ACTA TECHNICA CORVINIENSIS – Bulletin of Engineering
Tome V (Year 2012). FASCICULE 4 [October–December]. ISSN 2067-3809

[1.] Sorina Gabriela ŞERBAN

THE DETERMINATION OF PARAMETERS INVOLVED IN THE IDEAL GAS TRANSFORMING USING MICROSOFT ACCESS

[1.] UNIVERSITY POLITEHNICA OF TIMISOARA, FACULTY OF ENGINEERING FROM HUNEDOARA, ROMANIA

ABSTRACT: A transformation is a sequence of states through which a thermodynamic system when its parameters vary from baseline values to those in the final state. All thermodynamic properties at a time system are the system state. State parameters are all measurable physical quantities that characterize the unique thermodynamic state of the system. A substance is characterized, as we know, the state variables: pressure, volume, temperature, etc. At a certain amount of substance, these three variables are a well established interdependence of thermal equation of state. To ease the study of gases have made some considerations that lead to a relatively simple model study. This so-called ideal gas, the molecules are considered material points, and the interaction forces between molecules are void. It is obvious that this case can not be met in practice, but the considerations made on this system can be extended with some corrections and within certain limits, the real gas. The application is done using Microsoft Access and was made for students to be able to easily own knowledge about the transformations simple ideal gas of this gas. Students can calculate and make conclusions can be drawn, however this program is not meant to replace the teacher but to offer a tool to study in classes, the theory that parties are not very many. The menu is affordable, intuitive and helpful. For a better understanding of the application is structured in four parts.
KEYWORDS: transformation isobar, isochors transformation, isothermal transformation, the parameters of state, Microsoft Access

INTRODUCTION

Following the experiences with the constant volume gas thermometer was found that at very low pressures, tending to zero, all gases tend to behave the same way. Based on these considerations the notion of ideal gas is a homogeneous and isotropic gas whose molecules have their own volume and between them there are no interaction forces.

Ideal gas is a theoretical concept, it does not actually exist, but all gases tend to behave as the ideal gas (using the same law) when their pressure tends towards zero, as in this case, the volume of gas is very busy compared with the volume of the molecules (which becomes negligible), and greatly increase the distances between molecules and the forces of interaction between them also become negligible.

In 1661 Boyle Mariotte discovered in 1679 and experimentally verified and confirmed exactly that for an ideal gas in all possible states of an isothermal, the product of pressure and volume is constant, ie:

$$(p\cdot V)_{T=const}=const. \qquad (1)$$

For any two states 1 and 2 of the same isotherm:

$$(p_1\cdot V_1)_{T=const}=(p_2\cdot V_2)_{T=const}. \qquad (2)$$

In 1790 Charles found experimentally that if a given amount m of ideal gas occupies a constant volume when the pressure is proportional to the temperature, so their ratio is constant:

$$\left(\frac{p}{T}\right)_{V=const}=const \qquad (3)$$

For any two states that occupy the same volume of gas:

$$\left(\frac{p_1}{T_1}\right)_{V=const}=\left(\frac{p_2}{T_2}\right)_{V=const} \quad const \qquad (4)$$

In 1802 Gay-Lussac has shown that the volume of an ideal gas maintained at constant pressure varies linearly with temperature:

$$V=V_o+V_o\cdot\gamma\cdot(t-t_o) \qquad (5)$$

where: $\gamma[1/^oC]$ = volumetric expansion coefficient of ideal gas;

$V_o[m^3]$ = gas volume at the reference temperature to.

$$\gamma=\frac{1}{273{,}15}\left[\frac{m^3}{m^3\cdot{}^oC}\right]or\left[\frac{1}{^oC}\right] \qquad (6)$$

For any two states 1 and 2 volume ratio is:

$$\left(\frac{V_1}{T_1}\right)_{p=const}=\left(\frac{V_2}{T_2}\right)_{p=const} \qquad (7)$$

DESIGN AND IMPLEMENT APPLICATION

Data was stored in an Access database type, called ChimUniv. As an Access database type it includes all the items needed for the application: data tables, forms, query requests, reports, macros, modules.

Today there are applications that do not have a graphical interface through which to access the program options. Therefore, it was developed and implemented a main interface that allows accessing various options of the application, using the mouse and keyboard. The main interface has the layout presented in Figure 1.

