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FROM THE EXPERIENCE OF IMPROVING STUDENTS' SCIENTIFIC LITERACY IN CHEMISTRY

Abstract: This article presents an issue of practical methodological content intended to further increase the level of scientific literacy of students, develop non-standard and creative thinking abilities, and create high knowledge and skills.

Key words: soda, carbon dioxide gas, food industry, cooking, sodium carbonate, sodium hydrogen carbonate, metal atom, salts.

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Introduction



Picture 1.



Philadelphia, USA

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We know that baking soda is also called bread soda in the local language and it is mainly used in the preparation of dough, baked goods and desserts using flour products. The food industry and cooking are unthinkable without baking soda. Because when baking soda is heated, carbon dioxide (CO_2) is released. The released gas makes the dough porous. This, in turn, is one of the main reasons for the perfect taste and appearance of the finished dessert or dish.

1- question

Using the information above, choose the answer that correctly states the chemical formula for baking soda?





Baking soda belongs to the fourth class of inorganic compounds, which is considered the main branch of chemistry, that is, the family of salts, and is known as sodium bicarbonate as a salt. The composition of this salt includes a metal atom, hydrogen and an acid residue, so it is considered an acid salt. Sodium bicarbonate decomposes when it is



2- question

Among these reaction equations, determine the correct line of the reaction equation for the decomposition of baking soda?



Picture 3.

3- question

Dear reader, you have identified the correct answer to question 2, you must find the solution to question 3 using this answer.

According to the molecular formula of sodium bicarbonate, the mass of one mole is 84 g / mol, that is:

 $A_{r\,Na}\!=\!\!23$ g/mol; $A_{r\,H}\!=\!\!1g/mol;$ $A_{r\,O}\!=\!16$ g/mol; A_{r} $_{C}\!=\!12$ g/mol

Mr(NaHCO₃)=23+1+12+(16x3)=23+1+12+48= 84 g/mol

According to the molecular formula of sodium carbonate salt, the mass of one mole is 106 g / mol, that is:

 $Mr(Na_2CO_3) = (23x2) + 12 + (16x3) = 46 + 12 + 48 = 10$ 6g/mol

The volume of 1 mole of any gas (here CO2) under normal conditions is equal to MV=22.4 liters, this volume is called the molar volume.

The above data show that when 84 g/mol of soda is heated and decomposed under normal conditions, 106 g/mol of sodium carbonate and 22.4 liters of carbon dioxide are released.

ATTENTION! Calculate how many grams of sodium carbonate and how much carbon dioxide is released under normal conditions when 8.4 g of sodium carbonate, that is, soda, is heated and decomposed. Arrange the results in the order shown in the table 1 below.

Name, chemical formula and mass of the heated substance	The name of the formed salt and its mass (g / mol)	Name and volume of gas emitted under normal conditions (liters)	Name and chemical formula of other manufactured products
Baking soda, sodium bicarbonate NaHCO3	sodium carbonate Na2CO3 106 g/mol	Carbon dioxide CO ₂ 22,4 liter	water H ₂ O
84 g/mol			

Table 1.



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Baking soda,				
Sodium hydrogen carbonate NaHCO ₃ 8.4 g/mol	?	?	-	

During the implementation of this task, the reader will first of all receive information about the high importance of the use of soda in everyday life, and the food industry and medicine are unthinkable without the use of soda. They learn the name of soda as a chemical substance, its chemical formula, the equations of reactions of its decomposition into substances when heated. By determining the correct answer to the control questions, compiled using the information from the above question, the student will be able to fully understand the technique of making bread products and the essence of the stages of the baking process.

Based on STEAM-education, in the field of natural and economic sciences, to demonstrate the relevance of the acquired knowledge, skills and abilities of students in everyday life, conducting educational research, setting up experiments, aimed at educating their creative abilities in design, developing their interest in creating news . Practical exercises, laboratory work, independent performance and creative, creative thinking, instilling in the minds of the younger generation to work with complex practical problems, is considered one of the main tasks facing the teacher. It serves to increase scientific awareness and practical competencies.

In the process of studying the subject of chemistry, students will gain an understanding of the composition of substances, the distinction between chemical terms, human activities and chemical processes occurring in nature. Students study the differences between chemical compounds, the basis chemical of natural systems, the interdependence of the structure and composition of substances. The skills of careful handling of chemicals, household chemicals and conducting experiments based on them are being formed.

COMPETENCE OF SCIENTIFIC AWARENESS. - knows, represents and understands the essence of various natural objects, phenomena and processes based on theoretical knowledge; explains and applies in practice natural phenomena and processes observed in everyday life, based on the acquired knowledge, skills and competencies related to the terms, concepts and general laws of natural science; observes events, conducts research, experiments and measures the necessary quantities with the help of tools (stopwatch, scales, tape measure, thermometer, etc.), makes calculations; analyzes and sorts information given in various sources of information, uses them for educational purposes and understands the opinions expressed in the process of communication, thinks independently and creatively; aware of the socio-economic, scientific and technical news taking place in society, and can creatively develop their activities; knows the role of natural and other resources in the life of society and their significance in personal activities; explains the positive and negative impact of man on the environment and can indicate the causes of global and regional environmental problems; puts forward ways and ideas for solving environmental problems, expresses his opinion; knows the theoretical and practical foundations of health and a healthy lifestyle.

PRACTICAL COMPETENCE - is able to find the necessary information from various information sources, apply it in personal and professional activities; applies knowledge, skills and abilities obtained from the natural sciences to solve problems that arise in personal, professional and social activities; observes safety rules and uses various equipment wisely; mobilizes his practical skills for the sustainable development of his life and the area where he lives; are able to direct available opportunities and resources to innovative activities and make a positive contribution to the well-being of people; realizing the unity of man and nature, effectively uses nature and natural resources; eliminates and preserves factors that have a negative impact on the environment and ecology, and adheres to a healthy lifestyle in its activities; thinks creatively and logically in his daily activities. consciously plans his intellectual development, can control and evaluate the results of his educational activities.

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