books).

We tested this approach in practice twice, both times during students' Olympiads in chemistry. The first experience was that with the first open competition among Belarusian higher school students specializing in chemical technology, which was held at the Chemistry Department, Belarusian State University, in December 2010. One of the experimental round assignments was that associated with online information retrieval. That Olympiad gathered about forty 1–5-year chemical technology students of higher education institutions of Minsk, as well as former chemistry Olympiad winners and prize-winners from the Belarusian State Medical University, whose academic background levels on theoretical and experimental chemistry were significantly different. Clearly, for evaluating the competition and deciding winners in that situation it was necessary to provide each participant with an opportunity for demonstrating his/her creativity to the full extent. In the theoretical round assignments, the interests of participants with totally different academic background levels can be easily accommodated (student participants of different years were offered assignments of varying complexity depending on the chemistry science domains already learnt by them). By contrast, in the experimental round it was virtually impossible, in our opinion, to develop assignments of equal complexity for students of different years and different specialties such that winners could be selected from among them all (including chemists, physicians, technologists, and even biologists). Actually, realization of this fact gave birth to the idea of providing all experimental round participants with absolutely equal opportunities via suggesting assignments that would invite them to find on the Internet answers to tricky questions about real world. Thereby, the problem of "expensive equipment and rare chemicals" on a massive scale could be solved very easily, because every participant needs nothing but a PC connected to the Internet. Safety problems that may arise while running the experimental round are negligible, and environmental problems are totally lacking (in a sense, this is a "green chemistry" event). Also, truly equal opportunities could be provided for all the Olympiad participants.

The retrieval of reliable information within specific timeframes is not a trivial task. Its accomplishment requires basic chemical knowledge, as well as certain skills and ability to divide the problem into parts, find solutions to each of these parts, and combine these solutions into a single whole. In our opinion, it is highly important that the information retrieval component is not an alien idea to the Olympiad conception. Along with professional knowledge, the ability for information retrieval is a skill essential for today's chemist researchers, which allows them to be at least certain of the topicality of their research, to say nothing of being able to generate new ideas on the basis of the available information. (In this context, it would be appropriate to recall the saying "it is easier to make than to find a discovery," which was popular a couple of decades ago in the scientific community and which pointed to the existence of a serious problem of information retrieval, detection, and extraction.). Appropriate statistics shows that a half of the monographs available in fundamental libraries have never been opened by readers, not because no one needed them but because, sometimes, readers simply had no idea of their existence.

Annex 1 presents, by way of example, the assignment suggested to participants of the open contest in chemistry, whose online information retrieval experimental round was the first implementation of the conception discussed. Annex 2 describes how that assignment was evaluated and also provides brief explanations and expected results with appropriate comments. Though uncommon and novel (students were prepared to a traditional experimental round), that assignment was received favorably by all the Olympiad participants.

For the second time the online information retrieval conception was implemented by us on a larger scale, during the open students' contest in chemistry which was held in spring 2011 at the Chemistry Department, Belarusian State University, as financially supported by BASF chemical company Representation in Belarus. That time, more "chemical" assignments were suggested to the participants, whose composition was more homogeneous in terms of the chemical academic background knowledge they possessed. Based on past experience, we modified the assignments in a way such that they not only included a searching element but also were oriented toward creative application of the information retrieved, as well as toward its analysis, comprehension, and processing, whereby the creativity of the assignments developed was significantly increased.

For details on how the computer capabilities can be used for efficiently extracting chemical information and planning the search, as well as on the location and accessibility of information for online resources and functioning of major archives of scientific publications, see [4]; useful practical recommendations are also available on website [5]. However, it should be remembered that Internet is a dynamic system in which, from time to time, some documents appear, and other disappear without a trace, according to their authors' wishes. Therefore, to be able to use the above-mentioned materials, the interested reader should carefully check whether these Internet resources are still existent.

Our experience suggests that the above-described approach has enormous potential for implementation at chemistry Olympiads. Quite obviously, it is possible to infinitely increase the complexity of assignments, formulate creative tasks based on the information retrieved in each preceding step of search, and ensure virtually identical background knowledge levels for all the participants (the missing information on a very wide range of topics, including translations from foreign languages, reference books, encyclopedias, etc., can always be found on the Internet). In our opinion, the above-said offers the hope of making the online information retrieval an integral part to schoolchildren's and students' Olympiads in chemistry on a wide scale in the near future.