It is noted that there are several command buttons, labeled, to be used to select various options of the program. The main menu contains a summary of this application, and skills that they need to learn the student until the end of time.

For a better understanding of the application is structured in four parts, each with several components:

- Isothermal transformation: definition, graphical representation,
- Isobar transformation: definition, graphical representation,
- Transforming izocoră: definition, graphical representation,
- Ideal gas law applied problems.

Figure 1. Main Meniu

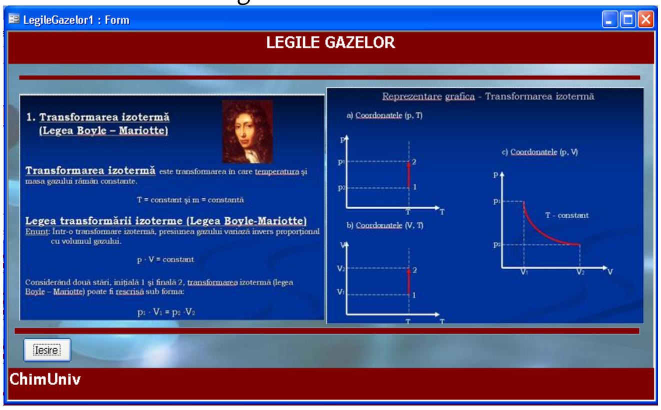

Figure 2. Isothermal transformation

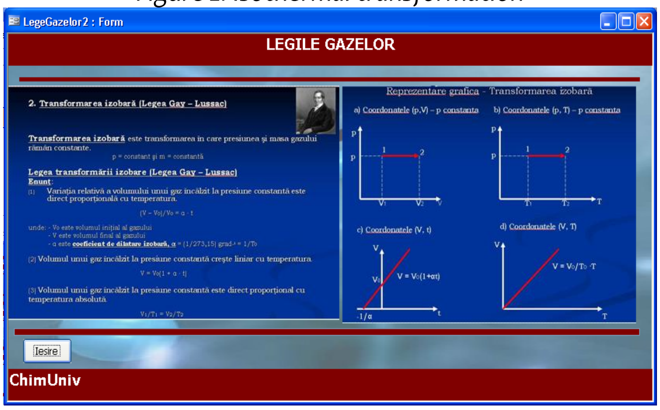

Figure 3. Isobar transformation

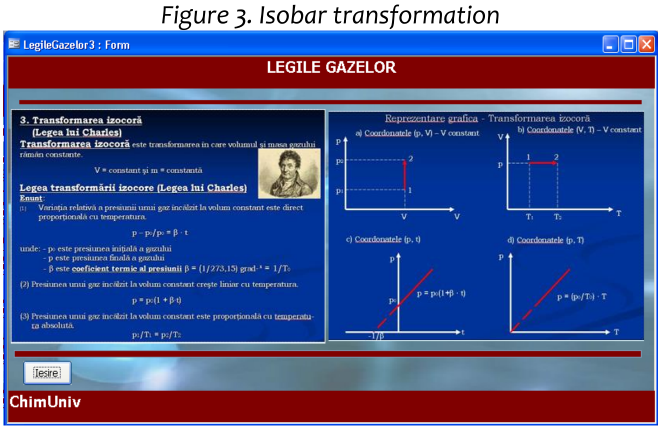

Figure 3. Isochors transformation

Figure 2 is the transformation of the isotherm shape and includes a summary of Boyle-Mariotte law and is made in the same way as the other two forms (Figure 3 and Figure 4).

Gas Laws form includes all three transformations, and moreover appears Van der Waals equation and the Clapeyron-Mendeleev equation. By activating the buttons, will open the forms that will present an example of application to each law separately. Clapeyron-Mendeleev equation in the case is five examples of problems.

Each application / problem has boxes where the student will enter data in the problem statement will be executed transformations and the application will calculate what the problem is required. Each form has a pressing „Clear" button that will clear the boxes and other data can be entered and a button"to exit" out of the application.

