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INTERACTIVE STUDENTS TRAINING AND EVALUATION SOFTWARE FOR RADIOISOTOPES

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Abstract

The present paper is focused on interactive students work with computer for detailed understanding of radioactive disintegration, fission and fusion, as well as corrects writing of nuclear reactions. A PHP program has been done to verify veracity of some equations of nuclear reactions, general questions about radioisotopes, as well as the observation of some reactions that are animated, and this is available through http Internet protocol at the address:

http://academicdirect.ro/virtual_library/molecular_dynamics/radio_isotopes/

Keywords: radioisotopes, PHP program, nuclear reaction.

1. Introduction

The isotopic marked compounds induce an activity sphere that offers many synthetic and applicative possibilities. The marked compounds have numerous applications, the principal direction of their use at this moment being the syntheses reagents, biosynthetic substrates, the establishment of metabolic schemes, the study of adsorption phenomenon, in vivo and in vitro clinical tracers diagnosis, toxicological and pharmacological studies, as well as establishment of mechanism reactions.[1]

From the discovery of radioactivity until now there were discovered more than 1200 radio nucleuses.[2,3] *The radioactivity* is defined as the property of nucleuses (of some nuclides) to emit spontaneously α, $\beta^{\pm}$ particles or to suffer an electronic capture and γ disintegration.[4]

Heavy charged particles can suffer three types of interactions:[5] (i) collision with atomic electrons (the most important); in these collisions the α radiation lose its energy in proportion of more than 98% and the effects of collision are excitation (detectors used in study of α radiations: ZnS), ionization (complete removal of electrons from atoms or molecules, originating positive and negative ions) and dissociation, (ii) braking in electric field of nucleus (reemission of γ and X radiations), (iii) nuclear reactions that are taking place with a very low probability, of aproximatively 10^{-3} %.

2. Software

A client server application was build. For implementation of the software, HTML language was choused to the easiness to run and use. Only a computer with windows operating system and Microsoft Internet Explorer ≥ 4.0 is enough to run all *.htm* files.

Also, a set of php programs for evaluation of students was implemented. PHP (post-processed hypertext) language is a very easy to use and is a server-dedicated software. The php page request is send to web server, and the server using mod_php module process the page, compile the program, execute the instructions and send to the client-processed data in html format.

Implementation

A entry interface was putted into a web server at URL (see fig. 1).

See reactions link leads to a page, which contain a set of nuclear reactions tabulated into a table with three columns. The page is under constructions and it contains until now a number of 25 reactions. Every reaction is animated one and is saved into GIF format. In figure 2 is presented an example of this type (…) captured in few moments of evolution.

http://academicdirect.ro/virtual_library/molecular_dynamics/radio_isotopes/index.php

Fig. 1. The entry point interface into web program

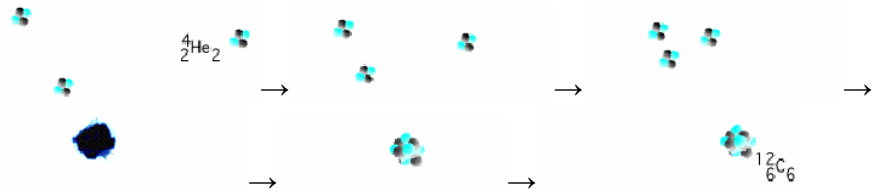

Fig. 2.Fusion of three molecules ^4_2He

See animations link leads into a page with a picture with a nuclear plant, most frequent artificial source of nuclear reactions. When user move the mouse pointer over the image, the image source is modified and page shows a technological scheme of a nuclear reactor.

The page, at URL:

http://academicdirect.ro/virtual_library/molecular_dynamics/radio_isotopes/filme/

it contain a select control which allow to chouse a audio-video file saved as *.avi.

Selection of one avi file makes that the source of picture to be replaced with selected animation. The animation starts then user moves the mouse pointer into movie area and it plays at two times. The repetition is possible by moving again the mouse pointer into movie area.

