Chemistry:

General Instrutions

1. ***Section I*** *is compulsory. Attempt* ***any four*** *questions from* ***Section II****.*
2. *The intended marks for questions or parts of questions are given in brackets.*

SECTION I (40 Marks)

Attempt all questions from this Section

Question 1

(a) From the following list of substances, choose the one substance in each case which matches the description (i) to (vi) given below. (Write down the names exactly as they are given in the list. Do not write formulae.)
Ammonium nitrate, calcium hydrogen carbonate, copper carbonate, lead carbonate, lead nitrate, potassium nitrate, sodium carbonate, sodium hydrogen carbonate, zinc carbonate. [6]

i. A hydrogen carbonate which exists in the solid state.
ii. A carbonate not decomposed by heat.
iii. A green coloured carbonate which turns black on heating.
iv. A nitrate which gives off only oxygen when heated.
v. A nitrate which on heating decomposes into dinitrogen oxide (nitrous oxide) and steam.
vi. A nitrate which gives off oxygen and nitrogen dioxide when heated.

(b) [6]

i. What is the volume (measured in dm^3 or litres) occupied by one mole of a gas at STP?
ii. 112 cm^3 (at STP) of a gaseous fluoride of phosphorus has a mass of 0.63g. Calculate the relative molecular mass of the fluoride. If the molecule of the fluoride contains only one atom of phosphorus, then determine the formula of the phosphorus fluoride. (F = 19; P = 31)

(c) [7]

i. What is an electrolyte?
ii. Classify following substance under three headings:
Strong Electrolytes, Weak Electrolytes, Non Electrolytes, Acetic acid, ammonium chloride, ammonium hydroxide, carbon tetrachloride, dilute hydrochloric acid, sodium acetate, dilute sulphuric acid.

(d) [6]

Some methods used for the laboratory preparation of salts are:
A. metal + acid B. carbonate + acid
C. precipitation (double decomposition) D. direct combination.
E. titration
Copy and complete the following table:

Salt	Method of Preparation
Ammonium sulphate	E
Calcium carbonate	
Iron (III) chloride	
Lead nitrate	
Zinc sulphate	

Question 1
(e) [5]

Copy and complete the following table which summarizes the effect of adding a small amount of sodium hydroxide to various salt solutions followed by an excess of the reagent, and then adding ammonium hydroxide (ammonia solution) in a small amount followed by an excess to another sample of each of the salt solutions.

Solutions	Effect of adding sodium hydroxide solutions		Effect of adding ammonium hydroxide	
	Small amount	In excess	Small amount	In excess
Calcium nitrate			No precipitate	No change
Zinc nitrate				
Lead nitrate				

(f) What do you see when: [5]

i. Concentrated nitric acid is added to copper.
ii. Concentrated sulphuric acid is added to copper sulphate·5 water.
iii. Concentrated hydrochloric acid is added to lead (IV) oxide with warming.
(You are not required to say what is happening nor it is necessary to name the products.)

(g) [3]

Determine the empirical formula of the compound whose composition by mass is 42% nitrogen, 48% oxygen and 9% hydrogen.
(H = 1, N = 14, 0 = 16)

(h) Write balanced equations for the following reactions: [4]

1. Iron (III) chloride solution with sodium hydroxide solution.
2. Chlorine and cold dilute sodium hydroxide solution.
3. Zinc and sodium hydroxide solution.
4. Sulphur dioxide and sodium hydroxide solution.
   (Give the equation for the formation of the normal salt):

SECTION II 40(Marks)
Attempt any four questions

Question 2
(a) [7]

i. State the number of elements in period 1, period 2, and period 3 of the - periodic table.
ii. Name the elements in period 1.
iii. What happens to atomic size of elements on moving from left to right in a period?

(b) [3]

i. What is the common feature of the electronic configurations of the elements at the end of period 2 and period 3?
ii. If an element is in group 7 (or group 7A), is it likely to be metallic or non-metallic in character?
iii. Supply the missing word from those in brackets:
   If an element has one electron in its outermost energy level (shell) then it is likely to be ..... (metallic/non−metallic).

