

ISC SEMESTER 1 EXAMINATION
SPECIMEN QUESTION PAPER
CHEMISTRY
PAPER-1
(THEORY)

Maximum Marks: 70

Time allowed: One and a half hours

(Candidates are allowed additional 15 minutes for only reading the paper.)

ALL QUESTIONS ARE COMPULSORY

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

Select the correct option for each of the following questions.

Question 1

Na and Mg crystallise in bcc and fcc structures respectively. The value of Z (number of atoms) for their crystals is: [1]

- (a) 8 and 14
- (b) 2 and 4
- (c) 14 and 8
- (d) 6 and 4

Question 2

Colligative properties depend on: [1]

- (a) The nature of solute particles in solution
- (b) The number of solute particles in solution
- (c) The nature of solute and solvent particles
- (d) The physical properties of solute particles in solution

Question 3

On dilution, the specific conductance of a solution:

[1]

- (a) Remains unchanged
- (b) Increases
- (c) Decreases
- (d) First increases then decreases

Question 4

The flux used in the extraction of iron from haematite ore is:

[1]

- (a) Limestone
- (b) Silica
- (c) Coke
- (d) Calcium phosphate

Question 5

Which of the following xenon fluoride of xenon cannot be formed?

[1]

- (a) XeF_2
- (b) XeF_4
- (c) XeF_6
- (d) XeF_3

Question 6

The gas obtained on heating iodoform with silver powder is:

[1]

- (a) Propane
- (b) Ethane
- (c) Ethyne
- (d) Ethene

Question 7

Boiling point of ethyl alcohol is greater than diethyl ether due to:

[1]

- (a) Vander Waals forces
- (b) London forces
- (c) Polarity
- (d) Hydrogen bonding

Question 8

In a face centred cubic lattice, atom 'A' occupies the corner positions and atom 'B' occupies the face centred positions. If one atom of 'B' is missing from one of the face centred points, the formula of the compound will be: [1]

- (a) AB_2
- (b) A_2B_3
- (c) A_2B_5
- (d) A_2B

Question 9

The standard reduction potential values of three metallic cations X, Y and Z are 0.52 V, - 3.03 V and -1.18 V respectively. The order of reducing power of the corresponding metals is: [1]

- (a) $Y > Z > X$
- (b) $X > Y > Z$
- (c) $Z > Y > X$
- (d) $Z > X > Y$

Question 10

If molality of the dilute solution of a non-volatile, non-dissociating and non-associating electrolyte is doubled, the value of molal elevation constant or Ebullioscopic constant (K_b) will be: [1]

- (a) doubled
- (b) halved
- (c) tripled
- (d) unchanged

Question 11

[1]

Extraction of zinc from zinc blende is achieved by :-

- (a) Electrolytic reduction
- (b) Roasting, followed by reduction with carbon
- (c) Roasting, followed by reduction with another metal
- (d) Roasting, followed by self-reduction

Question 12

[1]

The most powerful oxidizing agent is:

- (a) Fluorine
- (b) Chlorine
- (c) Bromine
- (d) Iodine

Question 13

During the course of S_N^1 reaction, the intermediate species formed is: [1]

- (a) A free radical
- (b) A carbanion
- (c) A carbocation
- (d) An intermediate complex

Question 14

Which type of defect has the presence of cations in the interstitial sites? [1]

- (a) Schottky defect
- (b) Vacancy defect
- (c) Frenkel defect
- (d) Metal deficiency defect

Question 15

Reaction between acetone and methyl magnesium chloride, followed by hydrolysis will give: [1]

- (a) tert-butyl alcohol
- (b) iso-butyl alcohol
- (c) iso-propyl alcohol
- (d) sec-butyl alcohol

Question 16

If 5.85 g of NaCl are dissolved in 90 g of water, the mole fraction of solute is: [1]

- (a) 0.2632
- (b) 0.0102
- (c) 0.0196
- (d) 0.1045

Question 17

When zinc granule is dipped into copper sulphate solution, copper is precipitated because: [1]

- (a) Both copper and zinc have a positive reduction potential.
- (b) Both copper and zinc have a negative reduction potential.
- (c) Reduction potential of zinc is higher than that of copper.
- (d) Reduction potential of copper is higher than that of zinc.