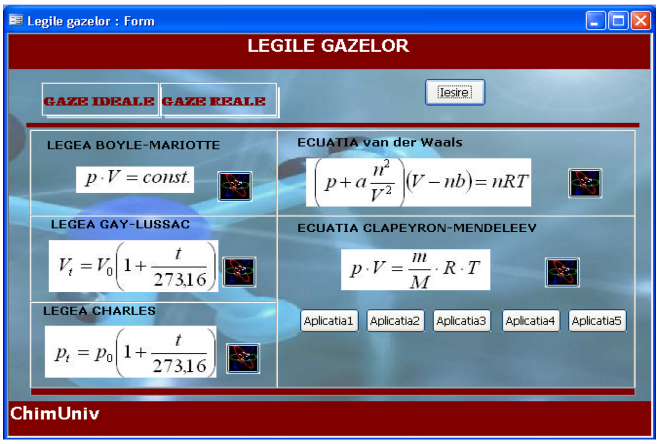

Figure 4. Application of Gas Laws

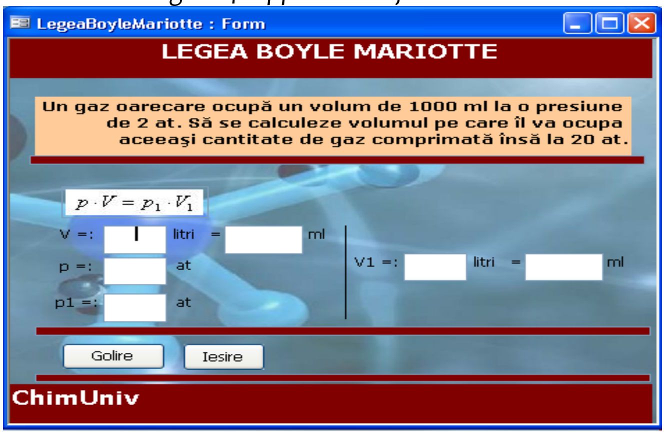

Figure 5. Application of Boyle Mariotte Law

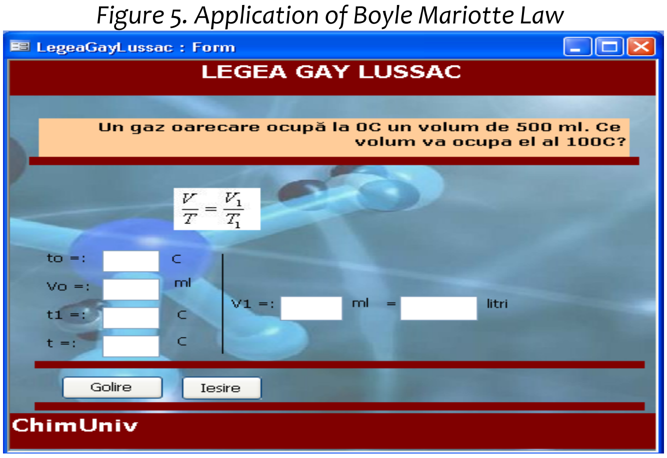

Figure 6. Application of Gay Lussac Law

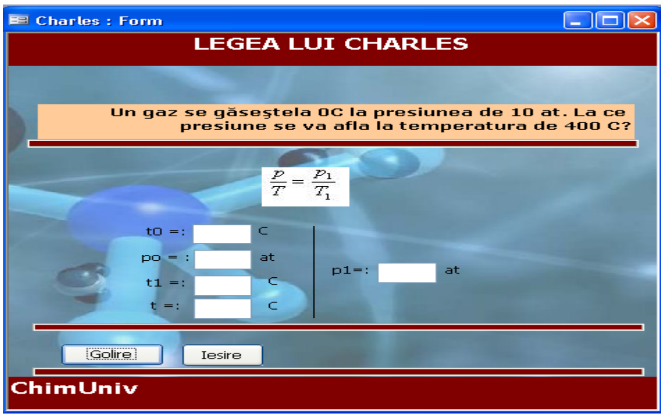

Figure 7. Application of Charles Law

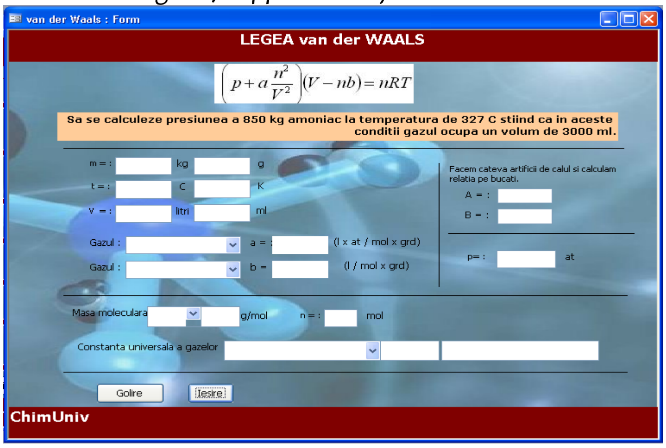

Figure 8. Application of van der Waals Law

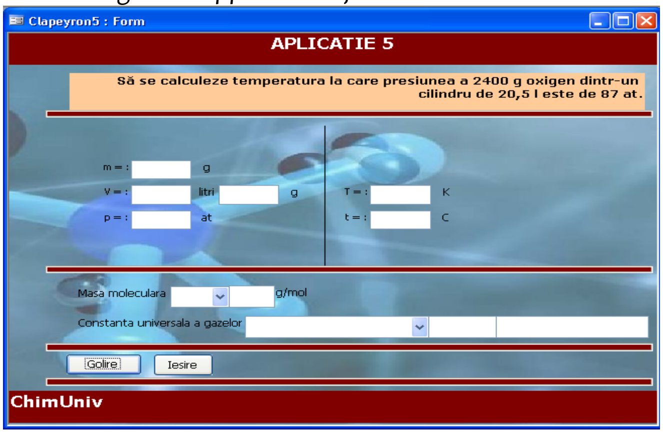

Figure 9. Application of Mendeleev Clapeyron Equation

Submitted application can run on the following conditions: - the existence of a computing system, Pentium I 200 MHz at least 32 MRAM available - there is a Windows operating system and Office 2003 package.

It can be converted and Office 97, if this software is available.

Experimental data processing by computer is faster, more complete, attractive and can help increase motivation and interest of students to study Chemistry.

CONCLUSIONS

Feedback provided by participants (pupils, students), underlines the strong impact that the use of educational software can play in teaching and learning chemistry. Such applications are considered as an alternative to the real experiment and a means to improve understanding by learners of abstract concepts. They may increase the motivation of students to learn and to engage their interest in making science topics. Clearly, the attractiveness is enhanced lessons, the teacher is the best choice in joining the virtual real experiment.

Using educational software will increase the competence and creativity, increasing the average educational attainment and higher to increase the knowledge base of students, and generally to increase the use of information technologies in various fields activity.

Development of educational software, with the pupils / students is one way to attract those who are less interested in Chemistry.

