B

1035

Register Number

Part III — CHEMISTRY

(English Version)

Time Allowed : 3 Hours] [Maximum Marks : 150

Note : Draw diagrams and write equations wherever necessary.

PART – I

Note : Answer *all* the questions. 30 × 1 = 30

Choose and write the correct answer :

1. A compound that undergoes bromination easily is

   a) benzoic acid b) benzene

   c) phenol d) toluene.

2. Ether is formed when alkyl halide is treated with sodium alkoxide. The method is known as

   a) Hoffmann's reaction b) Williamson's synthesis

   c) Wurtz reaction d) Kolbe's reaction.

3. When ether is exposed to air for some time, an explosive substance produced is

   a) peroxide b) TNT

   c) superoxide d) gun cotton.

4. Hydrogenation of benzoyl chloride in the presence of Pd and $BaSO_4$ gives

   a) phenol b) benzoic acid

   c) benzyl alcohol d) benzaldehyde.

[Turn over

5. Concentrated solution of sodium acetate on electrolysis gives

a) ethane b) propane

c) methane d) butane.

6. An example for metal deficiency defect is

a) NaCl b) AgCl

c) FeS d) CsCl.

7. If ΔG for a reaction is negative, the change is

a) spontaneous b) non-spontaneous

c) reversible d) equilibrium.

8. Entropy (S) and the entropy change (ΔS) of a process

a) are path functions b) are state functions

c) are constants d) have no values.

9. Which one of the following has negative value for $\Delta n g$?

a) $H_2(g) + I_2(g) \rightleftharpoons 2\,HI(g)$

b) $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$

c) $3\,H_2(g) + N_2(g) \rightleftharpoons 2\,NH_3(g)$

d) $2\,H_2O(g) + 2Cl_2(g) \rightleftharpoons 4\,HCl(g) + O_2(g)$.

10. State of a chemical equilibrium is

a) dynamic b) stationary

c) both (a) & (b). d) none of these.

11. Hybridisation in SF_6 molecule is

a) sp^3 b) sp^3d^2

c) sp^3d d) sp^3d^3.

12. In a molecule eight electrons are present in bonding molecular orbital and four electrons are present in anti-bonding molecular orbital. Its bond order is

a) 3 b) 4

c) 2·5 d) 2.

13. The metal having maximum electron affinity is

a) sodium b) calcium

c) gold d) silver.

14. Which of the following has the property of etching on glass ?

a) HI b) HF

c) HBr d) HCl.

15. Paramagnetism is the property of

a) paired electrons

b) completely filled electronic sub-shells

c) unpaired electrons

d) completely vacant electronic sub-shells.

16. The $-NO_2$ group in nitro-alkane is converted into $-NH_2$ group by the reagent

a) Zn/NH_4Cl b) Zn dust

c) Sn / HCl d) Zn / NaOH.

17. The organic compound that undergoes carbylamine reaction is

a) $(C_2H_5)_2NH$ b) $C_2H_5NH_2$

c) $(C_2H_5)_3N$ d) $(C_2H_5)_4N^+I^-$.

18. Use of chloropicrin is as

a) Explosive b) Dye

c) Anaesthetic d) Sterilizing agent.

19. The amino acid without chiral carbon is

a) Glycine b) Alanine

c) Proline d) Tyrosine.

20. Sorbitol and Mannitol are

a) isomers b) polymers

c) epimers d) dimers.

21. Half-life period of a first order reaction is 20 min. The time taken for the completion of 99·9% of the reaction is

a) 20 min b) 2000 min

c) 250 sec d) 200 min.

22. The Tyndall effect is associated with colloidal particle due to

a) scattering of light b) presence of charge

c) diffusion of light d) reflection of light.

23. Colloids are purified by

a) precipitation b) coagulation

c) dialysis d) filtration.

24. Which one of the following factors is false regarding catalyst ?

a) Small quantity is enough

b) Initiate the reaction

c) Remains unchanged in mass and chemical composition

d) Specific in its action.

25. When pH of a solution is 2, the hydrogen ion concentration in moles litre^{-1} will be

a) 1×10^{-12} b) 1×10^{-4}

c) 1×10^{-7} d) 1×10^{-2}.

26. Silver obtained from silver coin is purified by fusion with

a) $AgNO_3$ b) HNO_3

c) H_2SO_4 d) borax.

27. Alloys of lanthanides are called as

a) plate metals b) actinides

c) misch-metals d) metalloids.

28. The common oxidation state of actinide is

a) + 2 b) + 3

c) + 4 d) + 6.

29. $[FeF_6]^{4-}$ is paramagnetic because

a) F^- is a weaker ligand b) F^- is a stronger ligand

c) F^- is a chelating ligand d) F^- is a flexidentate ligand.

30. In nuclear reaction ..... is / are balanced on both sides.

a) mass b) number of atoms

c) mass number d) atomic number and mass number.

