S.6 CHEM SEMINAR QUESTIONS 2019

1. (a) Using equations , describe the reactions of zinc with

   (i) moist air

   (ii) water

   (iii) sodium hydroxide (10marks)

   (b) (i) Explain why zinc is not a typical transition element. (02marks)

   (ii) Give four ways in which zinc reacts in the same way as magnesium. (04marks)

   (c) State what would be observed and write equation for the reaction when dilute ammonia solution was added drop-wise until in excess to a solution containing zinc ions. (04martks)

2. (a) Write the electronic configuration of manganese (atomic number = 25)

   (b) (i) State the possible oxidations states exhibited by manganese.

   (ii) Write formula of oxides of manganese that exhibit the oxidation states in (b)(i) above.

   (c) Sodium bismuthate solution is reacted with manganese(II) sulphate solution in presence of concentrated nitric acid

   (i) State what would observed.

   (ii) State the role of concentrated nitric acid and write equation for the reaction in

   (iii) To the resultant mixture in (c)(i) was added sodium sulphite solution. State what was observed and write equation for the reaction.

   (d) Describe briefly how potassium manganate(VI)

   (i) can be prepared in the laboratory

   (ii) can react with carbon dioxide

   (Illustrate your answer with equation(s))

3. Magnesium ,aluminium , silicon , phosphorous , sulphur and chlorine are some of elements of period 3 of the Periodic Table.

(a) Write the formulae of the hydrides of elements and state the type of bonding in each hydride.

(b) Describe the reaction of elements with

(i) dilute hydrochloric acid

(ii) sodium hydroxide

(iiI) hydrofluoric acid

(c) Magnesium and phosphorus were separately ignited in air. State what would be observed and write equation(s) for the reaction(s).

(d) (i) Which oxide of sulphur can act both as a reducing agent and as an oxidizing agent.

(ii) Describe the reaction of each of properties of oxide of sulphur in d(i) above.(Illustrate you answer with equations)

4. (a) Describe how iron can extracted from siderite ore.

(b) Briefly describe the process of rusting of iron objects.

(c) Describe and explain reaction of iron with

(i) chlorine

(ii) copper(II) sulphate solution

(iii) dry oxygen gas

(d) Few drops of concentrated nitric acid were added to iron(II) sulphate solution and to the resultant mixture was added potassium hexacyanoferrate(II) solution.

(i) State all the observations made

(ii) Write equations for the reactions that took place.

5. 11.25g of an organic compound P on complete combustions yielded $8.4x10^{-3}m^{3}$ of carbon dioxide and 6.75g of water at s.t.p. Given that P has a vapour density of $3.75gdm^{-3}$ at room temperature.

(a) (i) Calculate the empirical formula of P

(ii) Determine the molecular formula of P

(b) Compound P gave effervescence of a colourless gas when treated with sodium carbonate solution. It also gave yellow precipitate when treated with iodine solution and sodium hydroxide solution. Identify P.

(c) Write equation for the reaction leading to the formation of

(i) colourless gas

(ii) yellow precipitate

(d) Write equation and suggest a mechanism for the reaction between **P** and

(i) methanol in the presence of few drops of concentrated sulphuric acid.

(ii) excess concentrated phosphoric acid at $170^{o}C$.

(e) Using equations show how **P** can be

(i) synthesized from but- 2- yne

(ii) converted to ethanol

6. (a) Distinguish between redoX reaction and disproportionation reaction

(b) Write equation to show

(i) disproportionation reaction between potassium manganate(VI) and dilute sulphuric acid

(ii) a redox reaction between copper turnings and silver nitrate solution.

(iii) a disproportionation reaction between iodine and hot concentrated sodium hydroxide solution.

(iv) a redox reaction between acidified solution of potassium chlorate(V) solution and iron(II) sulphate.

(c) Manganese (IV) oxide occurs in pyrolusite ore , 2.0g of pyrolusite ore was boiled with excess concentrated hydrochloric acid. The chlorine liberated was bubbled through excess potassium iodide solution. The iodine liberated required $33.5cm^3$ of 0.2M sodium thiosulphate solution.

(i) Write equations for the redox reactions involved.