I must mention that this application is part of my doctoral thesis (still unfinished at this point), which includes a number of such applications developed with Microsoft Access and others.

ChimUniv system development aimed at creating an easy to use for both learners, but perhaps especially for teachers, given that a very large extent, success depends on the availability of this in a manner such educational programs more attractive. Feedback is always assured.

The point at which we started in implementing this system was that the information could greatly facilitate the study of chemistry in school and university, this is because, using the computer can accumulate knowledge in a more intuitive and more attractive.

REFERENCES

[1.] Eleonora Neacşu, Bazele termotehnicii, Litografia Institutului Politehnic „Traian Vuia", Timişoara 1990

[2.] Mădărăşan, T, Bălan, M., Termodinamică tehnică – Editura Sincron, Cluj Napoca, 1999

[3.] Atkins P.W., Trapp C.A., Exerciţii şi probleme rezolvate de chimie-fizică, Editura Tehnică, Bucureşti, 1997

[4.] Ionel Muscalagiu, Teodora Petraş, DATABASE Visual FoxPro DBMS software, Mirton Publishing House, Timisoara 2002

[5.] Mihai Drăgănescu, Computers and Society, Technical Publishing House, Bucharest 1986

[6.] Florescu Vasile, Baze de date – fundamente teoretice şi practice, Editura Infomega, Bucureşti, 2002

[7.] A. Adăscăliţei, Computer Assisted Training, IAC. Multimedia Information Systems Design, Internet source http://www.ee.tuiasi.ro/~aadascal/

[8.] Eduard Koller, Monica Roşculeţ, Programming in Access 97 , Theory, Bucharest 2002

[9.] Sorina Şerban, Computer Training in Chemistry: Strengths and Weaknesses, Acta Technica Corviniensis – Bulletin of Engineering, Fascicule 2, Tome III, 2010.

