Society of Chemists and Technologists of Macedonia
Chemistry competitions for elementary and high school students

CODE:

(filled in by the jury)

FOR THE JURY ONLY

Total points: _____
Checked by:

_____
(Name Surname)

RULES FOR THE REGIONAL CHEMISTRY COMPETITION 2022

1) The competition **starts at 12 o'clock and lasts for 90 minutes**. The tests that are handed after the given time will not be considered for scoring.

2) The maximal score is 50 points (30 points from multiple choice questions and 20 points from the problems, as given in the test)

3) The tests are stapled with an envelope on the top. In the envelope there is piece of paper on which every competitor should fill in the requested data: name and surname, school, supervisor etc. and then close (seal) the envelope.

4) **No signature, or any mark is allowed on the envelope and on the test**. The code on the test, below and on the envelope, is filled in by the jury. If any signature or mark is found on the test or envelope, the competitor will be disqualified.

5) The competitors should bring a blue pen with them. The test should be solved by this pen only. **It is not allowed to use a pencil.**

6) Each competitor should leave the **cell phone** at the teacher's desk at the beginning and take it back at the end after handing over the test.

7) A calculator can be used for the numerical problems.

8) A conversation between the competitors during the competition is forbidden as well as using books, notebooks, any other paper, the periodic table of the elements etc. All necessary data are given in the test.

9) A competitor that does not follow any of these rules/recommendations shall be eliminated from the competition.

ПЕРИОДЕН СИСТЕМ НА ЕЛЕМЕНТИТЕ

PART I. MULTIPLE CHOICE TEST WITH ONE CORRECT ANSWER
(Answer by circling just one of the answers marked with A, B, C or D)

1. Which scientist assumed that electrons would have to move around the nucleus, being at precisely defined energy levels?
   A. Thomson
   B. Rutherford
   C. Bor
   D. Mosley

2. What is the mass number of one of the chlorine atoms?

   A. 17
   B. 18
   C. 35
   D. 35,453
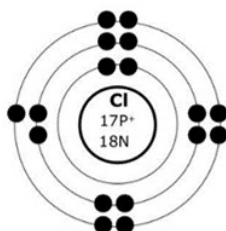
3. An atom has two electron shells and three valence electrons. This is the atom of which element?
   A. Si
   B. B
   C. Li
   D. He

4. How many atoms in total are there in three molecules of an oxide of 6-valent sulfur?
   A. 3
   B. 4
   C. 9
   D. 12

5. The chemical formula of arsenic(III) sulfide is:
   A. AsS_3
   B. As_2S_3
   C. As_4S_3
   D. As_2S

6. The valences of sulfur in Na_2S, CuS и Ni_2S_3, respectively, are:
   A. 2, 1, 2
   B. 2, 1, 3
   C. 1, 1, 1
   D. 2, 2, 2

7. Violeta noticed that the rate of a chemical reaction increased as the temperature of the system increased. Which of the following statements best explains why thermal energy causes an increase in the reaction rate?
   A. The concentrations of the products decrease.
   B. The surface area of the product particles decreases.
   C. The number of collisions between reactant particles increases.
   D. The concentrations of the reactants increase.

8. What can be assumed based on the following diagrams?

   I   II
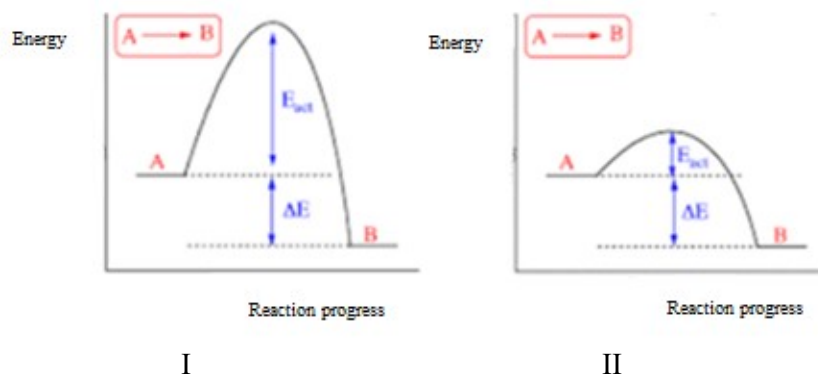
   A. The reaction I takes place in the presence of an enzyme
   B. The reaction II takes place in the presence of an enzyme
   C. The reaction I produces a larger amount of products
   D. The reaction II produces a larger amount of products

9. Which of the following occurs in an ionic bond?
   A. Two ions share protons.
   B. Two ions share electrons.
   C. Similarly charged ions attract each other.
   D. Oppositely charged ions attract each other.

