

MODEL QUESTION PAPER 2027

CHEMISTRY

Std. XII (H.S.C.) · Maharashtra State Board

Time: 3 Hours

Max. Marks: 70

General instructions:

- (1) All questions are compulsory.
- (2) The numbers to the right indicate full marks.
- (3) For each MCQ (Q. 1), only the first attempt will be evaluated.
- (4) Draw well-labelled diagrams wherever necessary.
- (5) Use of a calculator is not allowed.

SECTION A

Q. 1. Select and write the correct answer of the following (each 1 mark):

10

- (i) (i) Write observed electronic configuration of chromium ($Z=24$). (ii) Calculate magnetic moment of Ti^{3+} by using spin only formula (Z of $Ti=22$). (iii) Define Green chemistry.
- (ii) (a) Write cell reactions of hydrogen-oxygen fuel cell at anode and cathode. (b) Write an application of electrochemical series.
- (iii) Write the chemical name of Teflon.
- (iv) The unit of rate constant is per second, the order of reaction is: (a) Zero (b) First (c) Second (d) Third
- (v) The shape of bromine penta-fluoride is _____. (a) Linear (b) Bent-T-Shape (c) Tetrahedral (d) Square pyramidal
- (vi) The reagent used to convert acetyl chloride to acetaldehyde is: (a) $SnCl_2 + HCl$ (b) $Zn-Hg + Conc.HCl$ (c) $NH_2-NH_2/KOH, glycol$ (d) $H_2/Pd-BaSO_4$
- (vii) The pOH of 0.01 M HCl solution is _____. (a) 1 (b) 2 (c) 11 (d) 12
- (viii) (i) Define: (a) Schottky defect (b) Ferromagnetism (ii) Write the name of catalyst used in preparation of HDP. (iii) Draw structure of isoprene unit of natural rubber.
- (ix) Anisole reacts with HI at 398K to form: (a) cyclohexanol (b) benzenol (c) iodobenzene (d) benzene
- (x) The relation between edge length and radius for body centered cubic structure is: (a) $r=a/2$ (b) $r=\sqrt{3}a/4$ (c) $r=\sqrt{2}a/4$ (d) $r=\sqrt{3}a/2$

Q. 2. Answer the following (each 1 mark):

8

- (i) (i) Write a reaction for preparation of Nylon-6. (ii) The salt of Sc^{3+} ion is colourless and the salt of Mn^{3+} ion is coloured. Explain. [Z of $Sc=21$ and Z of $Mn=25$]
- (ii) When 6.0g of O_2 reacts with ClF as per $2ClF(g)+O_2(g)\rightarrow Cl_2O(g)+OF_2(g)$, the enthalpy change is 38.55 kJ. Calculate the standard enthalpy of the reaction.
- (iii) (a) What is the action of following reagents on Bromoethane? (i) KNO_2 (ii) 'Mg' metal (iii) Silver acetate (b) Draw structure - DDT insecticide.
- (iv) (i) Write the formula to measure % atom economy according to green chemistry. (ii) Convert: (a) Benzene into benzaldehyde (b) Cyclohexene into adipic acid.
- (v) (a) Write chemical reactions taking place during extraction of iron in zone of reduction of the blast furnace. (b) Write observed electronic configuration of gadolinium. ($Z=64$)
- (vi) (i) Convert acetamide into ethyl amine. (ii) Explain amphoteric nature of water.
- (vii) Draw the structure of perchloric acid.
- (viii) Complete the following reactions: (i) $CH_3-CH=CH_2 + HBr \rightarrow ?$ (ii) $C_2H_5OH + SOCl_2 \xrightarrow{\text{heat}} ?$

SECTION B

Q. 3 to Q. 14. Attempt any EIGHT of the following (each 2 marks):

16

- (i) When gold crystallizes, it forms face-centered cubic cells. The unit cell edge length is 4×10^{-8} cm. Calculate the density of gold. Molar mass of gold is 197 g mol^{-1} .
- (ii) What is the action of following reagents on ethyl amine? (Indicate by reaction) (a) Nitrous acid (b) Chloroform and KOH
- (iii) (a) Explain anomalous behaviour of oxygen with respect to (i) Atomicity (ii) Magnetic property (iii) Oxidation state (iv) Nature of hydride (b) Write any two uses of helium.
- (iv) Explain aldol condensation reaction with respect to ethanal.
- (v) (a) State Raoult's law. (b) Derive the relationship to determine molar mass of non volatile solute by depression of freezing point.
- (vi) (a) Mention the names of four principles of green chemistry. (b) Write advantages of nanoparticles and nanotechnology in the field of energy sector.
- (vii) How many coulombs of electricity is required to produce 1g of sodium metal by reduction of sodium ion?
- (viii) (i) Convert ethanoic acid to ethanol. (ii) Explain the mechanism of alkaline hydrolysis of bromomethane.
- (ix) (a) Write general electronic configuration of 3d series elements. (b) Write any two points which explain about the colour of a transition metal ion.
- (x) Explain Cannizzaro reaction with suitable example.
- (xi) Write two similarities and two differences between lanthanoids and actinoids.
- (xii) (i) Define: Common ion effect. (ii) Write preparation of glucose from starch.

SECTION C

Q. 15 to Q. 26. Attempt any EIGHT of the following (each 3 marks):

24

- (i) Convert the following: (a) Acetic acid to ethyl alcohol (b) Acetic acid to acetic anhydride (c) Acetyl chloride to acetamide
- (ii) (a) Write the representation of sodium hexacyanoferrate (III). (b) Write type of hybridization and magnetic behaviour of: (i) $[\text{Co}(\text{NH}_3)_6]^{3+}$ (ii) $[\text{NiCl}_4]^{2-}$
- (iii) (i) What is peptide linkage? (ii) Write general characteristics of interhalogen compounds.
- (iv) A solution has hydrogen ion concentration 0.01M . Calculate pOH of the same solution.
- (v) (i) Acetic acid is 5% ionised in its decimolar solution. Calculate the dissociation constant of acetic acid. (ii) Write chemical formula of epsom salt. Give two uses of H_2SO_4 .
- (vi) Derive the relation between half life and rate constant for a first order reaction.
- (vii) Write the names of the metal elements in brass alloy.
- (viii) Calculate maximum work done when 32 g of oxygen expanded isothermally and reversibly from pressure 2 bar to 1 bar at 298 K.
- (ix) Write preparation of glucose from sucrose.
- (x) (a) State second law of thermodynamics. (b) Define - Nucleotides. (c) Write chemical reaction for conversion of benzene diazonium chloride into benzene.
- (xi) The standard potential of electrode $\text{Cu}^{++} (0.02 \text{ M}) \mid \text{Cu(s)}$ is 0.337 volt. Calculate its potential in volt.
- (xii) Derive Ostwald's dilution law equation for a weak acid.

SECTION D

Q. 27 to Q. 31. Attempt any THREE of the following (each 4 marks):

12

- (i) (a) Derive relationship between dH and dU for a gaseous chemical reaction. (b) Give reason - Ozone is a good bleaching agent. (c) Write any two uses of SO_2 .
- (ii) Define the following terms: (a) Intensive property (b) Standard enthalpy of combustion
- (iii) (a) Define: (i) Co-ordination numbers (ii) Ambidentate ligand (b) Write a note on Clemmensen reduction of propanone.

(iv) Write the mathematical equation of first law of thermodynamics for following processes: (a) Isochoric process (b) Adiabatic process

(v) (a) Define - Polymorphism. (b) State and explain Hess's law of constant summation. Write its one application.

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