

Self Assessment Paper

General Instructions :

All questions are compulsory

Question 1 is of 20 marks having four sub parts, all of which are compulsory.

Question numbers 2 to 8 carry 2 marks each, with **any two** questions having internal choice.

Question numbers 9 to 15 carry 3 marks each, with **any two** questions having an internal choice.

Question numbers 16 to 18 carry 5 marks each, with an internal choice.

All working, including rough work, should be done on the same sheet as, and adjacent to the rest of the answer.

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

Balanced equations must be given wherever possible and diagrams where they are helpful.

When solving numerical problems, all essential working must be shown.

In working out problems, use the following data :

Gas constant $R = 1.987 \text{ cal deg}^{-1} \text{ mol}^{-1} = 8.314 \text{ JK}^{-1} \text{ mol}^{-1} = 0.0821 \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1}$

1 Faraday = 96500 coulombs.

Avogadro's number = 6.023×10^{23}

Question 1

- (a) Fill in the blanks by choosing the appropriate word/words from those given in the brackets : [4 × 1]
(aromatic oxide, sp^3d^2 , octahedral, minimum, Ferromagnetism, alkyl halide, ferrimagnetism decreases, sp^3d , pyramidal, maximum, increasing, aromatic hydride)
- (i) Aromatic ether is prepared by heating with
- (ii) SF_6 has hybridization and structure.
- (iii) Solids with conductivities in the range from 10^{-6} to $10^4 \text{ ohm}^{-1} \text{ m}^{-1}$ are called
- (iv) Degree of dissociation of a weak electrolyte is proportional to the of its molar concentration.
- (b) Complete the following statements by selecting the **correct alternative from** the choices given : [4 × 1]
- (i) The molecular weight of sodium chloride determined by measuring the osmotic pressure of its aqueous solution is :
- (1) Double the theoretical value
 - (2) Same as the theoretical value
 - (3) Half the theoretical value
 - (4) Three times the theoretical value
- (ii) In a molecule of tertiary haloalkanes, carbon atom is bonded to carbon atoms.
- (1) 3
 - (2) 2
 - (3) 4
 - (4) 1

(iii) Methyl phenyl ether can be obtained by reacting :

- (1) phenolate ions and methyl iodide
- (2) methoxide ions and bromobenzene
- (3) methanol and phenol
- (4) bromobenzene and methyl bromide

Ⓐ (iv) Froth flotation process may be used to increase the concentration of mineral in :

- (1) Chalcopyrite
- (2) Bauxite
- (3) Haematite
- (4) Calamine

(c) Match the following : [4 × 1]

- (i) Clemmensen reduction — Chemical reaction
- (ii) Zymase — Aerosol in gas
- (iii) Effective collision — Hydrolysis of cane sugar
- (iv) Liquid dispersed — Zn-Hg with HCl

(d) Answer the following questions [4 × 2]

- (i) The chemistry of actinoids is not so smooth as that of lanthanoids. Give reason.
- (ii) Give one good chemical test to distinguish between the following pair of compounds : Methylamine and dimethylamine.
- (iii) Name the type of isomerism shown by the following pair of compounds : $[\text{PtCl}_2(\text{NH}_3)_4]\text{Br}_2$ and $[\text{PtBr}_2(\text{NH}_3)_4]\text{Cl}_2$. Give a chemical test to distinguish between the given pair of isomers.
- (iv) What is a colligative property ? Give two examples.

Ⓐ Question 2

In a first order reaction, 10% of the reactant is consumed in 25 minutes. Calculate :

- (i) The half life of the reaction.
- (ii) The time required for completing 17% of the reaction. [2]

Question 3

What are biodegradable and non-biodegradable detergents ? Give one example of each class. [2]

OR

Give reason why phenol is more easily nitrated than benzene ?

Question 4

Rearrange the compounds of each of the following sets in order of reactivity towards SN_2 displacement : [2]

- (i) 2- Bromo-2- methyl butane, 1- Bromo-pentane, 2- Bromopentane.
- (ii) 1- Bromo- 2- methyl butane, 2- Bromo- 2- methyl butane, 3- Bromo- 2- methyl butane.

Question 5

How will you bring about the following conversion : acetaldehyde to acetamide? [2]

Question 6

What is the effect of denaturation on the structure of proteins ? [2]

Question 7

The following is not an appropriate reaction for the preparation of tert-butyl ethyl ether. [2]



- (i) What would be the major product of the given reaction ?
- (ii) Write a suitable reaction for the preparation of tert-butyl ethyl ether, specifying the names of reagents used.

Question 8

The rate of a reaction becomes four times when the temperature changes from 293 K to 313 K. Calculate the energy of activation (E_a) of the reaction assuming that it does not change with temperature. $[R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}]$

Question 9

The freezing point of nitrobenzene is 278.8 K. A 0.25 molal solution of a substance (molecular weight : 120) in nitrobenzene has a freezing point of 276.8 K. Calculate the molal depression constant of nitrobenzene. [3]

Question 10

- (a) For a crystal of sodium chloride, state : [3]
- The type of lattice in which it crystallizes.
 - The coordination number of each sodium ion and chloride ion in the crystal lattice.
 - The number of sodium ions and chloride ions present in a unit cell of sodium chloride.
 - The structural arrangement of the sodium chloride crystal.
- (b) Explain giving reasons why : Ionic solids conduct electricity in molten state, but not in solid state.

