| 2017 | III | 08 | | 1100 | **J-555** | (E) |

CHEMISTRY (55)

Time : 3 Hrs.   **(7 Pages)**   **Max. Marks : 70**

Notes :

(i) *All questions are compulsory.*

(ii) *Answers to the questions of* <u>Section - I and Section - II</u> *should be written in the* <u>same answer book</u>.

(iii) *Draw neat, labelled diagrams and write balanced chemical equations wherever necessary.*

(iv) *Figures to the right indicate full marks.*

(v) *Use of logarithmic table is allowed.*

(vi) *Every new question must be started on a new page.*

SECTION - I

Q. 1. **Select and write the most appropriate answer from the given alternatives for each sub-question :**   **[7]**

(i) An antifriction alloy made up of antimony with tin and copper, which is extensively used in machine bearings is called —

(a) Duralumin   (b) Babbitt metal

(c) Spiegeleisen   (d) Amalgams

| 0 | 5 | 5 | 5 |

(ii) Which of the following pairs is an intensive property?

(a) Density, viscosity

(b) Surface tension, mass

(c) Viscosity, internal energy

(d) Heat capacity, volume

(iii) Fe^{2+} ions react with nitric oxide formed from reduction of nitrate and yields a brown coloured complex –

(a) $\left[Fe(CO)_5 NO\right]^{2+}$

(b) $\left[Fe(NH_3)_5 NO\right]^{2+}$

(c) $\left[Fe(CH_3NH_2)_5 NO\right]^{2+}$

(d) $\left[Fe(H_2O)_5 NO\right]^{2+}$

(iv) MnO_2 and $Ca_3(PO_4)_2$ present in iron ore get reduced to M_n and P in the zone of –

(a) combustion

(b) reduction

(c) fusion

(d) slag formation

(v) An ionic compound crystallises in FCC type structure with 'A' ions at the centre of each face and 'B' ions occupying corners of the cube. The formula of compound is –

(a) AB_4

(b) A_3B

(c) AB

(d) AB_3

(vi) On passing 1·5 F charge, the number of moles of aluminium deposited at cathode are –

[Molar mass of Al = 27 gram mol^{-1}]

(a) 1·0

(b) 13·5

(c) 0·50

(d) 0·75

(vii) For a chemical reaction, A → products, the rate of reaction doubles when the conce (a)tion of 'A' is increased by a factor of 4, the order of reaction is –

(a) 2

(b) 0·5

(c) 4

(d) 1

Q. 2. **Answer any SIX of the following :** [12]

   (i)   What are 'fuel cells'? Write cathode and anode reaction in a fuel cell.

  (ii)   Derive the relationship between half life and rate constant for first order reaction.

 (iii) Explain magnetic separation process of ores with the help of a neat, labelled diagram.

 (iv) Derive the relationship between relative lowering of vapour pressure and molar mass of solute.

  (v)   Define the term 'enthalpy'.

        What will happen to the internal energy if work is done by the system?

 (vi) Nitrogen does not form pentahalides. Give reason.

 (vii) Calculate the percentage efficiency of packing in case of simple cubic cell.

(viii) Write the electronic configuration of the following elements :

      (a)   Sulphur $(Z = 16)$

      (b)   Krypton $(Z = 36)$

Q. 3. **Answer any THREE of the following :** [9]

   (i)   How is phosphine prepared using the following reagents?

      (a)   HCl

      (b) H_2SO_4

      (c)   Caustic soda

  (ii)   0·05 M NaOH solution offered a resistance of $31 \cdot 6\Omega$ in a conductivity cell at 298K. If the cell constant of the cell is $0 \cdot 367$ cm^{-1}, calculate the molar conductivity of NaOH solution.

(iii) Calculate ΔH° for the reaction between ethene and water to form ethyl alcohol from the following data :

$$\Delta_c H^\circ C_2H_5OH_{(l)} = -1368 \text{ kJ}$$
$$\Delta_c H^\circ C_2H_{4(g)} = -1410 \text{ kJ}$$

Does the calculated ΔH° represent the enthalpy of formation of liquid ethanol?

