ST. GREGORIOS HIGH SCHOOL
PRELIMINARY EXAMINATION, JANUARY 2019
CHEMISTRY

STD X — 80 MARKS
DATE: 4th January 2019 — TIME: 2 HOURS

Note: The first 15 mins are for reading only. No writing work to be done during this time. The writing time of 2 hours is excluding this time.
Section I is compulsory. Attempt any four questions from Section II.
All equations need to be balanced.

SECTION I

Question 1

(a) Choose the correct alternative:

1. The metal oxide which can react with acid as well as alkali is:
(i) Silver oxide (iii) Copper (II) oxide
(ii) Aluminium oxide (iv) Calcium oxide

2. The valence shell of element P contains 3 electrons while the valence shell of element Q contains 6 electrons. If P combines with Q, the chemical formula of the compound will be: (i) PQ_2 (ii) P_2Q (iii) P_2Q_3 (iv) P_3Q_2

3. If empirical formula of an organic compound is CH_2O then its molecular formula will be:
(i) $C_2H_2O_2$ (ii) C_2H_4O (iii) C_3H_6O (iv) $C_6H_{12}O_6$

4. The colour of the filtrate when manganese dioxide is heated with concentrated hydrochloric acid is:
(i) Bluish (ii) brownish (iii) greenish (iv) yellowish

5. Which one of the following four metals would be displaced from its salt solution by the other three metals?
(i) Mg (ii) Cu (iii) Zn (iv) Fe [5]

(b) Give one word or phrase for the following:

1. Formation of ions from molecules.
2. The method of preparing an insoluble salt from two soluble salts.
3. The term for number of atoms in 12g of carbon.
4. Compounds of various metals associated with their earthly impurities.
5. Compounds which undergo decomposition in fused or molten state due to flow of current. [5]

(c) Fill in the blanks with the choices given in the brackets:

1. Addition of (Iron (III) sulphide/ Iron (II) sulphide/ Iron pyrites) to dilute hydrochloric acid results in liberation of hydrogen sulphide gas.
2. Sulphuric acid was initially called (muriatic acid/ aqua fortis/ oil of vitriol).
3. The aqueous solution of (sulphuric acid/ nitric acid/ acetic acid) contains both ions and molecules.
4. The salt solutions containing cupric ions are (yellow/ blue/ black) in colour.
5. The formula of Chile salt petre is ($NaNO_3$/ KNO_3/ HNO_3). [5]

(d) State your observations in each of the following cases:

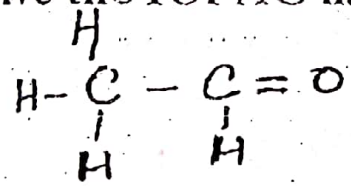
1. Dilute hydrochloric acid is added to copper sulphide.
2. Sodium hydroxide is added to a solution of calcium nitrate.
3. Catalytic oxidation of ammonia.
4. Concentrated sulphuric acid is added to sugar crystals.
5. Sodium metal is added to ethanol. [5]

(e) Give balanced equations for the following:

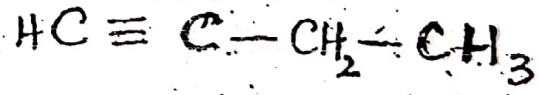
1. Hot concentrated nitric acid reacts with sulphur.
2. Ammonia is passed over heated copper oxide.
3. Reaction between carbon and concentrated sulphuric acid.
4. Reduction of lead oxide by carbon.
5. Reaction between acetic acid and sodium hydroxide. [5]

(f) 1. Give the IUPAC names of the following: [3]

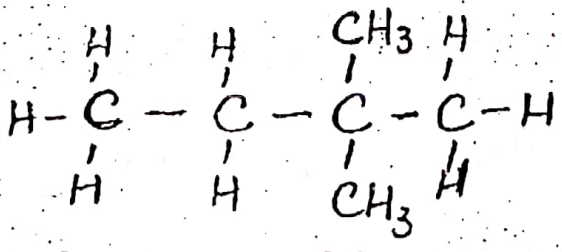
(i)



(iii)



(ii)



2. Give the structural formula of the two branched isomers of pentane. [2]

(g) 1. Draw the electron dot structures of the following compounds:

(i) Ammonia.