REFERENCES

1. Reshetova, M.D. and Churanov, S.S., *Iz istorii Mendeleevskikh olimpiad* (From the History of Mendeleev Olympiads), in *Sovremennye tendentsii razvitiya estestvennonauchnogo obrazovaniya: rabota s odarennymi shkol'nikami* (Modern Trends in Natural-Sciences Education: Work with Gifted Schoolchildren), Lunin, V.V., Ed., Moscow: Mosk. Univ., 2010, pp. 137–145.
2. Eremin, V.V., Kuz'menko, N.E., Ryzhova, O.N., and Lunin, V.V., *Eksperiment s khimicheskim obrazovaniem v Rossii* (Experiment with Chemical Education in Russia), in *Sovremennye tendentsii razvitiya estestvennonauchnogo obrazovaniya: ot shkoly k vuzu* (Modern Trends in Natural-Sciences Education: from Secondary to Higher School), Lunin, V.V., Ed., Moscow: Mosk. Gos. Univ., 2010, pp, 2006, pp. 5–15.
3. Lisichkin, G.V. and Leenson, I.A., *Shkol'noe estestvennonauchnoe obrazovanie v sovetskoe i postsovetskoe vremya: tendentsii i perspektivy* (Natural-Sciences Education in School in Soviet and Post-Soviet Periods: Trends and Prospects), in *Sovremennye tendentsii razvitiya estestvennonauchnogo obrazovaniya: fundamental'noe universitetskoe obrazovanie* (Modern Trends in Natural-Sciences Education: Fundamental University Education), Lunin, V.V., Ed., Moscow: Mosk. Univ., 2010, pp. 37–52.
4. Rahoisha, A.A., *Poisk khimicheskoi informatsii v Internete: Poiskovye sistemy i tematicheskie katalogi: Uchebnoe posobie dlya studentov khimicheskogo fakul'teta* (Online Retrieval of Chemical Information: Search Engines and Subject Directories: Handbook for Chemistry Department Students), Minsk: Belarus. Gos. Univ., 2003.
5. Rahoisha, A.A., *Azbuka veb-poiska dlya khimikov* (ABC of the Web Search [online], Minsk: Belarus. Gos. Univ., 1999–2012; *http://www.abc.chemistry.bsu.by/*.

Annex 1

Consider the following situation: An acquaintance of yours, a manager in a juice producing company, has established right connections and persuaded you to start joint business in this sphere. Your partner knows how to deal with organizational issues, and you have to take upon yourself all the technological aspects. Your attempts to get advice from professionals failed: They instantly recognized a potential competitor and refused to supply you with the required information.

The above-described is a typical situation in the life of a beginner technologist. You see before you a fragment of the "Specification of Tomato Paste". Certainly, you noticed several misprints in the text: GROP (crop), G.B. (C.B.=cold break), monoydrete (monohydrate), steei (steel), etc. Then you saw unfamiliar terms, and this made you feel sad. Your partner is not able to explain the meaning of the text; the only two things he is certain about are that this is a proven supplier and that the specification in question caused no doubts in his former situation. You have to undertake by yourself the activities on organizing the work of the lab engaged in testing the quality of raw materials, so you need to have a grasp of the relevant terminology and take in the situation with the relevant literature. So help you the World Wide Web!

Rules of Registration of Solutions

The solutions should be briefly formulated (in one sentence).

The solutions should contain the URL address of the documents containing the reliable information extracted; otherwise solution is awarded zero points.

For documents retrieved by the Search method, the address may be replaced by URL information on the search form, provided (mandatorily!) with the list of all query parameters.

Specification of tomato paste. 28–30% Brix, G.B., Grop 2010

Specification. Method	Range
Brix (refractometer RFM 330)	28–30
pH (WTW pH-meter pH 537)	4.10–4.40
Total acidity, as citric acid monoydrete (titration with 0.1 M NaOH)	4.1–7.6%
Color a/b Gardner	2.15 minimal
Total sugars as invert sugars (ane-synon method)	46–55%
Bostwick at 12.5 brix, 30 s (stainless steei bostwik consistometer)	7–11 cm

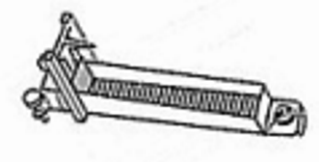
The list of all URLs should be duplicated and emailed to the jury.

