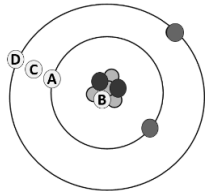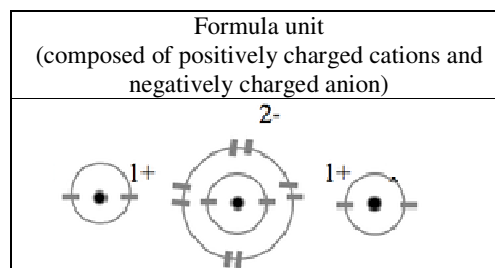**Answer by circling the letter in front of one of the offered answers. Every correct answer is worth 2 points. Every incorrect answer is worth negative 0.25 points. If the question is left unanswered it is worth 0 points. If the question is circled with pencil or if two answers are circled or the answered question is crossed out it will be marked with negative 0.25 points.**
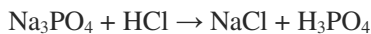
1. Carefully go over the following statements and circle the correct answer.
   A. The laboratory beaker is used for precise measurement of volume.
   B. The pipette is used for mixing liquids.
   C. Mortar and pestle are used for heating substances at high temperature.
   D. Graduated cylinder is used for approximate measurement of volume.

2. In Rutherford's experiment most of the alpha particles:
   A. got absorbed on the foil.
   B. went through the foil.
   C. combined with the foil.
   D. got deflected by the foil.

3. According to Bohr's model the electrons cannot be found in any of the following locations:



   A. B and C
   B. A and B
   C. B and D
   D. A and D

4. The atomic mass number of one element is 39 and the atomic mass number of the atom of the next element in the same period of the periodic table is 40. The two atoms have:
   A. Same number of protons and different number of neutrons.
   B. Same number of neutrons and different number of protons.
   C. Same number of protons and neutrons but different number of electrons.
   D. Same number of protons but different number of electrons.

5. Which pair of species have the same number of electrons?
   A. $^{16}_{8}O^{2-}$ and $^{16}_{8}O$
   B. $^{16}_{8}O^{2-}$ and $^{18}_{8}O$
   C. $^{16}_{8}O^{2-}$ and $^{18}_{8}O^{2-}$

   D. $^{16}_{8}O^{2-}$ and $^{32}_{16}S^{2-}$

6. The elements of the second group in the periodic table of elements are known as:
   A. alkaline earth metals
   B. alkaline metals
   C. halogen elements
   D. transition metals.

7. Which of the following substances will react violently with water and form a base?
   A. cobalt
   B. magnesium
   C. potassium
   D. ammonia.

8. The important difference between the current Periodic table of elements and the one created by Mendeleev is:
   A. Both tables are the same.
   B. Mendeleev's table does not order the elements according to the periodic repeating of their properties .
   C. The elements in the current table are ordered according to the increasing atomic mass.
   D. The elements in the current table are ordered according to the increasing of their atomic numbers.

9. The atoms of all the elements in the same period have:
   A. different number of neutron
   B. the same number of electron shells и
   C. different number of electrons
   D. all the above statements are correct.

10. Which of the following compounds contain covalent bond?
    A. NaCl
    B. MgO
    C. $SiO_2$
    D. $CaBr_2$

11. If every atom of oxygen in the molecule of sulfur dioxide forms two covalent bonds, how many bonds does the sulfur atom form?
    A. one.
    B. two.
    C. three.
    D. four.

12. Circle the label in front of the element whose atoms have five valence electrons:
    A. $_5E$
    B. $_{10}E$
    C. $_{15}E$
    D. $_{20}E$

13. What is the valency of arsenic in $As_2O_3$?
    A. I
    B. II
    C. III
    D. IV

14. The formula of ammonium sulfate is:
    A. $(NH_4)_2SO_4$
    B. $NH_4(SO_4)_2$
    C. $NH_4SO_4$
    D. $(NH_3)_2SO_4$

15. The catalyst changes the rate of the chemical reaction in such a way that:
    A. always provides the surface on which the molecules react.
    B. it changes the products that form during the reaction
    C. it changes the reaction pathway and lowers the activation energy
    D. it changes the collision frequency between the molecules.