10. The products of the reaction between iron(III) oxide and carbon monoxide are elemental iron and carbon dioxide. The sum of the smallest possible integer stoichiometric coefficients in the balanced chemical equation of this reaction is:
    A. 6
    B. 7
    C. 9
    D. 12

11. Which of the following metals reacts most violently with oxygen from the air?
    A. Sodium
    B. Copper
    C. Gold
    D. Aluminum

12. One way of producing copper would be to add a metal to an aqueous solution of copper(II) sulphate. That metal can be:
    A. Platinum
    B. Gold
    C. Carbon
    D. Iron

13. Which product is NOT formed during the reaction of lithium carbonate and nitric acid?
    A. Hydrogen
    B. Water
    C. Lithium nitrate
    D. Carbon dioxide

14. Which products will be obtained by reaction between HCl and $Mg(OH)_2$?
    A. Mg_2Cl and H_2O
    B. $MgCl_2$ and H_2
    C. $MgCl_2$, H_2 and O_2
    D. $MgCl_2$ and H_2O

15. When substance X is added to a solution of acid Y, a colorless gas is formed which obscures the lime water. Substance X could be:
    A. metal
    B. metal oxide
    C. metal hydroxide
    D. metal carbonate

Write your answer at the designated place.

1. Write the individual parts of the atom, in the marked places, next to the arrows.
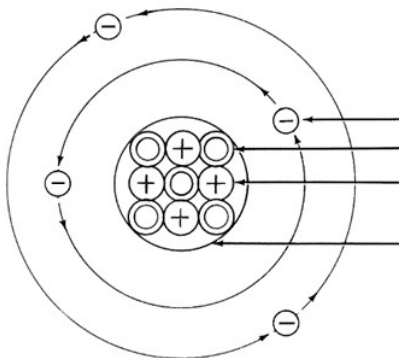
    There are _____ electron shells in this atom.
    The atomic number is _____, and the mass number is _____.

7 бода

Electron / s   Neutron / s   Proton / s   Atomic nucleus / nucleus   2   4   9

2. Statements (1-4) below describe the "mysterious substance". On the blank lines behind the statements, write the **letter / letters** before the name(s) of the substance(s) (A-G) that do NOT correspond to the given description, and in each subsequent statement do not take into account and do not write down the previously eliminated substances. The solution (mysterious substance) is the substance that you will not eliminate with the four statements.

A. N_2O_3
B. N_2O
C. CO_2
D. NH_3
E. HCl
F. SO_2
G. CO

1. I am an oxide. _____

2. My molecule does not contain an equal number of atoms of the corresponding elements.

_____

3. The element (except oxygen) in my composition is neither from the 14th nor from the 16th group in the Periodic table. _____

4. I do not form salts with hydroxides. _____

The mysterious substance is _____.

5 бода
(за секое тврдење се доделува или 0 или 1 бод)

NH_3, HCl CO CO_2, SO_2 N_2O_3 N_2O

3. Name the following compounds given by chemical formulas:

A. $CuSO_3$ _____

B. CuS _____

C. CuO _____

D. Cu_2S _____

E. $CuSO_4 \cdot 5H_2O$ _____

F. CoO _____

G. $CoHPO_4$ _____

H. $Co(OH)Cl$ _____

8 бода

Copper(II) sulfite
Copper(II) sulfide
Copper(II) oxide
Copper(I) sulfide
Copper(II) sulfate pentahydrate
Cobalt(II) oxide
Cobalt(II) hydrogenphosphate
Cobalt(II) hydroxide chloride