(ii) Carbon tetrachloride.

(iii) Calcium oxide. [3]

2. The mass of one litre of oxygen was 1.32g and the mass of one litre of hydrogen under the same conditions of temperature and pressure was 0.0825g. Calculate the relative molecular mass of oxygen. [2]

(h) 1. 24cc of marsh gas was mixed with 106cc of oxygen and then exploded. On cooling the volume of the mixture became 82cc of which 58cc was unreacted oxygen. Explain the law with relevant calculations. [2]

2. Answer the questions based on the flow chart:

$$Na_2SO_3 \xrightarrow{A} SO_2 \xrightarrow{B} SO_3 \xrightarrow{C} H_2SO_4 \xrightarrow{D} HCl$$

(i) Give a balanced equation for conversions A and D.
(ii) What are the necessary conditions for conversion B?
(iii) Name the intermediate product in conversion C. [3]

SECTION II

Question 2

(a) Answer the following based on the laboratory preparation of ammonia.

1. Name the ammonium salt and the alkali used for the preparation.
2. Give the balanced equation for the reaction.
3. Explain with an equation why concentrated sulphuric acid is not used to dry the gas.
4. How is the gas collected? Give reasons.
5. Name a compound that reacts with warm water to produce ammonia gas. [5]

(b) Salt solutions A, B, C, D and E are treated as described below. Identify the anion present in each salt solution based on the description:

1. When barium chloride is added to A, a white precipitate is seen which is insoluble in dilute hydrochloric acid.
2. When silver nitrate solution is added to B, a white precipitate is formed.
3. When dilute hydrochloric acid is added to C, a colourless gas is produced, which turned lime water milky.
4. When freshly prepared acidified ferrous sulphate is added to D, a brown ring is formed.
5. When dilute hydrochloric acid is added to E, a colourless gas is liberated, which turns lead acetate paper silvery black. [5]

Question 3

(a) **The following questions are based on the extraction of aluminium from alumina:**

1. Name the process.
2. Give the electrolytic reactions taking place at both electrodes.
3. Why is it necessary to lower the fusion temperature of the electrolyte?
4. It is preferred to use a number of graphite electrodes as anode instead of a single electrode. Explain.
5. Give the balanced equation for obtaining pure alumina from aluminium hydroxide.

[5]

(b) **Answer the following questions based on the periodic table:**

1. An element Z belongs to group 14 of the periodic table. What is the valency of this element and what type of bonds will it form?
2. Arrange Ca, Be, Ba, Mg, Sr according to increasing metallic character.
3. **Choose the correct word or letter from the bracket:**
   (i) An element P has low ionization potential. It is likely to be a (metal/ non-metal)
   (ii) Element Q is to the left of element R in period 2. The atom of element Q would be (larger/ smaller) than the atom of element R.
   (iii) Element S is below element T in a group in the periodic table. Element S will have a (greater/ lesser) electron affinity than element T.

[5]

Question 4

(a) **Answer the following based on the laboratory preparation of nitric acid.**

1. Name the acid used in the preparation. Why is it preferred?
2. What is the special precaution to be taken for this preparation? Give reasons.
3. Why must the temperature be properly maintained and controlled?
4. Give the balanced equation for the reaction.
5. The nitric acid prepared by this method has a yellowish brown tinge. How can it be removed?

[5]

(b) **Explain the following terms:**

1. Salt.
2. Roasting.
3. Denatured alcohol.

[3]

(c) **Draw the formation of the stable positive ion formed when an acid dissolves in water.**

[2]