(iv) In the Arrhenius equation for a first order reaction, the values of 'A' and 'E_a' are 4×10^{13} sec^{-1} and 98.6 kJ mol^{-1} respectively. At what temperature will its half life period be 10 minutes?

$[R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}]$

Q. 4. State Faraday's first law of electrolysis. [7]

Write any 'two' uses of each of the following :

(a) H_2SO_4, (b) Chlorine

Distinguish between crystalline solids and amorphous solids.

A solution of a substance having mass 1.8×10^{-3} kg has the osmotic pressure of 0.52 atm at 280 K. Calculate the molar mass of the substance used.

$[\text{Volume} = 1 \text{ dm}^3, R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}]$

OR

Define the following :
(a) Leaching
(b) Metallurgy
(c) Anisotropy

Derive an expression for maximum work.

The boiling point of benzene is 353·23 K. When 1·80 gram of non-volatile solute was dissolved in 90 gram of benzene, the boiling point is raised to 354·11 K. Calculate the molar mass of solute.

$[K_b$ for benzene $= 2·53$ K mol$^{-1}]$

SECTION - II

Q. 5. Select and write the most appropriate answer from the given alternatives for each sub-question : [7]

(i) When primary amine reacts with $CHCl_3$ in alcoholic KOH, the product is :

(a) aldehyde

(b) alcohol

(c) cyanide

(d) an-isocyanide

(ii) $CH_3 - CH_2 - Br \xrightarrow[\Delta]{Alco.\ KOH} B \xrightarrow{HBr} C \xrightarrow{Na/ether} D$
the compound D is :

(a) ethane

(b) propane

(c) n-butane

(d) n-pentane

(iii) Cisplatin compound is used in the treatment of

(a) malaria

(b) cancer

(c) AIDS

(d) yellow fever

(iv) A gas when passed through $K_2Cr_2O_7$ and dil. H_2SO_4 solution turns it green, the gas is

(a) CO_2

(b) NH_3

(c) SO_2

(d) Cl_2

(v) The alcohol used in thermometers is :

  (a) Methanol   (b) Ethanol

  (c) Propanol   (d) Butanol

(vi) Which of the following vitamins is the vitamin of alicyclic series?

  (a) Vitamin C   (b) Vitamin K

  (c) Vitamin B   (d) Vitamin A

(vii) Which of the following is the first oxidation product of secondary alcohol?

  (a) Alkene   (b) Aldehyde

  (c) Ketone   (d) Carboxylic acid

Q. 6. **Answer any SIX of the following :**   **[12]**

(i) How is diethyl ether prepared by continuous etherification process?

(ii) Write a note on Hofmann bromamide degradation.

(iii) How is ethanoic acid prepared from dry ice?

(iv) Write the molecular and structural formula of BHA and BHT.

(v) Explain the preparation of glucose from cane sugar.

(vi) Write the factors which are related to the colour of transition metal ions.

(vii) Explain the following terms :

  (a) Homopolymers

  (b) Elastomers

(viii) Define racemic mixture.

Give IUPAC name of $CH_3 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - CHO$.

Q. 7. **Answer any THREE of the following :** [9]

(i) What is 'effective atomic number' (EAN)?

Calculate the effective atomic number of the central metal atom in the following compounds :

(a) $K_4Fe(CN)_6$ (b) $Cr(CO)_6$

Fe (Z = 26)   Cr (Z = 24)

(ii) Write the different oxidation states of iron. Why +2 oxidation state of manganese is more stable?
(Z of Mn = 25).

(iii) Write a note on 'aldol condensation'.

(iv) What are 'nucleic acids'?

Define complex lipids. Mention any 'two' functions of lipids.

Q. 8. What is the action of mixture of $NaNO_2$ and dil. HCl on : [7]

(a) Ethyl amine,   (b) Aniline,   (c) Diethyl amine

How is nylon 6, 6 prepared?

What are 'antacids'?

Write any 'two' side effects of tranquilizers.

OR

Explain the mechanism of alkaline hydrolysis of tert-butyl bromide with energy profile diagram.

Define carbolic acid.

How carbolic acid is prepared from benzene sulphonic acid?

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