16. In certain aqueous solution a chemical reaction between two substances takes place. What can be done to increase the rate of the reaction?
    A. Add an indicator
    B. Increase the concentration of at least one of the reactants
    C. Rapid cooling of the flask that contains the reactants
    D. Pour the reactants in large flat container in order to increase the contact surface.

17. The reaction between zinc and hydrochloric acid can be shown by the following equation :
    $Zn + 2HCl \rightarrow H_2 + ZnCl_2$
    Determine in which of the following cases gaseous $H_2$ will for form the fastest :

A. 1 g of Zn granules in 50 cm$^3$ HCl with concentration of 0,5 mol/dm$^3$ at 20 °C
B. 1 g of Zn granules in 50 cm$^3$ HCl with concentration 0,5 mol/dm$^3$ at 30 °C
C. 1 g of Zn powder in 50 cm$^3$ HCl with concentration of 1 mol/dm$^3$ at 20 °C
D. 1 g of Zn powder in 50 cm$^3$ HCl with concentration of 1 mol/dm$^3$ at 30 °C.

18. Which of the following pair of elements will most likely form ionic bond?
    A. Ba and S
    B. Na and Mg
    C. B and S
    D. O and Ar

19. The following diagram refers to:



Formula unit
(composed of positively charged cations and negatively charged anion)

    A. Formation of the ionic compound $Na_2S$
    B. Formation of the ionic compound $Li_2O$
    C. Formation of the ionic compound $Na_2O$
    D. Formation of the ionic compound $LiO_2$

20. Which chemical equations corresponds to the following description of a chemical reaction: „If a piece of marble is treated with hydrochloric acid, then one can see appearance of bubbles. This reaction results in a formation of solution of calcium chloride and water is formed as one of the products.“
    A. $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$
    B. $CaSO_3 + 2HCl \rightarrow CaCl_2 + H_2O + SO_2$
    C. $K_2CO_3 + 2HCl \rightarrow K_2Cl_2 + H_2O + CO_2$
    D. $K_2CO_3 + 2HCl \rightarrow 2KCl + H_2O + CO_2$

21. How many nitrogen atoms are there in six units (entities) of copper(II) nitrate?
    A. 1
    B. 2
    C. 6
    D. 12

22. Determine the coefficients in front of the "participants" in the chemical reaction given below:

    $Na_3PO_4 + HCl \rightarrow NaCl + H_3PO_4$
    A. 1,1,3,1
    B. 3,1,1,3
    C. 1,3,3,1
    D. 1,3,1,1

23. What is the name of the compound with the formula $N_2O_3$?
    A. nitrate
    B. dinitrogen trioxide
    C. nitrogen oxide
    D. nitrogen(II) oxide.

24. Which of the statements **is not** true regarding the properties of aqueous solution of calcium hydroxide?
    A. It turns the red litmus paper to blue
    B. Forms hydroxide ions in aqueous solution
    C. Reacts with magnesium with a release of hydrogen
    D. It generates ammonia from ammonium chloride

25. In the table given below the behavior of the three metals P,Q and R upon treatment with hydrochloric acid and with water is shown.

| metal | diluted HCl | water |
|---|---|---|
| P | Hydrogen is generated | Hydrogen is generated |
| Q | No reaction | No reaction |
| R | Hydrogen is generated | No reaction |

Choose from the table below, which is the proper ordering of the metals starting from most reactive metal to the least reactive one.

| | Most reactive | $\rightarrow$ | Least reactive |
|---|---|---|---|
| A. | P | R | Q |
| B. | P | Q | R |
| C. | R | Q | P |
| D. | R | P | Q |