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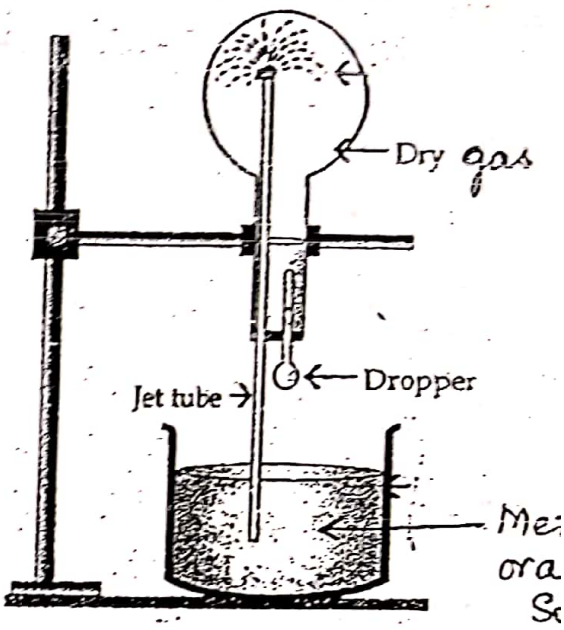
Question 5

(a) **Answer the following based on the diagram given alongside:**

1. Identify the gas in the jar.
2. What do you observe when the dropper is pressed?
3. What properties of the gas are being demonstrated?
4. Name another gas that can be used in the jar. What would you observe with this gas? [3]



(b) **Give appropriate scientific reasons for the following statements:**

1. Hydrogen chloride can be termed as a polar covalent compound.
2. Sulphuric acid produces two types of salts on reacting with an alkali.
3. Ammonium nitrate is not used in the laboratory preparation of ammonia.
4. Graphite anode is preferred to other electrodes during the electrolysis of molten lead bromide. [4]

(c) **Fill in the blanks with suitable words:**

To electroplate an article with silver, the preferred electrolyte is _____ which is in _____ state. The article to be plated is cleaned and placed as the _____ of the cell. The _____ of the cell is made of pure silver. The silver ions migrate to the _____ to be deposited there and the _____ diminishes in mass. [3]

Question 6

(a) **When compound A is melted and two electrodes that have been connected to a battery are put into it, the bulb lights up. Compound B is a liquid which does not dissolve in water.**

1. Which of the two compounds is likely to exist as a crystal lattice of ions?
2. Which of the two compounds is likely to have a higher boiling point? Why?
3. If the two electrodes connected to a battery and a bulb are put into liquid B, what will you observe?
4. Which of the two compounds contain molecules?
5. Which of the two compounds is likely to be volatile? [3]

(b) **Give balanced equations for the following:**

1. Conversion of bromoethane to ethane.
2. Preparation of ethyne from alkyl halide.
3. Preparation of ethene from ethyl iodide.
4. Complete combustion of ethanol. **[4]**

(c) **Consider the following reaction:**

$(NH_4)_2Cr_2O_7 \rightarrow Cr_2O_3 + 4\ H_2O + N_2$

Calculate: 1. The mass of Cr_2O_3 formed when 63 g of ammonium dichromate is heated.

2. The quantity in moles of Cr_2O_3 formed at the same time.
3. The volume of nitrogen evolved at S.T.P.

[N = 14, Cr = 52, O = 16, H = 1] **[3]**

Question 7

(a) **An aqueous solution of copper sulphate is electrolyzed using copper electrodes.**

1. Give the reactions taking place at the cathode and the anode.
2. What are your observations for the electrolysis?
3. What must be added to the electrolyte before electrolysis and why?
4. If the above electrolysis was carried out using platinum electrodes, what would be the products at the anode and the cathode? **[5]**

(b) **From the list of salts given below, choose one in each case corresponding to the description given. <u>No answer is to be repeated</u>.**

Lead chloride, copper sulphate, copper carbonate, basic copper chloride, sodium bicarbonate, zinc nitrate, ferric chloride, ferrous chloride, sodium chloride, silver chloride.

1. On treating with concentrated sulphuric acid, this salt changes from blue to white.
2. This salt gives a reddish brown gas on heating.
3. An acid salt.
4. This salt in soluble in hot water but is insoluble in cold water.
5. A salt prepared by titration.
6. A salt prepared by simple displacement.
7. A salt prepared by direct combination.
8. A green insoluble salt, which when treated with an acid, gives a blue soluble salt.
9. An insoluble salt.
10. A salt obtained from a diacidic base.

[5]