(1a) What is meant by "Brix" in item 1 of the Specification? What is the meaning of numbers 28–30 in item 1 of the Specification?

(1b) What regulatory document effective on the territory of Belarus describes the technique for estimating the Brix parameter for tomato paste? (Provide the title of the document and its identification number; name the indication of the fact that the document is subject to compulsory implementation on the territory of Belarus).

(1c) What is the value of the Brix parameter, if the refractive index at 25°C for a specimen of the raw material sample is 1.3770? Does the raw material comply with the Specification (correction for the presence of acid may be neglected)?

(2a) Give the name of the device that is shown in the figure below. Which of the parameters mentioned in the Specification can be measured with the device?



(2b) What is the meaning of the numerical value of the parameter, given in the Specification?

(3a) Give the Russian name(s) of the method employed in analysis described in item 5 of the Specification.

(3b) Give the full title of the journal in which the method was published for the first time. Provide the URL address at which the paper is available in full text (PDF).

(3c) What regulatory document effective on the territory of Belarus describes the technique of analysis by the method? Where is the free full text of the document available?

(3d) Provide the identification number of the eponymous Russian regulatory document. Give your comments (a few sentences) concerning item 6.6 of the document.

A literature search revealed a paper dedicated to determination of the physicochemical parameters of products made from tomatoes in International Journal of Food Sciences and Nutrition (2009).

(4a) Provide the URL address of the journal.

(4d) Provide the DOI code of the paper.

(4c) Find and extract PDF full text of the paper (provide its location information).

(4d) Which of the samples described in the paper are similar to the paste described in the Specification in terms of the color of the product and pH value solely? Specify the designations used for those samples in the paper and their corresponding pH value, as well as the extent of compliance with the Specification requirements.

Your reflections about your own niche in the market have led you to patent literature from which you got a prompt, specifically, in the form of a technology for production of clear tomato juice as revealed by the information search in the European Patent Organization databases.

A very interesting Japan patent application which protects, among other "original" ideas, that of filtering grated tomatoes through a fabric, was published in 2008.

(5a) Find the patent document; give its title, registration number, and name and surname of the inventor.

(5b) In which way does the patent formula of the document specify the pore size of the cloth filter?

(5c) According to the Example (paragraph 0014), for the purposes of long-term storage, the resulting juice can either be frozen or ... (specify).

Annex 2

Task	Solution	Comments
(see Annex 1)	(Solutions containing references to documents providing clearly incorrect or conflicting information are awarded 0 points. Total score for all correct solutions = 50)	(Presented here is one possible search algorithm to find the solution)
1a	Brix (degrees Brix; Brix, %) is a unit of measurement of the content of dissolved substances in sugar-containing solutions. A reference to the article in English *Wikipedia* (http://en.wikipedia.org/wiki/Brix) is acceptable, since the information it contains does not contradict the data available from other (more reliable) sources. °Bx (Refractometer) = 28...30 means that the refractive index of the liquid component of the tomato paste is identical to that of the solution of sucrose with the weight proportion $w(C_{12}H_{22}O_{11}) = 28...30\%$. Reason: the formal definition given in GOST (State Standard) 28562-90 (e.g., archived at http://gostexpert.ru/gost/gost-28562-90): "The mass proportion of soluble dry substances (refractometer) means the mass proportion of *sucrose* in an aqueous solution whose *refractive index* is identical to that of the solution under study at the preset temperature and conditions of analysis".	The solution containing a reference to the article *Shkala Briksa (Brix)* in Russian *Wikipedia* is awarded 0 points. Reason: the presence of gross errors in the text of the article (example: "25°Bx solution – 25% (wt/wt) means 25 g of sugar per 100 g of liquid. Or, to put it another way, 100 g of solution contains 25 g of sucrose and 75 g of water."). The statement of the fact that the liquid component of the tomato paste (in the worst possible case, the paste itself) contains 28…30% (by weight) sucrose is not absolutely true, but contains some truth, and the solution is awarded 1 point.
1b	GOST 28562-90: Fruit and Vegetable Processing Products: Refractometric Method for Determination of Soluble Dry Substances Content (e.g., archived at http://gostexpert.ru/gost/gost-28562-90). This is an interstate standard (*which means that it is effective on the territories of Belarus and some other CIS member-states*).	This regulatory document is State Standard (GOST). Googling, e.g., the *gost refraktometricheskii metod opredeleniya briks (gost refractometric method determination Brix*) query easily leads to STB GOST (State Standard of Belarus) R 51433/PR: Fruit and Vegetable Juices. Method for Determination of Soluble Dry Substances on a Refractometer (http://www.tnpa.by/tnpa/TnpaFiles/pdf/stb-gost_51433-Soki-fr-ovosh_proekt.pdf), but this is only a draft of Belarusian standard. The solution providing a reference to this draft standard is awarded 0 points. The STB GOST P 51433/PR contains a useful hint (terms helpful in search for a valid standard) in item 4 "The Essence of the Method". An example of Google query: *GOST pokazatel' prelomleniya sakharoza (GOST refractive index sucrose)*. This query generates the desired result: GOST 28562-90. The solution suggesting a State or international standard that is not effective on the territory of Belarus but contains the desired technique is awarded 1 point. The solution providing references to documents other than Standard is awarded 0 points. The solution providing references to a Standard whose full text is inaccessible is awarded 0 points

