Series: SSO/1

Code No. 56/1/2

Roll No. | | | | | | | |

Candidates must write the Code No. on the title page of the answer-book.

- Please check that this question paper contains **12** printed pages maps.
- Code number given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
- Please check that this question paper contains **30** questions.
- **Please write down the serial number of the question before attempting it.**
- 15 minutes time has been allotted to read this question paper. The question paper will be distributed a 10.15 a. From 10.15 a.m. to 10.30 a.m. the student will read the question paper only and will not write any answer on the answer script during this period.

CHEMISTRY (Theory)

Time allowed: 3 hours] [Maximum marks: 70

General Instruction:

(i) All questions are compulsory.
(ii) Marks for each question are indicated against it.
(iii) Questions numbers 1 to 8 are very short – answer and carry 1 mark each.
(iv) Questions numbers 9 to 18 are short – answer and carry2 mark each.
(v) Questions numbers 19 to 17 are also short – answer and carry 3 mark each.
(vi) Questions numbers 28 to 30 are long– answer and carry 5 mark each.
(vii) Use Log Tables, if necessary. Use of calculator is not allowed.

Q1. Which point defect in its crystal units alters the density of a solid? [1]

Q2. Why is the froth flotation method selected for the concentration of Sulphide ores? [1]

Q3. Define the term 'Tyndall effect.' [1]

Q4. Which is a stronger oxidizing agent Bi (v) or Sb (v)? [1]

Q5. Why is an alkylamine more basic than ammonia? [1]

Q6. Write the structure of 3 – oxopentanal. [1]

Q7. Give the IUPAC name of the following compound: [1]

$CH_3 – C \;=\; C – CH_2OH$

| |

CH_3 Br

Q8. Give an example of elastomers. [1]

Q9. Explain the role of [2]

(i) Cryolite in the electrolytic reduction of alumina.

(ii) Carbon monoxide in the purification of nickel.

Q10. A reaction is of second order with respect to a reactant. How will the rate of reaction [2]

(i) doubled,

(ii) Reduced to half?

Q11. Differentiate between molality and molarity of solution. What is the effect of change in temperature of a solution on its molality and molarity? [2]

Q12. Draw the structures of the following molecules: [2]

(i) XeF_4

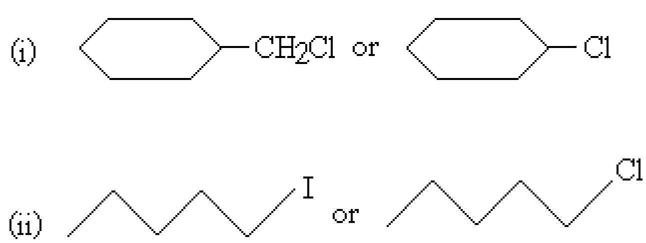
(ii) BrF_3

Q13. Complete the following chemical reaction equations: [2]

(i) $P_{4(s)} + NaOH_{(aq)} + H_2O_{(l)} \rightarrow$

(ii) $I^-_{(aq)} + H_2O_{(l)} + O_{3(g)} \rightarrow$

Q14. Which ones in the following Pairs of substances undergoes S_N2 substitution reaction faster and why? [2]

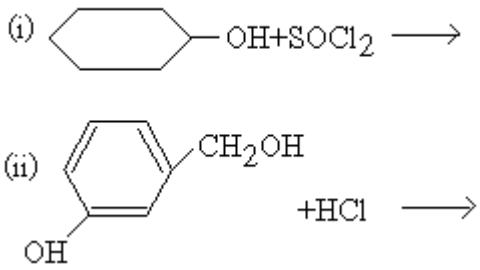


Q15. Explain what is meant by

(i) a peptide linkage

(ii) a glycosidic linkage

Q16. Complete the following reaction equations: [2]



Q17. Draw the structures of the monomers of the following polymers: [2]

(i) Teflon

(ii) Polythene

OR

What is the repeating unit in the condensation polymer obtained by combining $HO_2CCH_2CH_2CO_2H$ (succinic acid) and $H_2NCH_2CH_2NH_2$ (ethylene diamine).

Q18. Name two water soluble vitamins, their sources and the diseases caused due to their deficiency in diet. [2]

Q19. 100 mg of a protein is dissolved in just enough water to make 10.0 mL of solution. If this solution has an osmotic pressure of 13.3 mm Hg at 25^{o}C, what is the molar mass of the protein? [3]

(R = 0.0821 L atm mol^{-1} K^{-1} and 760 mm Hg = 1 atm.)

