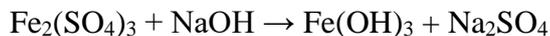




MULTIPLE CHOICE TEST WITH A SINGLE CORRECT ANSWER  
(Answer by checking **only one** of the answers offered under A, B, C or D)

**Part I**

1. Determine the stoichiometric coefficients in front of the participants, in the following chemical reaction:



- A. 1, 2, 2, 1  
B. 1, 4, 2, 1  
C. 1, 6, 2, 3  
D. 1, 7, 2, 3

2. Which substance is composed of diatomic molecules?

- A. Chlorine  
B. Iron  
C. Silver  
D. Copper

3. Which of the following ions does not have a noble gas electron configuration?

- A.  $\text{O}^{2-}$   
B.  $\text{Ca}^+$   
C.  $\text{B}^{3+}$   
D.  $\text{Cl}^-$

4. An ionic bond cannot be formed between:

- A. K and O  
B. H and F  
C. Sr and Cl  
D. Mg and N

5. Which of the following pairs of metals does not displace hydrogen from hydrochloric acid?

- A. Li and Na  
B. Mg and Ca  
C. Ag and Cu  
D. Zn and Sn

6. A is a solid simple substance, and B is a compound that is in a solid aggregate state. Neither substance conducts electricity, but a solution of B in water does. Therefore, A is \_\_\_\_\_ and B is \_\_\_\_\_ and the bond in compound B is \_\_\_\_\_.

- A. sulphur; AgCl; covalent  
B. sulphur; NaCl; ionic  
C. copper; AgCl; ionic  
D. copper; NaCl; covalent

7. If the equation  $\text{Al}_2(\text{SO}_4)_3 + \text{Ca}(\text{OH})_2 \rightarrow \text{Al}(\text{OH})_3 + \text{CaSO}_4$  is balanced with the smallest possible stoichiometric coefficients, the sum of all coefficients is:

- A. 9  
B. 12  
C. 18  
D. 8

8. In the oxygen molecule,  $\text{O}_2$ , the two oxygen atoms have in common:

- A. two electrons  
B. one electron  
C. two electron pairs  
D. one electron pair

9. Which chemical equation shows a possible chemical substitution reaction?

- A.  $\text{Zn} + \text{CaSO}_4 = \text{ZnSO}_4 + \text{Ca}$   
B.  $4\text{Fe} + 3\text{Sn}(\text{SO}_4)_2 = 2\text{Fe}_2(\text{SO}_4)_3 + 3\text{Sn}$   
C.  $\text{Cu} + \text{Li}_2\text{SO}_4 = \text{CuSO}_4 + 2\text{Li}$   
D.  $\text{Ag} + \text{CuCl} = \text{AgCl} + \text{Cu}$

10. Hydrogen salts can be formed from:

- A. nitrous acid.  
B. carbonic acid.  
C. hydrobromic acid.  
D. none of the above.

11. The formula of the salt which is a crystalline hydrate copper(II) sulfate is:

- A.  $\text{CuSO}_4 \cdot \text{H}_2\text{O}$   
B.  $\text{Cu}_2\text{SO}_4 \cdot 5\text{H}_2\text{O}$   
C.  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$   
D.  $\text{CuSO}_4 \cdot (\text{H}_2\text{O})_5$



12. Which of the following statements about acid oxides is true?
- They react with bases.
  - They dissolve in water.
  - They react with bases and acids.
  - They dissolve in water, but do not react with acids and bases.

A. I and II

B. only I

C. III and IV

D. only IV

13. Two laboratory beakers contain 50 mL of distilled water. Oxide X is added in the first beaker and oxide Y in the second beaker. A piece of litmus paper dipped into the first beaker turns reddish, while it does not change color in the second beaker. The oxides X and Y can be respectively:

A.  $\text{N}_2\text{O}_3$ ; NO

B. NO;  $\text{N}_2\text{O}$

C.  $\text{NO}_2$ ;  $\text{CO}_2$

D.  $\text{CO}_2$ ;  $\text{SO}_2$

14. The following table shows the arrangement of electrons in the atoms of elements A, B, C, and D by electron shells (levels).