Question 18

The optically active compound is: [1]

- (a) Butan-1-ol
- (b) Butan-2-ol
- (c) Propan-1-ol
- (d) 2-methyl-propan-1-ol

Question 19

Chlorine reacts with cold and dilute NaOH under ordinary conditions to give: [1]

- (a) NaCl and Cl₂O
- (b) NaCl and ClO₂
- (c) NaCl and NaClO
- (d) NaCl and NaClO₃

Question 20

Solutions which distil without any change in composition and temperature are called: [1]

- (a) Ideal
- (b) Super saturated
- (c) Azeotropic
- (d) Isotonic

Question 21

The reaction: Sodium alkoxide + alkyl halide \longrightarrow Ether + Sodium halide is called: [1]

- (a) Wurtz reaction
- (b) Kolbe's reaction
- (c) Perkin's reaction
- (d) Williamson's synthesis

Question 22

Benzene diazonium chloride on hydrolysis gives:

[1]

- (a) Benzene
- (b) Phenol
- (c) Chlorobenzene
- (d) Benzyl alcohol

Question 23

The vacant space in body centred cubic lattice unit cell is:

[1]

- (a) 32%
- (b) 26%
- (c) 48%
- (d) 68%

Question 24

For a spontaneous reaction ΔG° and E° cell will be respectively:

[1]

- (a) -ve and -ve
- (b) +ve and +ve
- (c) +ve and -ve
- (d) -ve and +ve

Question 25

A liquid is mixed with ethanol and few drops of conc. H_2SO_4 is added. A compound with a fruity smell is formed. The liquid is:

[1]

- (a) HCHO
- (b) CH_3CHO
- (c) CH_3COOH
- (d) CH_3COCH_3

Question 26**[2]**

The chief ore of copper is copper pyrite (CuFeS_2)

- (i) How is the sulphide ore concentrated?
- (a) By Gravity separation process
 - (b) By Froth-floatation process
 - (c) By Electromagnetic separation process
 - (d) By Leaching process
- (ii) Copper is purified by electrolytic refining of blister copper. The correct statement about this process is:
- (a) Impure copper strip is used as cathode
 - (b) Impurities do not settle as anode mud
 - (c) Pure copper deposits at cathode
 - (d) Acidified silver nitrate is used as electrolyte

Question 27**[2]**

The reaction: $\text{CH}_3\text{Br} + \text{OH}^- \longrightarrow \text{CH}_3\text{OH} + \text{Br}^-$

- (i) The expected mechanism of the above reaction is:
- (a) S_N^1 mechanism
 - (b) S_N^2 mechanism
 - (c) S_E^1 mechanism
 - (d) S_E^2 mechanism
- (ii) The above reaction is:
- (a) Elimination reaction
 - (b) Nucleophilic addition reaction
 - (c) Nucleophilic substitution reaction
 - (d) Electrophilic substitution reaction

Question 28**[2]**

For the extraction of metal, answer the following:

- (i) The smelting of iron ore in blast furnace involves all the processes except:
 - (a) Combustion
 - (b) Reduction
 - (c) Slag formation
 - (d) Sublimation

- (ii) Which of the following metal is obtained by leaching the concentrated ore with dilute sodium cyanide solution, followed by treatment with zinc?
 - (a) Aluminium
 - (b) Iron
 - (c) Copper
 - (d) Silver

Question 29**[2]**

Phenol is heated with alcoholic KOH and chloroform:

- (i) What is the name of the reaction?
 - (a) Cannizzaro reaction
 - (b) Gattermann reaction
 - (c) Reimer –Tiemann reaction
 - (d) Kolbe reaction

- (ii) What is the main product formed in this reaction?
 - (a) Salicylaldehyde
 - (b) Salicylic acid
 - (c) Aniline
 - (d) Phenyl isocyanide

Question 30

For IF₇ molecule:

[2]

- (i) The structure of the given molecule is:
- (a) Octahedral
 - (b) Tetrahedral
 - (c) Trigonal bipyramidal
 - (d) Pentagonal bipyramidal
- (ii) The type of hybridization of the given molecule is:
- (a) sp³ hybridisation
 - (b) sp³d³ hybridisation
 - (c) sp³d² hybridisation
 - (d) sp³d hybridisation

Question 31

Ethyl alcohol when reacts with PCl₅ gives a compound (A). When compound (A) is treated with alc. KOH, compound (B) is formed along with KCl and H₂O.

[2]

- (i) The compound (A) is:
- (a) C₂H₄Cl₂
 - (b) CH₃CHO
 - (c) C₂H₅Cl
 - (d) CH₃OH
- (ii) The compound (B) is:
- (a) C₂H₂
 - (b) C₂H₄
 - (c) C₂H₆
 - (d) C₂H₅OH

Question 32

Copper pyrite or chalcopyrite (CuFeS_2) is the main ore of copper. The extraction of copper from its ore involves, concentration, partial roasting, removal of iron and self-reduction. [2]

- (i) On heating the mixture of Cu_2O and Cu_2S , which one of the following will be obtained?
- (a) Cu_2SO_3
 - (b) $\text{Cu} + \text{SO}_3$
 - (c) $\text{CuO} + \text{CuS}$
 - (d) $\text{Cu} + \text{SO}_2$
- (ii) Iron is removed during the extraction of copper as:
- (a) FeO
 - (b) FeS
 - (c) FeSiO_3
 - (d) Fe_2O_3