Q20. Iron has a body centred cubic unit cell with a cell edge of 286.65 pm. The density f iron is 7.87 g cm^{-3}. Use this information to calculate Avogadro's number (At. Mass of Fe = 56 g mol^{-1}). [3]

Q21. What is the difference between multimolecular and macromolecular colloids? Give one example of each. How are associated colloids different from these two types of colloids? [3]

Q22. A first order reaction has a rate constant of 0.0051 min-1. if we begin with 0.10 M concentration of the reactant, what concentration of reactant will remain in solution after 3 hours? [3]

Q23. For the complex [Fe $(en)_2$ Cl_2] Cl, (en = ethylene diamine), identify[3]

(i) the oxidation number of iron,

(ii) the hybrid orbitals and the shape of the complex,

(iii) the magnetic behaviour of the complex,

(iv) the number of geometrical isomers,

(v) whether there is an optical isomer also, and

(vi) name of the complex, (At. no. of Fe = 26)

Q24. Explain the following observations: [3]

(i) Fluorine does not exhibit any positive oxidation state.

(ii) The majority of known noble gas compounds are those of Xenon.

(iii) Phosphorus is much more reactive than nitrogen.

Q25. Giving an example for each describe the following reactions: [3]

(i) Hofmann's bromamide reaction

(ii) Gatterman reaction

(iii) A coupling reaction

Q26. Explain the mechanism of the following reactions: [3]

(i) Addition of Grignard's reagent to the carbonyl group of a compound forming an adduct followed by hydrolysis.

(ii) Acid catalysed dehydration o fan alcohol forming an alkene.

(iii) Acid catalysed hydration of an alkene forming an alcohol.

Q27. How do antiseptics differ from disinfectants? Give one example of each type. [3]

Q28. (a) Complete the following chemical reaction equations: [5]

$$(i) Fe^{2+}_{(aq)} + MnO^{-}_{4\,(aq)} + H^{+}_{(aq)} \rightarrow$$

$$(ii) Cr_2O^{2-}_{7\ (aq)} + I^{-}_{(aq)} + H^{+}_{(aq)} \rightarrow$$

(b) Explain the following observations:

(i) Transition elements are known to form many interstitial compounds.

(ii) With the same d^4 d – orbital configuration Cr2+ ion is reducing while Mn^{3+} ion is oxidising.

(iii) The enthalpies of atomization of the transition elements are quite high.

OR

(a) Complete the following chemical reaction equations:

$$(i) Cr_2O_7^{2-}{}_{(aq)} + H_2S_{(g)} + H^+{}_{(aq)} \rightarrow$$

$$(ii) MnO_{2(s)} + KOH_{(aq)} + O_2 \rightarrow$$

(b) Explain the following observations:

(i) Transition metals form compounds which are usually coloured.

(ii) Transition metals exhibit variable oxidation states.

(iii) The actinoids exhibit a greater range of oxidation states than the lanthanoids.

Q29. (a) What type of a cell is the lead storage battery? Write the anode and the cathode reactions and the overall reaction occurring in a lead storage battery while operating. [5]

(b) A voltaic cell is set up at 25° C with the half – cells, Al | Al^{3+} (0.001 M) and Ni | Ni^{2+} (0.50 M). Write the equation for the reaction that occurs when the cell generates an electric current and determine the cell potential.

$$\left(Given: E^o_{Ni^{2+}|Ni} = -0.25V, E^o_{Al^{3+}|Al} = -1.66\right).$$

OR

(a) Express the relationship amongst cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?

(b) Calculate the equilibrium constant for the reaction

$$Fe_{(s)} + Cd^{2+}{}_{(aq)} \rightleftharpoons Fe^{2+}{}_{(aq)} + Cd_{(s)}$$

$$\left(Given: E^o_{Cd^{2+}|Cd} = 0.40V, E^o_{Fe^{2+}|Fe} = -0.44V\right).$$

Q30. (a) Illustrate the following name reactions by giving example: [5]

(i) Cannizzaro's reaction

(ii) Clemmensen reduction

(b) An organic compound A contains 69.77% carbon, 11.63% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollen's reagent but forms and addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation is ethanoic and propanoic acids. Derive the possible structure of compound A.

OR

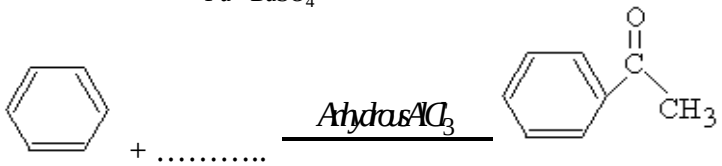
(a) How are the following obtained?

(i) Benzoic acid from ethyl benzene.

(ii) Benzaldehyde from toluene.

(b) Complete each synthesis by giving the missing material, reagent or products:

(i) $C_6H_5COCl \xrightarrow[Pd-BaSO_4]{H_2}$ ……..

(ii)  + …….. $\xrightarrow{Anhydrous\ AlCl_3}$

(iii)  + ……. $\xrightarrow{\cdots\cdots\cdots}$