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Learners' Academy  
Preliminary Examination  
Subject: Chemistry

Date: 10/12/14

M.M.80  
Time: 2 hr

Answers to this paper must be written on the paper provided separately.

You will not be allowed to write during the first 15 minutes.

This time is to be spent in reading the question paper.

The time given at the head of this paper is the time allowed for writing the answers.

**Section I** is compulsory. Attempt any four (4) questions from **Section II**.

The intended marks for questions or parts of questions are given in brackets [ ].

**All equations need to be balanced.**

**SECTION I (40 Marks)**

Attempt all questions in **this** Section

**Question 1**

a. Name the following:

- The compound obtained when aqueous potassium hydroxide is added to ethyl bromide.
- The precipitate obtained when aqueous silver nitrate is added to sodium chloride.
- The gas evolved when dilute hydrochloric acid is added to potassium sulphite.
- This compound on heating evolves a gas that is not oxygen but rekindles a glowing splint.
- A gaseous hydrocarbon that has the same empirical formula as benzene ( $C_6H_6$ ). [5]

b. Fill in the blanks from the choices given below. (Rewrite the whole sentence.)

- A solution turns blue litmus red, so it must contain \_\_\_\_ (hydronium/hydroxy) ions.
- A nitrate that does not emit nitrogen dioxide on strong heating is \_\_\_\_ (zinc nitrate/sodium nitrate).
- When a piece of zinc is introduced in a solution of copper sulphate, the blue colour of the solution \_\_\_\_ (darkens/disappears).
- In the laboratory, hydrogen chloride is collected by the \_\_\_\_ (upward/downward) displacement of air.
- In the modern periodic table the elements are arranged in the order of their \_\_\_\_ (atomic numbers/atomic mass numbers). [5]

**Question 2**

a. Choose the correct answer from the options given below: (Do not rewrite the whole sentence.)

Just write the question number, the appropriate letter and the option against the letter.)

- This element burns with a lilac flame:  
A. sodium; B. calcium; C. zinc and D. potassium
- This metal is used to make the alloy of stainless steel.  
A. silver; B. zinc C. chromium and D. copper.
- This oxides forms two acids with water.  
A. nitrogen dioxide; B. sulphur dioxide; C. carbon dioxide and D. manganese dioxide.
- This chloride is insoluble in water but soluble in ammonium hydroxide.  
A. sodium chloride; B. silver chloride; C. magnesium chloride and D. potassium chloride.
- This acid is used to make explosives.  
A. nitric acid; B. carbonic acid; C. acetic acid and D. hydrochloric acid. [5]

- b. Match the options A to E with the statements (i) to (v): (rewrite the matter from both the columns:

Column I	Column II	
A. ammonia	i. is used in galvanizing	
B. helium	ii. the concentrated form of this acid is used to obtain chlorine	
C. zinc	iii. is used for the manufacture of fertilizers	
D. sulphuric acid	iv. contains two electrons in the outermost orbit	
E. hydrochloric acid	v. is the least volatile of the three mineral acids	[5]

### Question 3

- a. Write balanced equations for the following:
- Action of heat on silver nitrate.
  - Action of ammonia on excess chlorine.
  - Action of concentrated sulphuric acid on zinc.
  - Reaction at the cathode during the electrolysis of fused alumina mixed with cryolite.
  - Action of hot concentrated caustic soda on aluminium. [5]
- b. Distinguish between the following pairs of compounds (only one test for each pair):
- Potassium nitrate and potassium chloride.
  - Copper oxide and manganese dioxide. (both are black)
  - Dilute sulphuric acid and concentrated sulphuric acid.
  - Ethane and ethylene.
  - Sodium sulphate and calcium sulphate using a test other than the flame test. [5]

### Question 4

- a. Using the reaction between nitrogen and hydrogen, show that nitrogen is a bi-atomic gas. [2]
- b. Carbon monoxide reacts with iron (III) oxide as per the reaction given below:
- $$\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$$
- Find the volume and weight of carbon dioxide evolved when 3,200 g of iron (III) oxide is strongly heated with carbon monoxide.
- (Atomic weights: iron = 56, oxygen = 16, carbon = 12. You may take the molar volume as 24 l at S.T.P.) [2]
- c. Find the volume of 12.8 g of sulphur dioxide at S.T.P. ( sulphur = 32) [2]
- d. Write down the electronic configuration of:  $^{40}_{20}\text{Ca}$  and  $^{31}_{15}\text{P}$ . [2]
- e. What is the difference between the action of chlorine on ethane and on ethylene. Name the type of reactions and not the products. [2]

### SECTION II (40 Marks)

Attempt any **four** questions from this Section

### Question 5

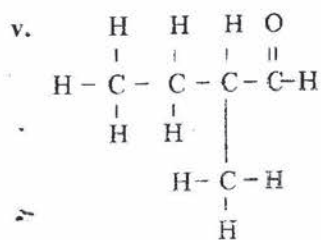
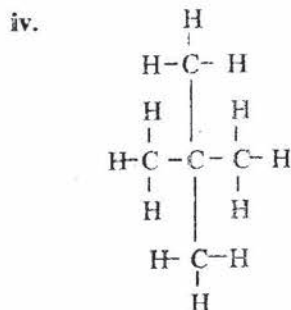
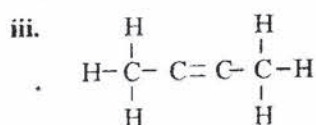
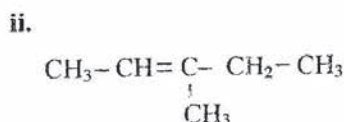
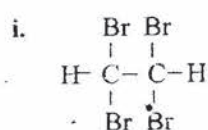
State two observations in each of the following cases:

- Zinc nitrate is strongly heated in a test tube.
- Dilute sulphuric acid is slowly added to copper carbonate.