Question 11

What are lyophilic and lyophobic sols ? Give one example of each type. Which one of these two types of sols is easily coagulated and why ? [3]

OR

Ethylene glycol is used as an antifreeze agent. Calculate the amount of ethylene glycol to be added to 4 kg of water to prevent it from freezing at -6°C (K_f for $\text{H}_2\text{O} = 1.85 \text{ K kg}$)

Question 12

Write the IUPAC name of the following : [3]

- $[\text{Co}(\text{NH}_3)_6] \text{Cl}_3$
- $[\text{NiCl}_4]^{2-}$
- $\text{K}_3[\text{Fe}(\text{CN})_6]$

Question 13

Explain why transition metals form complex compounds. [3]

Question 14

Identify the reagents A, B, C, D, E and F required for the following conversion : $\text{C}_6\text{H}_5\text{NO}_2 \xrightarrow{\text{A}}$
 $\text{C}_6\text{H}_5\text{NH}_2 \xrightarrow{\text{B}} \text{C}_6\text{H}_5\text{N}_2\text{Cl} \xrightarrow{\text{C}} \text{C}_6\text{H}_5\text{Cl} \xrightarrow{\text{D}} \text{C}_6\text{H}_5\text{OH} \xrightarrow{\text{H}_2\text{SO}_4} \text{E} + \text{F}$ [3]

OR

Give balanced chemical equation for the following reaction :

- Potassium iodide is treated with acidified potassium permanganate solution.
- Sodium dichromate with calculate amount of potassium chloride.
- Sulphur dioxide treated with acidified potassium permanganate.

Question 15

Account for the following facts : [3]

- The reduction of a metal oxide is easier if the metal formed is in the liquid state at the temperature of reduction.
- Limestone is used in the manufacture of pig iron from haematite.
- Pine oil is used in the froth flotation process used to concentrate sulphide ores.

Question 16

- Specific conductance decreases with dilution whereas equivalent conductance increases with dilution. Why ? [5]
- State the Faraday's second law of electrolysis.

OR

0.05 M NaOH solution offered a resistance of 31.6 ohm in a conductivity cell at 298 K. If the cell constant of the cell is 0.367 cm^{-1} , calculate the molar conductivity of the NaOH solution.

Question 17

- (A) Complete the following chemical reactions : [5]
- $\text{XeF}_4 + \text{SbF}_5 \rightarrow$
 - $\text{XeF}_6 + 2\text{H}_2\text{O} \rightarrow$
 - $\text{XeF}_6 + 3\text{H}_2\text{O} \rightarrow$

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(B) Why could fluorine not be prepared for a long time from HF and metal fluorides either by electrolysis or by any chemical reaction ?

OR

(A) Suggest a possible reason for the following observations :

(i) In the solid state, PCl_5 behaves as an ionic species.

(ii) H_2S is more acidic than water.

(iii) Fluorine forms the largest number of inter halogen compounds amongst the halogens.

(B) (i) What is the hybridization of the chlorine atom in ClF_3 molecule ?

(ii) Draw the structure of the ClF_3 molecule and state its geometry.

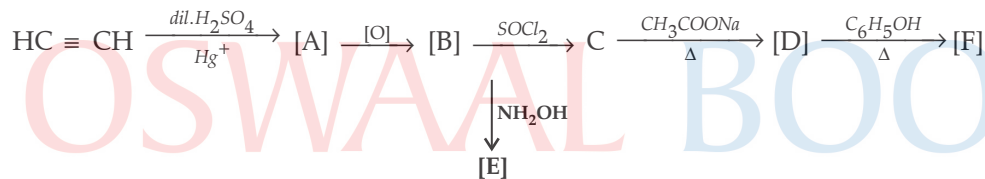
Question 18

(i) An organic compound A with molecular formula C_7H_8 on oxidation by chromyl chloride in the presence of CCl_4 gives a compound B which gives positive Tollen's test. The compound B on treatment with NaOH followed by acid hydrolysis gives two products C and D. C on oxidation gives B which on further oxidation gives D. The compound D on distillation with sodalime gives a hydrocarbon E. Below 60°C , concentrated nitric acid reacts with E in the presence of concentrated sulphuric acid forming a compound F. Identify the compounds A, B, C, D, E and F. [5]

(ii) Give chemical test to distinguish : Formaldehyde and acetaldehyde.

OR

(i) Identify the compounds A, B, C, D, E and F.



(ii) Write the relevant balanced equation and the name of the reaction involved in the conversion of acetyl chloride to acetaldehyde.

Finished Solving the Paper ?
Time to evaluate yourself !
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OR

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