PART – II

Note : i) Answer any *fifteen* questions.

ii) Each answer should be in one or two sentences. $15 \times 3 = 45$

31. State Heisenberg's uncertainty principle.

32. Define electron affinity.

33. How is potash alum prepared ?

34. Draw the electronic structure of H_3PO_3.

35. Write a note on chrome plating.

36. What is the action of heat on copper sulphate crystals ? Write the equation.

37. Calculate the number of α and β particles emitted when $_{90}Th^{232}$ nucleus is converted into $_{82}Pb^{208}$.

38. Write a note on molecular crystals.

39. Calculate the molar heat of vaporisation of the ideal liquid CCl_4 (Boiling point of CCl_4 is 76·7°C and $\Delta S = 87{\cdot}864$ J).

40. What is the relationship between formation equilibrium constant and dissociation constant ? Give one example.

41. What is Pseudo first order reaction ? Give an example.

42. Write a note on 'activation energy'.

43. What is heterogeneous catalysis ? Give an example.

44. What is common ion effect ? Give one example.

45. What is racemic mixture ? Give an example.

46. Alcohols cannot be used as a solvent for Grignard reagents. Why ?

47. How is ethylene glycol converted into dioxan ?

48. What is urotropine ? Give its use.

49. What is the reaction of lactic acid with dil. H_2SO_4 ?

50. When benzamide is treated with bromine and alkali gives compound *A*. Also when benzamide is reduced by $LiAlH_4$, compound *B* is formed. Find *A* and *B*. Write the equations.

51. Why are iodoform and phenolic solutions called antiseptic ?

PART – III

Note : Answer any *seven* questions choosing at least *two* questions from each Section. $7 \times 5 = 35$

SECTION – A

52. Give any five postulates of molecular orbital theory.

53. How is gold extracted ?

54. Discuss the position of lanthanides in the periodic table.

55. How is chlorophyll important in environmental chemistry ? Mention its function.

SECTION – B

56. State the various statements of Second law of thermodynamics.

57. Apply Le Chatelier's principle for the formation of NH_3 by Haber's process.

58. Write notes on (i) consecutive reactions, (ii) parallel reactions and (iii) opposing reactions.

59. Determine the standard e.m.f. of the cell and standard free energy change of the cell reaction Zn, $Zn^{2+} \,||\, Ni^{2+}$ Ni. The standard reduction potentials of Zn^{2+}, Zn and Ni^{2+}, Ni half cells are – 0·76 V and – 0·25 V respectively.

SECTION – C

60. Give any three methods of preparation of ethers.

61. Write the differences between acetaldehyde and acetone.

62. Give the mechanism involved in the esterification of a carboxylic acid with alcohol.

63. How are Buna-S and Nylon-66 prepared ?

PART – IV

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

64. a) Explain the Pauling scale for the determination of electronegativity. Give the disadvantage of Pauling scale.

b) How does Fluorine differ from other halogens ?

65. a) Explain the co-ordination isomerism and ionisation isomerism with example.

b) Explain Radio carbon dating.

66. a) Explain Bragg's spectrometer method.

b) How are colloids prepared by using (i) mechanical dispersion method, (ii) electro dispersion method ?

67. a) Derive Henderson equation.

b) How is e.m.f. of a half cell determined ?

68. a) Distinguish between enantiomers and diastereomers.

b) How are the following conversions take place ?

i) Salicylic acid → Methyl salicylate

ii) Lactic acid → Pyruvic acid

iii) Methyl cyanide → Acetamide.

69. a) How are (i) phenol, (ii) chlorobenzene, (iii) biphenyl prepared by using benzene diazonium chloride ?

b) Outline the classification of carbohydrates giving example for each.

70. a) Compound *A* with molecular formula C_3H_6 is obtained from petroleum. When *A* is treated with chlorine at 773 K compound *B* of molecular formula C_3H_5Cl is obtained. When *B* is treated with Na_2CO_3 solution at 773 K/12 atm. it gives the compound *C* with molecular formula C_3H_6O, *C* on treatment with HOCl followed by hydrolysis with NaQH gives *D* having molecular formula $C_3H_8O_3$. Find *A*, *B*, *C* and *D*. Explain the reaction.

b) The metal *B* is extracted from the ore *A*. On treatment with dil. nitric acid metal *B* gives a compound *C*, which is also known as Lunar Caustics. The compound *C* on treatment with KI gives a yellow precipitate *D*. Find *A*, *B*, *C* and *D*. Explain the reactions of the formation of *C* and *D*.

OR

c) Compound *A* with molecular formula C_7H_6O reduces Tollen's reagent and also gives Cannizzaro reaction. *A* on oxidation gives the compound *B* with molecular formula $C_7H_6O_2$. Calcium salt of *B* on dry distillation gives the compound *C* with molecular formula $C_{13}H_{10}O$. Find *A*, *B* and *C*. Explain the reaction.

d) An electric current is passed through three cells in series containing respectively the solutions of copper sulphate, silver nitrate and potassium iodide. What weights of silver and iodine will be liberated while 1·25 gm of copper is being deposited ?