Annex 2. (Contd.)

Task	Solution	Comments
(see Annex 1)	(Solutions containing references to documents providing clearly incorrect or conflicting information are awarded 0 points. Total score for all correct solutions = 50)	(Presented here is one possible search algorithm to find the solution)
1c	28.0 < °Bx < 28.1 Reason: GOST 28562-90. The raw material meets the Specification requirements.	The task can be solved using GOST 28562-90, with temperature to be incorporated into the formula given in item 5.1. $n_D^{20} = n_D^{25} + K(25–20) = 1.3770 + 0.00013 \cdot 5 = 1.3770 + 0.0006 = 1.3776$. The n_D^{20} and their corresponding °Bx values are given in Table 2 of the Annex to GOST: $n_D^{20} = 1.3775$, °Bx = 28.0 $n_D^{20} = 1.3777$, °Bx = 28.1 The solution which does not take into account the effect of temperature (i.e., that at $n_D = 1.3770$, according to Table 2, °Bx = 27.70, and the raw material supposedly does not meet the Specification requirements, because °Bx < 28) is awarded 1 point. The correct solution to entire item 1c, obtained with the use of a reliable normative or reference document other than GOST 28562-90, is awarded 2 points. The correct solution obtained with the use of reference data of uncertain reliability (e.g., from a book of problems) is awarded 0 points.
2a	Bostwick consistometer (Bostwick). It is used to determine the viscosity (fluidity). http://www.consistometer.com/ etc.	Googling unfamiliar terms mentioned in the Specification leads to the unambiguous solution in the case of *bostwick consistometer* query.
2b	A portion of the paste (diluted to °Bx=12.5) flows a distance of 7...11 cm in the trough within 30 s. http://www.pomidora.com/ua/content/61-materali	A suitable Google query for searching the analysis techniques is *vyazkos' po botsviku (Bostwick viscosity)*.
3a	Lane-Eynon constant titer method. http://vsegost.com/Catalog/99/9934.shtml, etc.	Googling *ane-synon method* does not lead to any successful result, which sets one to thinking and on the alert. Experimentation with combinations of terms and analysis of the documents retrieved lead to Lane-Eynon word combination. Example: the *total sugars as invert sugars method* query gives a list of results, among whose first items is the *Sugar – High Test Molasses* page; the *method* search at this page leads to "…Eynon and Lane method for Reducing Sugars…" fragment. Hence, the Specification contains another misprint: read *Lane-Eynon* instead of *ane-synon*. The Russian name of the method can be found by Googling *metod Lane-Eynon (Lane Eynon method.)*

Annex 2. (Contd.)