[10.] Sorina Şerban, Educational soft for chemistry, Annals of Faculty of Engineering Hunedoara, 2006, Tome IV, Fascicule 3

[11.] Sorina Serban, Analysis and design of information systems, Acta Technica Corviniensis – Bulletin of Engineering, Fascicule 3, 2012, 49-52

[12.] Grupul BDSEIG, Baze de date. Fundamente teoretice şi practice, Editura InfoMega, 2001

[13.] Thomas Connolly, Carolyn Begg, Anne Strachan, Baze de date. Proiectare. Implementare. Gestionare, Editura TEORA, 2001
[14.] M.D. Popovici, Virtual Reality: Technology components, Politehnica University, Bucureşti, 2002
[15.] Sorina Şerban, Vasile Alexa, About the concept of educational software and the implementation in the University educational System, 1st Regional Conference - Mechatronics in Practice and Education MECH - CONF 2011, Subotica, Serbia, 357-362
[16.] Vasile Alexa, Imre Kiss, Sorin Aurel Ratiu, Vasile George Cioată, E-Learning Practice in Performing the Laboratory Works Specific to the Pneumatic Drives, 1st Regional Conference - Mechatronics in Practice and Education MECH - CONF 2011, Subotica, SERBIA, 34-38
[17.] Sorin Aurel Ratiu, Vasile Alexa, Imre Kiss, Ana Josan, Virtual Didactic Laboratory for the Interactive Study of an Internal Combustion Engine Management System, 1st Regional Conference - Mechatronics in Practice and Education MECH - CONF 2011, Subotica, SERBIA, 316-320
[18.] xl. Cerghit, Teaching methods, Polirom Publishing House, Iaşi, 2006
[19.] I. Jinga, E. Istrate, Training and computer-assisted assessment, ALL Publishing House, Bucuresti, 2006
[20.] F. Moldoveanu, Z. Racovita, S. Petrescu, G. Hera, Computer graphics, Teora Publishing House, 1996
[21.] B. J. Reiser, I. Tabak, W. A. Sandoval, B. Smith, F. Steinmuller, T. J. Leone: BGuILE – Stategic and Conceptual Scaffolds for Scientific Inquiry in Biology Classrooms, Cognition and Instruction: Twenty five years of progress, Mahvah, NJ: Erlbaum, 2001
[22.] Baek, Young K., Layne, Benjamin H., Color, graphics, and animation in a computer-assisted learning tutorial lesson, Journal of Computer-Based Instruction, Vol 15(4), 1988, 131-135
[23.] Roger P. Gladwin, Don Margerison, Steve M. Walker, Computer-assisted learning in chemistry, Computers & Education, 19, l1–2, 1992, 17-25
[24.] I.D. Benest, Computer-Assisted Learning using dynamic electronic books, Computers & Education, 15, 1–3, 1990, 195-203
[25.] A. Jones, E. Scanlon, C. Tosunoglu, E. Morris, S. Ross, P. Butcher, J. Greenberg, Contexts for evaluating educational software, Interacting with Computers, 11, 5, 1999, 499-516
[26.] Dee Baldwin, Joyce Johnson, Peggy Hill, Student satisfaction with classroom use of computer-assisted instruction, Nursing Outlook, 42, 4, 1994, 188-192
[27.] Hossein Mahdizadeh, Harm Biemans, Martin Mulder, Determining factors of the use of e-learning environments by university teachers, Computers & Education, 51, 1, 2008, 142-154
[28.] Roşca, Ioan Gh., Zamfir, Gabriel, Apostol, Constantin-Gelu, Bodea, Constanța-Nicoleta, Informatica instruirii, Editura Economică, Bucureşti, 2002
[29.] Zamfir, Gabriel, Integrarea aplicațiilor în instruirea asistată, Editura Economică, Bucureşti, 2001

ACTA TECHNICA CORVINIENSIS – BULLETIN of ENGINEERING
ISSN: 2067-3809 [CD-Rom, online]