Question 3 [3]

(a) Explain what is meant by the term allotropy. Use the allotropic forms of sulphur to illustrate your answer.

(b) State how you can obtain: [3]

i. Sulphur dioxide from sulphur.
ii. Hydrogen sulphide from iron (II) sulphide.

(c) Some bacteria obtain their energy by oxidizing sulphur, producing sulphuric acid as a by-product. In the laboratory, or industrially, the first step in conversion of sulphur to sulphuric acid is to produce sulphur dioxide (see (b) (i) above). Then sulphur dioxide is converted to sulphur trioxide which reacts with water producing sulphuric acid. [4]

i. Name one catalyst used industrially which speeds-up the conversion of sulphur dioxide to sulphur trioxide.
ii. Write the equation for the conversion of sulphur dioxide to sulphur trioxide. Why does this reaction supply energy?
iii. What is the name of the compound formed between sulphur trioxide and sulphuric acid?

Question 4

(a) Give the names and structural formulae of: [4]

i. A saturated hydrocarbon.
ii. An unsaturated hydrocarbon with a double bond.

(b) Copy and complete the following sentence: [2]

A saturated hydrocarbon will undergo ..... reactions whereas the typical reaction of an unsaturated hydrocarbon is .....

(c) [4]

i. Write the equation for the laboratory preparation of ethyne (acetylene) from calcium carbide.
ii. What is the special feature of the structure of ethyne?
iii. What would you see when ethyne is bubbled through a solution of bromine in carbon tetrachloride?
iv. Name the addition product formed between ethene and water.

Question 5

(a) X is an element in the form of a powder. X burns in oxygen and the product is soluble in water. The solution is tested with litmus. Write down only the word which will correctly complete each of the following sentences. [5]

i. If X is a metal, then the litmus will turn .....
ii. If X is a non-metal, then the litmus will turn .....
iii. If X is a reactive metal, then ..... will be evolved when X reacts with dilute sulphuric acid.
iv. If X is a metal it will form ..... oxide, which will form ..... solution with water.

v. If X is a non-metal it will not conduct electricity unless it is carbon in the form of .....

(b) [5]

i. The ore zinc blende, is an important source of the metal zinc. What is the name of the zinc compound in zinc blende?
ii. What is the zinc compound obtained by roasting zinc blende?
iii. What is the type of chemical reaction carried out after roasting in order to obtain zinc?
iv. Are liquid zinc and liquid lead miscible or immiscible?
v. What is the name of the alloy formed by zinc and copper?

Question 6

(a) [3]

i. What must be added to sodium chloride to obtain hydrogen chloride?
ii. Write the equation for the reaction which takes place in (a) (i) above.
iii. What would you see when hydrogen chloride mixes with ammonia?

(b) Hydrogen chloride dissolves in water forming an acidic solution. [4]

i. Name the experiment which demonstrates that hydrogen chloride is very soluble in water.
ii. Give three distinct tests (apart from using an indicator) you would carry out with this solution to illustrate the typical properties of an acid.

(c) Write the equation for the reaction of hydrochloric acid with each of the following: [3]

i. Bleaching powder
ii. Lead nitrate solution.
iii. Manganese (IV) oxide

Question 7

(a) If 112 cm^3 of hydrogen sulphide is mixed with 120 cm^3 of chlorine at STP what mass of sulphur is formed?
$H_2S + Cl_2 \longrightarrow 2HCl + S$ [2]

(b) Washing soda has the formula $Na_2CO_3.\ 10H_2O$. What mass of anhydrous sodium carbonate is left when all the water of crystallization is expelled by heating 57.2 g of washing soda? [4]

(c) When excess lead nitrate solution was added to a solution of sodium sulphate, 15.15 g of lead sulphate were precipitated. What mass of sodium sulphate was present in the original solution?

$Na_2SO_4 + Pb(NO_3)2$——> $PbSO_4$+ $2NaNO_3$

(H = 1; C = 12; O = 16; Na = 23; S = 32; Pb = 207) [4]