Task	Solution	Comments
(see Annex 1)	(Solutions containing references to documents providing clearly incorrect or conflicting information are awarded 0 points. Total score for all correct solutions = 50)	(Presented here is one possible search algorithm to find the solution)
3c	GOST 31049-2002: Starch Hydrolysis Products. Determination of the Reducing Power and Dextrose Equivalent. Lane-Eynon Constant Titer Method. http://www.gosstandart.gov.by/txt/glav-tnpa/docs/postanovl-9-2007.pdf etc. Republican Scientific and Technical Library of Belarus (7, Pobeditelei pr., room 504, technical standards reading hall). http://rlst.org.by/data_base.htm	Search the desired document by *metod leina einona (Lane Eynon method)* querying in *".by"* domain sites. The solution providing GOST R 50549-93, Russian patent, is awarded 0 points. Under international agreements, free distribution of the standard is prohibited. It is available from the official distributor, Belarusian State Institute for Standardization and Certification, for fee. Presumably, this standard is available to read for free in off-line library. Execute search, e.g., for *leina einona (Lane Eynon)* query, at the Republican Scientific and Technical Library of Belarus, electronic catalogue (http://rntbcat.org.by).
3d	GOST R 50549-93: Starch Hydrolysis Products. Determination of the Reducing Power and Dextrose Equivalent. Lane-Eynon Constant Titer Method. http://vsegost.com/Catalog/99/9934.shtml etc. According to the technique, the color change during titration SHOULD BE observed. Item 6.6 contains an apparent misprint: read *making it* possible instead of *making it impossible*.	Googling the Standard name. Item 6.6: ("A heating device suitable for keeping the boiling in accordance with the requirements of item 7.1.4, while making it impossible to observe the color change at the titration endpoint without extraction of the flask from the device.") The text looks absurd. Analyze item 7, the experimental technique.
4a	http://informahealthcare.com/ijf	Googling the journal title gives the desired URL.
4b	doi:10.1080/09637480802446621 http://informahealthcare.com/doi/abs/10.1080/09637480802446621	At journal pages, use the search system (*Advanced Search*). Conduct search for *tomato (title) 2009 (year)* query Paper: *Determination of physicochemical characteristics in different products of tomato varieties. 2009, Vol. 60, No. s1. Pages 126-138.* Authors: *Bulent Akbudak, Hasan Bolkan, and Nancy Cohen*. DOI code is available on the abstract page.
4c	Aggregator EBSCOhost. Database: Academic Search Premier. Access number: 43571772 Search phrase: *Title of the paper.* Search box: *Title*.	The Publisher's website does not provide free access to the full text. Search over open web shows that full text is not available. Conduct search over hidden web (e.g., repositories, password aggregators). Full text is available from EBSCOhost commercial aggregator via Belarusian State University network.

Annex 2. (Contd.)

Task	Solution	Comments
(see Annex 1)	(Solutions containing references to documents providing clearly incorrect or conflicting information are awarded 0 points. Total score for all correct solutions = 50)	(Presented here is one possible search algorithm to find the solution)
4d	Full compliance (both pH and color): CXD254. The same pH, close color: AB2. The same color, close pH: CXD203 and CXD179.	The pH values of the samples are listed in Tables 3 and 4 of the paper. Samples from the Table 4 are similar to the raw material described in the Specification. Take data from the line marked "P" (i.e., *paste*). Take color from *a*/*b* column (in the Specification, *a*/*b*≥2.15): Sample no. pH color, *a*/*b* AB2 4.25 (2.14) CXD179 4.41 (2.29) CXD203 4.49 (2.35) CXD254 4.30 (2.27) Consider $4.10 \le pH \le 4.40$ from the Specification.
5a	Method for Producing Tomato Juice Inventor: FUNADAIKU SHIGERU Publication info: JP2008086214 (A) - 2008-04-17	Conduct search in the esp@cenet database for *transparent tomato juice* query in *Title+Abstract* boxes. Retrieved are a little over ten patents, of which one satisfies the condition: year 2008, registration no. starts with *JP*.
5b	The patent formula (and the entire patent) does not specify the pore size of the silk fabric used as the filter.	Full text is available from esp@cenet database, though in Japanese and in graphical file format. Translating with the use of a standard translator (Google, etc.) makes no sense. Patent databases of the National Patent Office can be helpful in this case The *PAJ* website provides the desired tool, an automatic translator of Japanese patent documents. Retrieve the patent (search feature options: author's name, subject terms, registration no.). There is a "catch": search by name will not lead to the desired information, because the English translations of the titles, available from esp@cenet and PAJ, are textually different. Translation of the *Claims* gives the following fragment: "...and carrying out the natural fall of the part for liquid via a mesh of said silk from..."
5c	... adding an antiseptic (in other words, a preservation agent).	Translation of the *Example* gives the following fragment: "A mothball can be presented with the tomato juice 8 which comprises only the pure transparent ingredient stored in said container 6 by being frozen or throwing in an antiseptic etc." (The entire *Description* can be translated, but this will take much time).