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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 - I

Note : Answer *all* the questions.

30 × 1 = 30

Choose and write the correct answer :

- Ethylene diamine forms glycol with
 - nitrous acid
 - Na₂CO₃ solution
 - NaHCO₃ solution
 - Baeyer's reagent.
- When ethers are exposed to air for a long time, they form
 - peroxides
 - halides
 - oxides
 - superoxides.

[Turn over

45. Differentiate diastereomer from enantiomer.
46. Why is glycol more viscous than ethanol ?
47. How is phenolphthalein prepared ?
48. How does formaldehyde react with ammonia ?
49. What is meant by esterification reaction ? Write the equation.
50. An organic compound (A) having molecular formula C_2H_7N is treated with nitrous acid to give (B) of molecular formula C_2H_6O which answers iodoform test. Identify (A) and (B) and explain the reaction.
51. Write a brief note on Buna-S.

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 O_2 molecule using molecular orbital theory.
53. Explain the extraction of silver from its chief ore (Argentite).
54. Discuss the consequences of lanthanide contraction.
55. Using VB theory explain why $[Ni(CN)_4]^{2-}$ is diamagnetic whereas $[Ni(NH_3)_4]^{2+}$ is paramagnetic.

SECTION - B

56. Write the various statements of second law of thermodynamics.
57. Apply Le Chatelier principle to Haber's process of manufacture of ammonia.
58. Explain the experimental determination of rate constant for the decomposition of hydrogen peroxide in aqueous solutions.
59. Calculate the *e.m.f* of zinc-silver cell at $25^\circ C$ when $[Zn^{2+}] = 0.10 M$ and $[Ag^+] = 10 M$. (E_{cell}° at $25^\circ C = 1.56$ volts).

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SECTION - C

60. Discuss the isomerism in ethers.
61. Write the mechanism of crossed aldol condensation of acetone.
62. Account for the reducing property of formic acid.
63. Explain briefly on Rocket propellants.

PART - IV

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

64. a) Explain the various factors that affect electron affinity. 5
 b) How are noble gases isolated from air ? 5
65. a) Give the postulates of Werner's theory of coordination compounds. 5
 b) Write a note on radio carbon dating. 5
66. a) Explain Braggs spectrometer method. 5
 b) Write any three methods for the preparation of colloids by dispersion methods. 5
67. a) Explain Ostwald's theory of indicators. 5
 b) Derive Nernst equation. 5
68. a) Discuss the optical isomerism in tartaric acid. 5
 b) How can salicylic acid be converted to
 i) Aspirin
 ii) 2, 4, 6 tribromophenol
 iii) Methyl salicylate ? 5
69. a) Distinguish between primary, secondary and tertiary amines. 5
 b) Prove the structure of glucose. 5

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70. a) An organic compound (A) C_2H_6O liberates hydrogen on treatment with metallic sodium. (A) on mild oxidation gives (B) C_2H_4O which answers iodoform test. (B) when treated with conc. H_2SO_4 undergoes polymerisation to give (C), a cyclic compound. Identify (A), (B) and (C) and explain the reactions. 5
- b) Silver reacts with dil. HNO_3 to give compound (A) which on heating at 723 K gives (B). (B) on further heating gives (C). Further compound (A) reacts with KBr and gives (D) which is highly useful in photography. Identify (A), (B), (C) and (D) and write the reactions. 5

OR

- c) An organic compound (A) of molecular formula C_2H_6O on treatment with PCl_5 gives compound (B). Compound (B) reacts with KCN to give a compound (C) of molecular formula C_3H_5N which undergoes acid hydrolysis to give compound (D) which on treatment with Sodalime gives a hydrocarbon. Identify (A), (B), (C) and (D) and explain the reactions.
- d) Find the pH of a buffer solution containing 0.20 mole per litre sodium acetate and 0.15 mole per litre acetic acid. K_a for acetic acid is 1.8×10^{-5} .
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