ICSE-2003

Section A (40 Marks)

(Attempt all questions from this section)

Question 1

(a) [5]

(i) What volume of oxygen is required to burn completely a mixture of 22.4 dm^3 of methane and 11.2 dm^3 of hydrogen into carbon dioxide and steam? Equations of the reactions are given below(Assume all volumes are at stp)

$CH_4 + 2\ O_2 \rightarrow CO_2 + 2\ H_2O$, $2\ H_2 + O_2 \rightarrow 2\ H_2O$

_____.

_____.

_____.

(ii) The gases hydrogen, oxygen, carbon dioxide, sulphur dioxide and chlorine are arranged in order of their increasing relative molecular mass.

Given 8 g of each gas at stp, which gas will contain the least number of molecules and which gas the most?

_____.

(b) Match the description in column X with appropriate substance in column Y. Write down the number of the description with the letter of the substance. The first one has been done for you. [10]

X	Y
1. A gas whose solution in water is alkaline.	A. Hydrogen sulphide.
2. A solution which bleaches by oxidation.	B. Hydrochloric acid.
3. An alloy of copper and zinc.	C. Lead bromide.
4. A gas which smells of rotten eggs.	D. Sulphur.
5. A liquid which is a non-electrolyte.	E. Fluorine.
6. A solid which undergoes electrolysis when molten.	F. Brass.
7. A gas formed by burning sulphur.	G. Ammonia.
8. A solution which gives chlorine on oxidation.	H. Sulphur dioxide.
9. An element existing in two crystalline forms.	I. Ethanol.
10. A gas which is the most electronegative among all the elements.	J. Concentrated nitric acid.
11. A solution which gives nitrogen dioxide with copper	K. Chlorine water.
	L. Dilute nitric acid.
The first answer is 1 – G	M. Bronze.

(c) [5]

(i) How will you distinguish between Zn^{2+} and Pb^{2+} using ammonium hydroxide solution?

	Zn^{2+}	Pb^{2+}
Add ammonium hydroxide solution dropwise and excess		

(ii) Copy and complete the table which refers to action of heat on some carbonates:-

Carbonate	Colour of residue
Zinc carbonate	
Lead carbonate	
Copper carbonate	

(d) Copy and complete table which refers to two practical applications of electrolysis:- [5]

	ANODE	ELECTROLYTE	CATHODE
Silver plating a spoon		Solution of potassium argento cyanide	
Purification of copper			

(e) Choosing the correct words from given in brackets, complete the sentences given below: [5]

(i) An acid is a compound which, when dissolved in water, gives ……. (hydronium/hydroxide) ions as the only ……. (positive/ negative) ions

(ii) Electrolysis is the passage of ……. (electricity/ electrons) through a liquid or a solution accompanied by a …… ... (physical/ chemical) change.

(iii) Allotropy is the property of a(n) ……. (compound/ element) which can exist in two or more forms in the same ……. (chemical/ physical) state.

(iv) A(n) ……. (acid/ basic) salt is one in which the hydrogen of an acid has been partially replaced by a ……. (metal/ non-metal).

(v) The number of atoms present in one ……. (mole / molecule) of an element is called its ……. (acidity/ atomicity).

(f) Write the observations and balanced equations for the following reactions:- [10]

(i) Sodium hydroxide is added drop-wise till in excess to a solution of zinc sulphate.

_____.

(ii) Ammonium hydroxide is added first in a small quantity and then in excess to a solution of copper sulphate.

_____.

_____.

(iii) Excess of ammonium hydroxide is added to a substance obtained by adding silver nitrate solution to hydrochloric acid.

_____.

(iv) Moist starch iodide paper is put on the mouth of a test tube containing chlorine.

_____.

(v) A paper dipped in potassium permanganate solution is put on the mouth of a test tube containing sulphur dioxide gas.

_____.

Section – B (40 marks)

(Attempt any four questions from this section)

Question 2

(a) 10 g of a mixture of sodium chloride and anhydrous sodium sulphate is dissolved in water. And excess of barium chloride solution is added and 6.99 g of barium sulphate is precipitated according to the equation given below:- (O=16, Na=23, S=32, Ba=137) [4]

$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$

Calculate the percentage of sodium sulphate in the original mixture.

_____.

_____.

_____.

_____.

_____.

_____.

_____.

(b) [6]

(i) Which compound should be treated with soda lime to obtain ethane gas in the laboratory?