- c. Ammonia is passed over heated copper oxide.  
 d. Sodium hydroxide is added drop wise to a solution of zinc sulphate till in excess.  
 e. A small amount of magnesium powder is added to a solution of iron (II) sulphate. [10]

**Question 6**

- a. Write down the IUPAC names of the following organic compounds: [5]

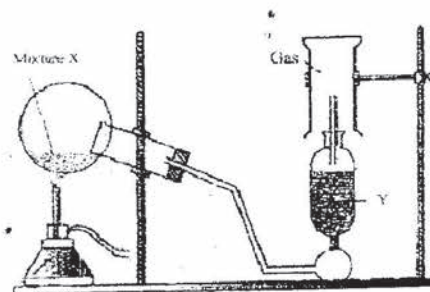


- b. i. Ethylene forms an addition product with chlorine. Name this addition product.  
 ii. Sodium chloride when heated with concentrated sulphuric acid and manganese dioxide gives out a gas name this gas.  
 iii. Which compound should be heated with soda lime to obtain ethane gas in the laboratory?  
 iv. Write a balanced equation for the complete combustion of ethane.  
 v. Name a solid which can be used instead of concentrated sulphuric acid to prepare ethylene by the dehydration of ethanol. [5]

**Question 7**

- a. The first 20 elements are given here in the order of their atomic numbers as they appear in the periodic table.  
 1. hydrogen; 2. helium; 3. lithium; 4. beryllium; 5. boron; 6. carbon; 7. nitrogen; 8. oxygen;  
 9. fluorine; 10. neon; 11. sodium; 12. magnesium; 13. aluminium; 14. silicon; 15. phosphorus;  
 16. sulphur; 17. chlorine; 18. argon; 19. potassium and 20. calcium.  
 i. Write the formula of the phosphate of the element having atomic number 11.  
 ii. How many electrons are present in the valence (outermost) shell (orbit) of the element with atomic number 8.

- iii. What is the electronic configuration of the element in the third period which gains two electrons to change into an anion?
- iv. What happens to the atomic size of elements as we go down a group?
- v. What is the name given to the energy released when an atom in its isolated gaseous state accepts an electron to form an anion? [5]
- b. The diagram shows the apparatus for the laboratory preparation of a pungent smelling gas, which is alkaline in nature.
- i. Name the gas collected in the jar.
- ii. Name the method by which the gas being collected?
- iii. Name the drying agent (Y) used.
- iv. Considering the way that the gas is being collected, what can be said about the density of the gas as compared to that of air?
- v. Write the balanced equation for the above preparation. [5]



### Question 8

- a. Give the equations for the following conversions A to E. Also mention the conditions, if any.
- $$\text{MgCl}_2 \xrightarrow{\text{A}} \text{MgCO}_3 \xrightarrow{\text{B}} \text{Mg(NO}_3)_2 \xrightarrow{\text{C}} \text{Mg(OH)}_2 \xrightarrow{\text{D}} \text{MgO} \xrightarrow{\text{E}} \text{MgSO}_4 \quad [5]$$
- b. Butane gas, when heated in a sufficient supply of oxygen, results in carbon dioxide and water as per the equation given below:
- $$2\text{C}_4\text{H}_{10} + 13\text{O}_2 \longrightarrow 8\text{CO}_2 + 10\text{H}_2\text{O}$$
- i. What is the volume of butane and of oxygen required to obtain 56 *kl* of carbon dioxide? [2]
- ii. What is the mass of carbon dioxide obtained at the same time? [1]
- iii. What will be the actual number of molecules of carbon dioxide present in 56 *kl* of carbon dioxide? [2]
- You may take molar volume as 24 *l* and Avogadro's number as  $6.023 \times 10^{23}$ .

### Question 9

- a. The questions given below pertain to the extraction of zinc.
- i. Name the process by which the ore zinc blende is concentrated.
- ii. The concentrated ore is then roasted with oxygen. A gas and a solid are obtained. Name the solid that is obtained.
- iii. Write down the equation for the roasting of the concentrated zinc ore.
- iv. How is the solid obtained in 'a ii.' above converted to zinc? Write down the reaction for the same.
- v. Why is it necessary to purify the zinc so obtained in 'iv'? (One reason.) [5]
- b. i. Write down the structure of:
1. hydronium ion. [2]
  2. ammonium ion. [2]
- ii. With the help of suitable equations show that aluminium oxide is an amphoteric oxide. [2]

- iii. Write down the reaction at the anode during the electrolysis of zinc sulphate using impure zinc as the anode and pure zinc as the cathode. [1]

**Question 10**

- a. Classify the following substances under three headings:
- Strong electrolytes
  - Weak electrolytes
  - Non electrolytes
- Acetic acid, ammonium chloride, carbon tetrachloride, dilute sulphuric acid and acetone. [5]
- b. Name two metals that react with aqueous sodium hydroxide to liberate hydrogen. [2]
- c. With the help of suitable equations show the following characteristics of sulphuric acid:
- As an oxidising agent.
  - As the least volatile of the three mineral acids. (only one equation)
  - As a dehydrating agent in the case of an organic compound.
- Also mention whether the acid used is dilute or concentrated. [3]

