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Part III — CHEMISTRY

(New Syllabus)

(English Version)

Time Allowed : 3 Hours]

[Maximum Marks : 150

- Note :
- Answer *all* the questions from **Part - I**.
 - Answer any *fifteen* questions from **Part- II**.
 - Answer any *seven* questions from **Part - III** covering all Sections and choosing at least *two* questions from each Section.
 - Question No. **70** is compulsory. Answer any *three* from the remaining questions in **Part - IV**.
 - Draw diagrams and write equations wherever necessary.

PART - INote : Answer *all* the questions. $30 \times 1 = 30$

Choose and write the correct answer :

- The transition element with the lowest atomic number is
 - scandium
 - titanium
 - zinc
 - lanthanum.
- The elements in which extra electron enter ($n - 2$) f orbital are
 - s-block elements
 - p-block elements
 - d-block elements
 - f-block elements.

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41. Give any three examples for opposing reactions.
42. The half-life period of a first order reaction is 20 mins. Calculate the rate constant.
43. What is electrophoresis ?
44. State Faraday's first and second laws of electrolysis.
45. Mesotartaric acid is an optically inactive compound with asymmetric carbon atoms. Justify your answer.
46. How can the consumption of alcohol by a person be detected ?
47. How will you convert phenol to phenolphthalein ?
48. Give the IUPAC names for the following :
 - i) Crotonaldehyde
 - ii) Methyl *n*-propyl ketone
 - iii) Phenyl acetaldehyde.
49. What is trans-esterification ?
50. How will you convert acetamide to methyl amine ? Give equation.
51. How is Dacron prepared ? Give any one of its uses.

PART - III

Note : Answer any seven questions choosing at least two questions from each Section. 7 × 5 = 35

SECTION - A

52. Explain the formation of oxygen molecule by molecular orbital theory.
53. How is zinc extracted from its chief ore ?
54. Compare the points of similarities and differences between lanthanides and actinides (any five points).
55. Explain the postulates of Werner's theory.

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SECTION - B

56. Write the various statements of second law of thermodynamics.
57. Derive the relation $K_p = K_c (RT)^{\Delta n(g)}$ for a general chemical equilibrium reaction.
58. State the characteristics of order of a reaction.
59. Calculate the *e.m.f.* of the cell having the cell reaction



when concentration of $\text{Zn}^{2+} = 0.1 \text{ M}$ and $\text{Ag}^+ = 10 \text{ M}$ in the solution.

SECTION - C

60. How do ethers react with HI ? Give the significance of the reaction.
61. Explain the mechanism of Cannizzaro reaction.
62. How is lactic acid manufactured in large scale ? How can it be converted into cyclic diester ?
63. Explain briefly the characteristics of rocket propellants.

PART - IV

Note : Question No. 70 is compulsory and answer any *three* from the remaining questions. 4 × 10 = 40

64. a) Explain Pauling's method to determine ionic radii. 5
 b) How is fluorine isolated from their fluorides by Dennis method ? 5
65. a) Mention the type of hybridisation, magnetic property and geometry of the following complexes using VB theory. 5
 i) $[\text{FeF}_6]^{4-}$ ii) $[\text{Fe}(\text{CN})_6]^{4-}$
 b) How are radioactive isotopes useful in medicine ? 5

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66. a) Explain Schottky and Frenkel defects. 5
b) Write briefly about the adsorption theory of catalysis. 5
67. a) Explain Ostwald's dilution law. 5
b) Write the IUPAC convention of representation of a cell. 5
68. a) Distinguish enantiomers from diastereomers. Give an example each. 5
b) Give the mechanism of esterification. 5
69. a) Distinguish between primary, secondary and tertiary amines. 5
b) Discuss the structure of fructose in detail. 5
70. a) An organic compound (A) of molecular formula C_7H_6O is not reduced by Fehling's solution but will undergo Cannizzaro reaction. Compound (A) reacts with Aniline to give compound (B). Compound (A) also reacts with Cl_2 in the presence of catalyst to give compound (C). Identify (A), (B) and (C) and explain the reactions. 5
b) An element (A) belongs to group number 11 and period number 4. (A) is a reddish brown metal. (A) reacts with HCl in the presence of air and gives compound (B). (A) also reacts with conc. HNO_3 to give compound (C) with the liberation of NO_2 . Identify (A), (B) and (C). Explain the reactions. 5

OR

- c) An organic compound (A) of molecular formula C_3H_8O gives turbidity within 5 - 10 min on reaction with anhydrous $ZnCl_2 / HCl$. Compound (A) on treatment with sodium hypochlorite gives a carbonyl compound (B) which on further chlorination gives compound (C) of molecular formula $C_3H_3OCl_3$. Identify (A), (B) and (C). Explain the reactions. 5
- d) What is the pH of a solution containing 0.5 M propionic acid and 0.5 M sodium propionate? The K_a of propionic acid is 1.34×10^{-5} . 5
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