Figure out which element each of the letters corresponds to, if you know:

- The atomic number of sulphur is 16;
- Lithium and fluorine belong to the same period; and
- Fluorine and chlorine belong to the same group.

level \ element	A	B	C	D
1	2	2	2	2
2	1	8	7	8
3		7		6

A. chlorine -A; lithium -B; fluorine -C; sulphur-D

B. lithium -A; chlorine -B; fluorine -C; sulphur -D

C. lithium -A; fluorine -B; chlorine -C; sulphur -D

D. fluorine -A; sulphur -B; chlorine -C; lithium -D

15. In which of the following chemical reactions (represented by chemical equations) is a precipitate formed?

A.  $\text{BaCl}_2 + \text{Na}_2\text{SO}_4 = \text{BaSO}_4 + \text{NaCl}$

B.  $\text{Mg} + 2\text{HCl} = \text{MgCl}_2 + \text{H}_2$

C.  $2\text{HCl} + \text{Ca}(\text{OH})_2 = \text{CaCl}_2 + 2\text{H}_2\text{O}$

D.  $\text{PbO} + 2\text{HNO}_3 = \text{Pb}(\text{NO}_3)_2 + \text{H}_2\text{O}$

## Part II

1. (Total: 5p.) Write the formulae or names of the following compounds:

dinitrogen pentoxide

$N_2O_5$

$MgNH_4PO_4$

magnesium ammonium phosphate

basic copper(II) carbonate

$Cu_2(OH)_2CO_3$

$H_2Se$

hydrogen selenide

cobalt(II) nitrate hexahydrate

$Co(NO_3)_2 \cdot 6H_2O$

sodium dihydrogen phosphate

$NaH_2PO_4$

$CaCO_3$

calcium carbonate

phosphorous acid

$H_3PO_3$

CO

carbon monoxide

ammonium hydroxide

$NH_4OH$

(For each correct answer 0.5p.)

2. (Total: 5p.) Match each of the listed terms (left) to the corresponding statement/term (right).

**A. Carbon dioxide**

a) It is formed by the formation of a common pair of electrons between two atoms.

**B. Ionic bond**

b) A triatomic molecule in which the atoms are joined by double bonds.

**C. Catalase**

c) A metal whose atom contains two valence electrons.

**D. Magnesium**

d) Potassium bromide.

**E. Coefficients**

e) Indicators of the number of different types of atoms in a structural unit of the compound.

f) A biocatalyst involved in a large number of reactions in the human organism.

g) An alkaline earth element occurring in the third period.

h) Gas that assists in the combustion process.

i) Numbers that precede chemical symbols (formulae) in a balanced chemical equation.

j) Black powdery substance involved in the decomposition of hydrogen peroxide.

**A-b; B-d; C-f; D-c; E-i**

(For each correct answer 1p.)

3. (Total: 10p.) The table contains information on the following metals: Lead, sodium, aluminum, silver, tin and copper.

Metal	Physical properties	Chemical properties	Additional information
Test tube 1	It is silvery-white, soft and bends easily.	It darkens in air and forms a thin oxide layer on the surface.	A good conductor of heat and electricity.
Test tube 2	It has an orange-red color.	It does not react with water, but reacts slowly with atmospheric oxygen.	It is used in the manufacture of cables.
Test tube 3	It has a silvery-white color.	It does not react with water or hydrochloric acid.	In nature it also occurs in elemental form.
Test tube 4	It has a silvery-white color, is soft and can be cut.	Reacts violently with water to liberate hydrogen.	Its compounds are of big economic importance.
Test tube 5	It melts at a low temperature of 232 °C.	Moderately reactive with dilute acids.	In combination with other elemental substances, it forms a number of useful alloys.
Test tube 6	Soft metal, has a high density.	When exposed to air, it is coated with an oxide layer that protects it from further oxidation.	Some of its compounds are used as dyes.

a) Write the chemical symbols for the metals in the corresponding test tubes.

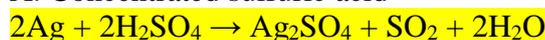


- 1 – Al
- 2 – Cu
- 3 – Ag
- 4 – Na
- 5 – Sn
- 6 – Pb

(For each correct answer 1p.)

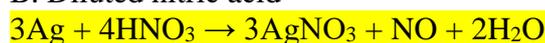
b) Write and balance (using the smallest possible integer stoichiometric coefficients) the chemical equations that describe the reactions of the metal in test tube 3 with:

A. Concentrated sulfuric acid



\_\_\_\_\_ (Balanced 2p., unbalanced 1p.)

B. Diluted nitric acid



\_\_\_\_\_ (Balanced 2p., unbalanced 1p.)