Question 33

Conversion of Chlorobenzene into phenol. [2]

- (i) Which of the following statements is correct for the above conversion?
- (a) Heating it with alc. KOH at room temperature
 - (b) Heating it with aqueous NaOH at 623 K under pressure followed by acidification with dilute HCl
 - (c) Heating it with CuCN followed by acidification with dilute HCl
 - (d) Heating it with sodium metal in the presence of dry ether
- (ii) What is the name of the above reaction?
- (a) Dow process
 - (b) Wurtz reaction
 - (c) Sandmeyer's reaction
 - (d) Kolbe's reaction

Question 34

With reference to XeF_6 molecule, answer the following questions.

[2]

- (i) What is the hybridisation of Xe atom in the given molecule?
- (a) sp^3d^3
 - (b) sp^3d^2
 - (c) sp^3
 - (d) sp^3d
- (ii) What is the geometry of this molecule?
- (a) Distorted octahedral
 - (b) Square planer
 - (c) Pyramidal
 - (d) Tetrahedral

Question 35

An unknown alcohol is treated with Lucas reagent to determine whether the alcohol is primary, secondary or tertiary.

[2]

- (i) Which alcohol reacts fastest and by what mechanism?
- (a) Tertiary alcohol by S_N^2
 - (b) Secondary alcohol by S_N^1
 - (c) Tertiary alcohol by S_N^1
 - (d) Secondary alcohol by S_N^2
- (ii) What is the chemical composition of the Lucas reagent used above?
- (a) Anhydrous zinc chloride in concentrated HCl
 - (b) Anhydrous aluminium chloride in concentrated HCl
 - (c) Anhydrous lead chloride in concentrated HCl
 - (d) Anhydrous barium chloride in concentrated HCl

Question 36

Ozone is prepared from oxygen:

[2]

- (i) Which method is used in the above preparation?
- (a) Oxidation at high temperature
 - (b) Oxidation using catalyst
 - (c) Silent electric discharge
 - (d) Reduction at high temperature

- (ii) The ozone obtained above acts as a:
- (a) reducing agent
 - (b) oxidising agent
 - (c) decomposer
 - (d) dehydrating agent

Question 37

Copper metal crystallises with face centred cubic unit cell. If the edge length of copper atom is 361.5 pm. (Atomic weight of Cu = 63.5, $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$) [2]

- (i) The density of copper metal is:
- (a) 7.86 g/cm³
 - (b) 8.93 g/cm³
 - (c) 9.76 g/cm³
 - (d) 10.5 g/cm³
- (ii) The radius of copper metal is:
- (a) 180.75 pm
 - (b) 156.53 pm
 - (c) 127.79 pm
 - (d) 104.86 pm

Question 38

An aqueous solution containing one gram of urea (molecular weight = 60) boils at 100.25°C. The same solution freezes at -0.894 °C. The aqueous solution containing 3 gram of glucose (Molecular weight = 180) in the same volume of solution: [2]

- (i) What is the boiling point of glucose?
- (a) 100.75 °C
 - (b) 100.50 °C
 - (c) 100.25 °C
 - (d) 100.08 °C
- (ii) What is the freezing point of glucose?
- (a) +0.894 °C
 - (b) -0.894 °C
 - (c) +0.447 °C
 - (d) -0.447 °C

Question 39

When two Faradays of electricity is passed through an aqueous solution of CuSO_4 and an aqueous solution of AgNO_3 . (Atomic weight of $\text{Cu} = 63.5 \text{ g mol}^{-1}$, $\text{Ag} = 108 \text{ g mol}^{-1}$) [2]

(i) The mass of copper deposited at the cathode is:

- (a) 127.02 g
- (b) 63.50 g
- (c) 31.75 g
- (d) 15.87 g

(ii) The mass of silver deposited at the cathode is:

- (a) 54 g
- (b) 108 g
- (c) 216 g
- (d) 270 g

Question 40

[2]

Gold has cubic crystal whose unit cell has an edge length of 407.9 pm. Density of gold is 19.3 g cm^{-3} . Atomic weight of gold is 197 g mol^{-1} . ($N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$)

(i) The number of atoms (Z) in a unit cell of gold is:

- (a) 1
- (b) 2
- (c) 3
- (d) 4

(ii) The type of crystal structure of gold is:

- (a) Simple cubic unit cell
- (b) Body centred cubic unit cell
- (c) Face centred cubic unit cell
- (d) Side centred cubic unit cell

Question 41

A solution of sucrose (molecular weight 342 g mol^{-1}) has been prepared by dissolving 68.4 g of sucrose in 1000 g of water. [2]

(K_f for water = $1.86 \text{ K kg mol}^{-1}$)

