



---

MULTIPLE CHOICE QUESTIONS WITH A SINGLE CORRECT ANSWER

(Answer by choosing **only one** of the given options A, B, C or D)

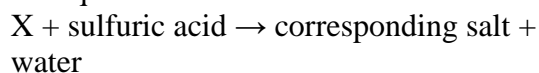
---

I

- What is the number of protons, neutrons, and electrons in the structure of the ion X, which forms the compound  $X_3(PO_4)_2$ ? It is given that  $Z(X) = 30$  and  $A(X) = 64$ .  
A.  $p = 30, n = 34, e = 30$ .  
B.  $p = 30, n = 34, e = 28$ .  
C.  $p = 64, n = 30, e = 62$ .  
D.  $p = 34, n = 30, e = 32$ .
- Which combination of compound and compound type is incorrect?  
A.  $Li_2CO_3$  – salt.  
B.  $LiOH$  – hydroxide.  
C.  $Li_2O_2$  – oxide.  
D.  $LiCl$  – salt.
- The ion of  ${}^{24}_{12}Mg^{2+}$  and the atom of  ${}^{20}_{10}Ne$  have the same number of:  
A. protons.  
B. neutrons.  
C. electrons.  
D. protons and neutrons.
- Which of the following chemical formulae represent ionic compounds?  
I.  $CaCl_2$     II.  $H_2O$     III.  $SO_3$   
IV.  $MgO$     V.  $NH_4NO_3$   
A. I, IV and V.  
B. II, III and V.  
C. Only I.  
D. I and II.
- Encircle the chemical formula of the compound that is an amphoteric oxide:  
A.  $CO_2$ .  
B.  $Na_2O$ .  
C.  $SO_2$ .  
D.  $Al_2O_3$ .
- The name of the substance  $H_2SO_3$  is:  
A. Hydrosulfuric acid.  
B. Sulfuric acid.  
C. Sulfurous acid.  
D. Sulfoxylic acid.
- Which of the chemical reactions (their corresponding equations are given) will proceed at room temperature at the slowest rate?  
A.  $2Cu + O_2 \rightarrow 2CuO$   
B.  $4Na + O_2 \rightarrow 2Na_2O$   
C.  $4Fe + 3O_2 \rightarrow 2Fe_2O_3$   
D.  $2Mg + O_2 \rightarrow 2MgO$ .
- When a solution of KI reacts with a solution of  $Pb(NO_3)_2$ , a precipitate forms. To separate the precipitate from the solution, you need:  
A. A syringe and a graduated cylinder.  
B. A funnel, a beaker and filter paper.  
C. A scale and a laboratory beaker.  
D. None of the above.
- The formation of carbon dioxide in a chemical reaction is proven by a (i), which results in the formation of a (ii).  
A. (i) solution of HCl, (ii) white precipitate of  $CaCl_2$ .  
B. (i) solution of NaOH, (ii) white precipitate of  $Ca(OH)_2$ .  
C. (i) lime water, (ii) white precipitate of  $Ca(OH)_2$ .  
D. (i) lime water, (ii) white precipitate of  $CaCO_3$ .



10. Which substance matches the unknown X in the equation



- A. MgO.
- B. Ca.
- C. AlCl<sub>3</sub>.
- D. Ca(NO<sub>3</sub>)<sub>2</sub>.

11. When a piece of metal M is immersed in a solution of FeSO<sub>4</sub> a chemical reaction takes place in which small particles of iron are obtained as products. The metal M is:

- A. Zinc.
- B. Silver.
- C. Copper.
- D. Lead.

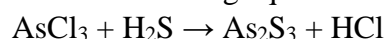
12. Aronia juice can serve as an indicator instead of litmus: in acidic solutions it has a red color, and in basic solutions it has a blue color. Determine the formulae of the substances whose aqueous solutions will turn red when we add aronia juice?

- A. NH<sub>4</sub>OH, Ba(OH)<sub>2</sub>, Ni(OH)<sub>2</sub>.
- B. Na<sub>2</sub>O, SrO, MgO.
- C. Al<sub>2</sub>O<sub>3</sub>, NaCl, KI.
- D. CO<sub>2</sub>, SO<sub>2</sub>, N<sub>2</sub>O<sub>3</sub>.

13. The products of the chemical reaction between sodium hydroxide and nitric acid are:

- A. NaNO<sub>3</sub> and CO<sub>2</sub>.
- B. NaNO<sub>3</sub> and H<sub>2</sub>O.
- C. NaNO<sub>3</sub>, H<sub>2</sub>O and CO<sub>2</sub>.
- D. NaNO<sub>3</sub> and H<sub>2</sub>.