.....

(ii) Write the equation for the reaction in 2(b)(i) above.

.....

(iii) Write a balanced equation for the complete combustion of ethane.

.....

(iv) Name a solid which can be used instead of concentrated sulphuric acid to prepare ethylene by the dehydration of ethanol.

.....

(v) Name a reagent which can be used to distinguish between ethane and ethene.

.....

(vi) Ethylene forms an addition product with chlorine.
Name this addition product and write its structural formula.

.....

Question 3

1A	2A											3A	4A	5A	6A	7A	O
1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

The following table represents the first three periods of the modern periodic table. Study the table and answer the questions that follow: [10]

(a) Write the formula of the sulphate of the element with atomic number 13.

.....

(b) What type of bonding will be present in the oxide of the element with atomic number 1?

.....

(c) Which feature of the atomic structure accounts for the similarities in the chemical properties of the elements of group 7A of the periodic table?

(d) Name the element which has the highest ionization potential.

(e) How many electrons are present in the valency shell of the element with atomic number 18?

(f) What is the name given to the energy released when an atom in its isolated gaseous state accepts an electron to form an anion?

(g) What is the electronic configuration of the element in the third period which gains one electron to change into an anion?

(h) Fill in the blanks:-
The atomic size _____ as we move from left to right across the period, because the _____ increases but the _____ remains the same.

Question 4

(a) [4]

(i) Write the equation for the formation of ammonia by the action of water on magnesium nitride.

(ii) How is ammonia collected?

(iii) Why is ammonia not collected over water?

(iv) Which compound is normally used as a drying agent for ammonia?

(b) [6]

(i) When nitric acid is prepared by the action of concentrated sulphuric acid on potassium nitrate, which is the special feature of the apparatus used?

(ii) Write the equation for the laboratory preparation of nitric acid from potassium nitrate and concentrated sulphuric acid.

.....

(iii) Potassium nitrate is prepared from potassium hydroxide and nitric acid. Name type of this reaction.

.....

(iv) Which gas is produced when potassium nitrate is heated? Write the equations for this reaction.

.....

Question 5

(a) Complete the sentences (i) and (ii) and answer the questions (iii) (iv). [5]

(i) Chlorine is prepared in the laboratory by the ____ (state type of reaction) of _____ hydrochloric acid.

(ii) Chlorine is a _____ (state the colour) gas which is _____ than air.

(iii) Bleaching powder ($CaOCl_2$) smells of chlorine due to the action of carbon dioxide on it. Write the equation for the reaction.

(iv) Write balanced equation for the action of chlorine with excess of ammonia.

.....

(b) [5]

(i) Iron has valencies 2 and 3. When iron reacts directly with chlorine what is the valency of iron in the resulting compound? Write equation.

.....

(ii) Name a non-metallic element which reacts with chlorine to give two compounds. Under normal conditions one of these compounds is a liquid and the other is a solid. Name the two compounds.

Question 6

(a) Write equations for sulphur combining with : (1) A metal. (2) A non-metal. [6]

(i) .....

.....

(ii) Which concentrated acid will oxidize sulphur directly to sulphuric acid? Write equations for the same.

.....

(iii) What is the name if the process by which sulphuric acid is manufactured? Name the catalyst for the process.

_____.

(iv) Complete the following sentence choosing the correct word from the brackets. 'Concentrated sulphuric acid is used in the laboratory preparation of nitric acid and hydrochloric acid because it is _____ (less volatile/stronger) in comparison to these acids.'

(b) Write the equations for the laboratory preparation of the following salts using sulphuric acid:- [4]

(i) Iron (II) sulphate from iron.

_____.

(ii) Copper sulphate from copper.

_____.

(iii) Lead sulphate from lead nitrate.

_____.

(iv) Sodium sulphate from sodium carbonate.

_____.

Question 7

(a) With respect to the reduction of iron-ore in the blast furnace, answer the following questions:- [6]

(i) Name the raw material placed in the blast furnace.

(ii) Which is the reducing agent? Write equation for reduction of iron ore.

(iii) What is the significance of double cup and cone arrangement?

(iv) What is the composition of the exiting furnace gases?

(b) Compare the properties of a typical metal and a non-metal on the basis of [4]

	Metal	Non-metal
(i) Electronic configuration.		
(ii) Nature of the oxides.		
(iii) Oxidising or reducing action.		
(iv) Conductivity of heat and electricity.		