(i) The freezing point of the solution obtained will be:

- (a) $-0.52 \text{ }^\circ\text{C}$
- (b) $+0.52 \text{ }^\circ\text{C}$
- (c) $-0.372 \text{ }^\circ\text{C}$
- (d) $+0.372 \text{ }^\circ\text{C}$

(ii) The molality of sucrose solution will be:

- (a) 0.1
- (b) 0.2
- (c) 0.3
- (d) 0.4

Question 42

The standard electrode potential for the reaction is:

[2]



(i) The E°_{cell} will be:

- (a) 0.66 V
- (b) 0.88 V
- (c) 0.94 V
- (d) 1.08 V

(ii) The value of standard Gibbs energy (ΔG°) will be:

($F = 96,000 \text{ C mol}^{-1}$)

- (a) -181.42 kJ
- (b) -90.71 kJ
- (c) -45.36 kJ
- (d) -22.68 kJ

Question 43

A metal has face centred cubic lattice. The edge length of the unit cell is 404 pm. The density of the metal is 2.72 g/cm^3 . ($N_A = 6.023 \times 10^{23} \text{ mol}^{-1}$) [2]

- (i) The molar mass of the metal is:
- (a) 20 g mol^{-1}
 - (b) 27 g mol^{-1}
 - (c) 30 g mol^{-1}
 - (d) 40 g mol^{-1}
- (ii) The radius of the metal atom in centimetre (cm) is:
- (a) $103.29 \times 10^{-10} \text{ cm}$
 - (b) $125.63 \times 10^{-10} \text{ cm}$
 - (c) $142.81 \times 10^{-10} \text{ cm}$
 - (d) $175.76 \times 10^{-10} \text{ cm}$

Question 44

A binary solution contains 92 g ethyl alcohol and 72 g water. (Atomic weight of C = 12, H = 1, O = 16) [2]

- (i) Mole fraction of ethyl alcohol is:
- (a) 0.40
 - (b) 0.80
 - (c) 0.66
 - (d) 0.33
- (ii) Mole fraction of water is:
- (a) 0.33
 - (b) 0.66
 - (c) 0.20
 - (d) 0.80

Question 45

The limiting molar conductivities (Λ_m^∞) for NaCl, KBr and KCl are 126, 152 and 150 $\text{ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$ respectively.

[2]

- (i) The molar conductivity at infinite dilution for NaBr is:
- (a) $128 \text{ ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$
 - (b) $176 \text{ ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$
 - (c) $278 \text{ ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$
 - (d) $302 \text{ ohm}^{-1} \text{cm}^2 \text{mol}^{-1}$
- (ii) The law applied to determine the molar conductivity of infinite dilution is known as:
- (a) Faraday's Law
 - (b) Avogadro's Law
 - (c) Kohlrausch's Law
 - (d) Ohm's Law

Question 46

Assertion: Haloalkanes when treated with alcoholic KCN forms alkane nitrile as a major product. **[1]**

Reason: Potassium cyanide is a covalent compound.

- (a) Assertion is false but reason is true.
- (b) Assertion is true but reason is false.
- (c) Both assertion and reason are false.
- (d) Both assertion and reason are true and reason is the correct explanation of the assertion.

Question 47**[1]**

Assertion: Iron is found free in nature.

Reason: Iron is highly reactive element.

- (a) Assertion is false but reason is true.
- (b) Assertion is true but reason is false.
- (c) Both assertion and reason are true but reason is not correct explanation of the assertion.
- (d) Both assertion and reason are true and reason is the correct explanation of the assertion.

Question 48

Assertion: Ethers are more volatile than alcohols having the same molecular formula. [1]

Reason: Alcohols have intermolecular hydrogen bond.

- (a) Assertion is false but reason is true.
- (b) Assertion is true but reason is false.
- (c) Both assertion and reason are true but reason is not correct explanation of the assertion.
- (d) Both assertion and reason are true and reason is the correct explanation of the assertion.

Question 49

Assertion: SO₂ decolorises pink colour of acidified KMnO₄ solution. [1]

Reason: SO₂ is an oxidising agent

- (a) Assertion is false but reason is true.
- (b) Assertion is true but reason is false.
- (c) Both assertion and reason are true but reason is not the correct explanation of the assertion.
- (d) Both assertion and reason are true and reason is the correct explanation of the assertion.

Question 50

Assertion: Sulphide ores are concentrated by froth floatation process. [1]

Reason: Sulphide ores are wetted by pine oil forming the froth while impurities are wetted by water.

- (a) Both assertion and reason are correct and reason is the correct explanation of the assertion.
- (b) Both assertion and reason are correct but reason is not the correct explanation of the assertion.
- (c) Assertion is correct and the reason is wrong.
- (d) Both assertion and reason are wrong.