(ii) calculate the percentage by mass of manganese(IV) oxide in the ore.

(d) $25cm^3$ of a solution containing 3.6875g of YSO_4 per $250cm^3$ of solution was acidified with dilute sulphuric acid and required $12.70cm^3$ of 0.027M potassium manganate(VII)

solution. In acidic medium , Manganate(VII) ions oxidise Y^{2+} to Y^{n+}. Determine the value of n. (Y= 119, S = 32 , O = 16 ,)

(e) State the conditions and write equation for the reaction between

(i) manganese (II) sulphate solution and lead(IV) oxide

(iii) manganese(IV) oxide and a mixture of potassium hydroxide and potassium chlorate(V).

7. Write equations to show how the following compounds can be synthesized

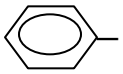
(a) 1-methyl cyclohexane-1-ol from cyclohexanol

(b) CH_3COCH_3 from ethanol

(b) Phenyl methanal (benzaldehyde) from benzoic acid

(c) CH_3CH_2COOH from propene

(d) $(CH_3)_2C = N- NH_2$ from propan-1-ol

(e) benzene to  $N H_2$

(f) propene to 2- methylpropan -2 –ol

8. The elements sodium , aluminium , silicon, phosphorus , sulphur and sulphur and chlorine belong to period 3 of the Period Table.

(a) Explain the differences in the melting points of the elements.

(b) Describe the reactions of

(i) aluminium , silicon , phosphorus and chlorine with sodium hydroxide.

(ii) the hydride of sodium , silicon and sulphur with water.

(iii) aluminium with sulphuric acid

(iv) the chlorides of aluminium , silicon and phosphorus with water

(v) the oxides of phosphorus with sodium hydroxide.

9. (a) Define the terms

(i) a colligative property .

(ii) boiuling point constant.

(b) Describe an experiment that you would carry out to determine the relative molecular mass of s compound using boiling point method. Use a diagram to illustrate your answer.

(c) Explain the effect of association of the solute on its value of relative molecular determined by the boiling point method.

(d) (i) State the laws of osmotic pressure.

(ii) State the conditions under which these laws are valid.

(e) The osmotic pressure of a 1.42% solution of polyvinyl chloride is 2.356×10^{-2} mmHg at 25^{o}.

(i) Calculate the relative molecular mass of polyvinylchloride

(ii) Calculate the number of monomer units of polyvinylchloride.

(iii) Write equation for the formation of polyvinylchloride from chloroethene.

10. (a) Describe the reaction of

(i) ethanol wih sulhuric acid

(ii) benzene with chlorine

(iii) propanoic acid with methanol

(iv) nitrous acid with amines

(Your answer should include conditions for the reactions and mechanisms for the reactions in (i) and (iii))

(b) Write equation for the reaction and indicate the mechanism for the reaction between

(i) chloroethane and phenol in presence of sodium hydroxide solution

(ii) propanone and 4-nitrophenylhydrazine in acidic medium.

(iii) 1-methylcyclohex-1-ene and bromine water.

11. (a) What is meant by the term electron affinity.

(b) The first electron affinities of group(VII) elements are shown below.

Element	Fluorine	chlorine	bromine	Iodine
Atomic number	9	17	35	64
Electron affinity ($kJmol^{-1}$)	-328	-349	-325	-295

(i) Plot a graph of first electron against atomic number

(ii) Explain the shape of the graph

(c) State three reasons why fluorine differs in some reactions from group (VII) elements.

(d) State four properties in which fluorine differs from other group(VII)

(e) Describe the reaction of group(VII) elements

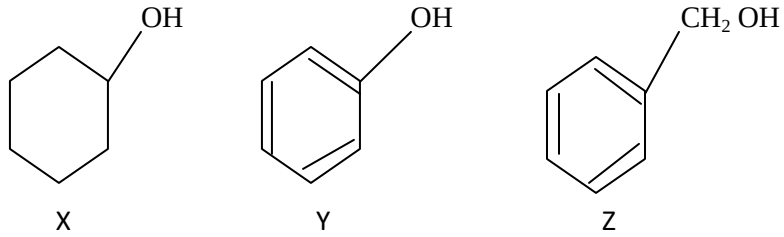
(i) with water

(ii) with sodium hydroxide

(f) Write equations for the reactions between the hydride of group(VII) with concentrated sulphuric acid.