Test1 link goes to a test with 6 questions and every with 4 answers. User chouse the correct answer for every question and submit data to the server. The php program verifies answers and computes the resulted score and displays it onto the client browser.

Test2 link goes to a set of 10 nuclear reactions equations. The mission of the user is to chouse the correct atomic number (Z) and mass number (A), element (X) or particle from a list with more than one value (see figure 4).

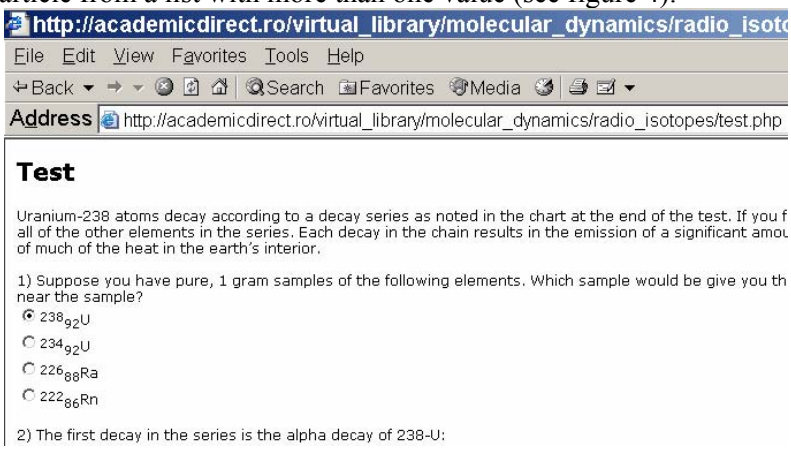

Fig 3.Test for knowledge checking

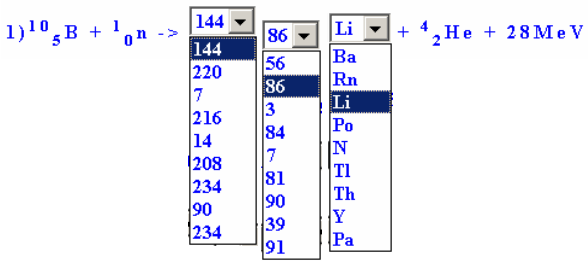

Fig. 4. Nuclear reaction equation

3. Conclusions

The program leads to a more efficient activity of teaching learning at chapter "Nuclear reactions", by the specific dynamism of animations and through immediate evaluation, shorting the time of assimilation the new notions.

The client-server interface determines the program to be able to be executed from anywhere, using any computer bound to Internet, which determine that this application to be ideal for distance education also.

Study of radioisotope and of these reactions has distinct applications in biology. A particular interest presents radioisotope that emit β particles with low

energy, especially carbon-14 (^{14}C), phosphorus-32 (^{32}P), tritium (^{3}H), because they are incorporated in a great number of organic substances, which represent forerunners for different synthesis.[6] The use of marked substances with radioisotopes ($^{32}PO_4$, timidina-^{3}H, citozina-^{3}H, uridina-^{3}H, metionina-^{31}S) has remarkable results on biosyntheses of some cellular chemical constituents and it's possible to explain the moment and the mechanism of genetic material retorting [7,8], the fundamental biochemical processes, genetic recombination by cross-over procedure.[9, 10]

It was studied closely the nitrogen metabolism at different plants: the absorption of azotate compounds, the protein metabolism, the settling of nitrogen from air, as well as the establishment of comprising time of nitrogen in aminoacides, proteins and chlorophyll, in different parts of the plant.[11, 12] Between the most interesting applications of oxygen-18 are the investigations on the light effect in respiration of green plants, the mechanism of Hill reactions, mechanism de splitting phosphatic and phosphorilitic, formation of adenosine triphosphate in oxidative phosphorilation, source of oxygen in respiratory CO_2.[13, 14]

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