14. What smallest integer stoichiometric coefficients should be written, respectively, in front of the formulae of the reactants, so that the following equation is balanced?



- A. 2, 3, 1, 6.
- B. 2, 1, 1, 2.
- C. 4, 6, 2, 12.
- D. 4, 3, 2, 1.

15. A chemist used to study the reaction between copper(II) oxide and dilute sulfuric acid. In which case was the reaction the fastest one?

- A. 1 g copper(II) oxide powder and 50 mL of sulfuric acid at 30 °C.
- B. 1 g copper(II) oxide powder, 50 mL of sulfuric acid and 50 mL of water at 30 °C.
- C. 1 g copper(II) oxide powder and 50 mL of sulfuric acid at 50 °C.
- D. 1 g copper(II) oxide powder, 50 mL of sulfuric acid and 50 mL of water at 50 °C.

1. Potassium oxide is a pale yellow solid used in the fertilizer industry.

A. Write the chemical formula of potassium oxide.

$K_2O$  (0.5 points)

B. In potassium oxide, the charge of potassium is  $1+$ , and that of oxygen is  $2-$ .

(2 x 0.5 = 1 point, accepted only with a +/- sign, +1 and -2 is not accepted!)

C. Write the electronic configurations of:

i) atom of potassium 2, 8, 8, 1

ii) potassium ion 2, 8, 8

iii) atom of oxygen 2, 6

iv) oxygen ion 2, 8

(4 x 0.5 = 2 points)

D. The potassium ion achieves the electronic configuration of the noble gas Ar (argon), and the oxygen ion achieves the electronic configuration of the noble gas Ne (neon).

(2 x 0.5 = 1 point)

E. Based on its chemical behavior, which group of oxides does potassium oxide belong to?

Basic oxide

(0.5 points)

F. Write and balance the equation for the reaction between potassium oxide and water.

$K_2O + H_2O \rightarrow 2KOH$  (1 point, for an unbalanced equation 0.5 points)

(6 points)

2. Balance the equation, write the textual equation, and write the type of chemical reaction:

A.  $2Zn + O_2 \rightarrow 2ZnO$

text equation: zinc + oxygen  $\rightarrow$  zinc oxide

reaction type: combination/synthesis reaction (Oxidation/combustion/burning reaction is also accepted.)

B.  $2NaNO_3 \rightarrow 2NaNO_2 + O_2$

text equation: sodium nitrate  $\rightarrow$  sodium nitrite + oxygen

reaction type: decomposition reaction

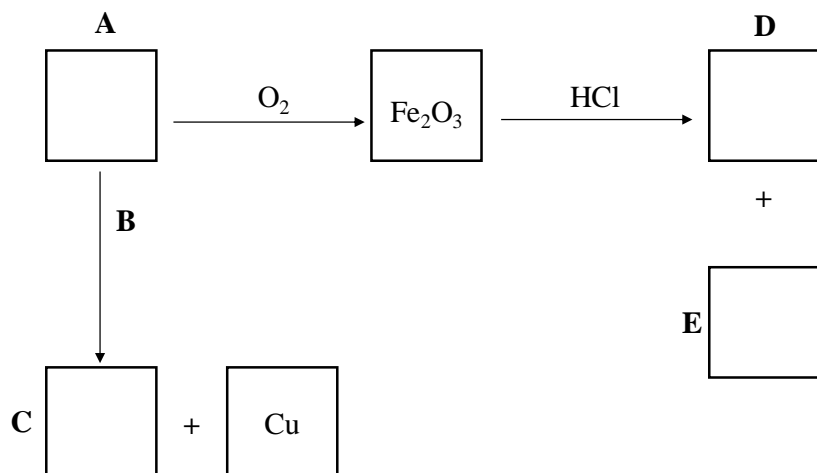
C.  $P_2O_5 + 3H_2O \rightarrow 2H_3PO_4$

text equation: diphosphorus pentoxide (or phosphorus(V) oxide + water  $\rightarrow$  phosphoric acid

reaction type: combination/synthesis reaction

1 point each for a correctly balanced reaction, a correct text equation, and a correct reaction type (9 points)

3. Complete the following diagram without balancing the equations:



A = Fe

B =  $CuSO_4$  (or some other copper salt)

C =  $FeSO_4$  (or appropriate, see above, iron salt)

D/E =  $FeCl_3/H_2O$

1 point for each correct answer. (5 points)