(g) Describe briefly how you would prepare crystals of potassium chlorate.

12. The structural formulae of some compounds X, Y and Z are shown below.



X Y Z

(a) For compound Y and Z , name one reagent which

(i) when reacted with Y and Z will show similar observation

(ii) can be used to distinguish between Y and Z

In each case state what would be observed when Y and Z is separately treated with the reagent you named.

(b) (i) Write equation(s) to show how Y can be prepared from benzene. (Your answer should include reagents and conditions)

(ii) Y can be used in the manufacture of azo- dye. By means of equations only , show how Y can be used to make an azo- dye starting from phenylamine (aniline)

(c) Write

(i) equation for the reaction between X and acidified potassium dichromate

(ii) equation(s) to show how X be converted into cyclohexanecarboxylic acid.

(You answer should include reagent and conditions)

(iii) the mechanism for the reaction between X and ethanoic acid in the presence of concentrated sulphuric acid.

(d) Y is a stronger acid than Z . Explain this observation.

13. (a) State what is meant by the following terms.

(i) Standard enthalpy

(ii) enthalpy of solution

(b) Describe an experiment that can be carried out to determine the enthalpy change of neutralization of hydrochloric acid by sodium hydroxide.(No diagram is required)

(c) In an experiment to determine the heat of neutralization of an acid Q by sodium hydroxide , 2M acid solution was added in the intervals of $5cm^3$ into a plastic beaker containing $40.0cm^3$ of 2M sodium hydroxide solution. After each addition, the mixture was stirred and highest temperature of the solution recorded. The data obtained is shown below.

Volume of acid Q added (cm^3)	0.0	5.0	10.0	15.0	20.0	25.0	30.0
Highest temperature of the mixture(^{OC})	28.0	34.0	39.0	43.0	45.0	42.0	40.0

(i) Plot a graph of highest temperature against volume of acid Q added.

(ii) Use the graph to determine the enthalpy of neutralization of Q by sodium hydroxide solution. (density of solution is $1gcm^{-3}$, specific heat capacity of solution is $4.2jg^{-1}K^{-1}$)

(d) (i) State Hess's law

(ii) The table below shows some heats of combustion of some selected substances.

Substance	Heat of combustion , ΔH^oc ($kJmol^{-1}$)
Ethane	-1542
Ethyne	-1310
hydrogen	-285

Calculate the heat of hydrogenation of ethyne to ethane.

14. State what would be observed and write equation(s) for the reaction(s) when

(a) Methanoic acid was warmed with acidified potassium dichromate solution

(b) Lead(II) nitrate solution was warmed with an alkaline solution sodium hypochlorite.

(c) sulphur is warmed with concentrated nitric acid

(d) potassium peroxo disulphate solution was added to iron(II) suphate solution

(e) Methanal is warmed with Fehling's solution.

(f) Copper tunings are reacted with moderately concentrated nitric acid.

(g) Benzoic acid solution is mixed with iron(III) chloride solution.

(h) Sodium ethanoate solution is warmed with neutral iron(III) chloride solution.

(i) phosphorus is warmed with concentrated sulphuric acid

(j) sodium hydroxide solution was added to tin(IV) sulphate solution drop wise until in excess.

(k) Magnesium ribbon was added to an aqueous solution of chromium (III) sulphate.

(l) potassium iodide was warmed with concentrated sulphuric acid.

(m) potassium chromate solution was added to lead(II) nitrate solution followed sodium hydroxide drop wise until in excess.

`(n) Ammonia solution was added drop-wise until in excess to a solution of nickel (II) sulphate .

15. (a) What is meant by the term ore?

(b) Briefly describe how the following ores are concentrated.

(ii) Copper pyrites

(iii) Bauxite

(c) Describe how a pure metal can be extracted from each of the concentrated ore in (b).

(d) Describe how each of the pure metals in (c) can react with

(i) oxygen

(ii) mineral acids

(iii) halogens

(e) State **two** uses of each of the metals obtained in (c) above.

END