B

Register Number

Part III — CHEMISTRY

(English Version)

Time Allowed : 3 Hours] [Maximum Marks : 150

Note : i) Answer *all* the questions from **Part – I.**

ii) Answer any *fifteen* questions from **Part– II.**

iii) Answer any *seven* questions from **Part – III** covering all Sections and choosing at least *two* questions from each Section.

iv) Question No. **70** is compulsory. Answer any *three* from the remaining questions in **Part – IV.**

v) Draw diagrams and write equations wherever necessary.

PART – I

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

Choose and write the correct answer :

1. Compound which undergoes iodoform test is

a) 1-pentanol b) 2-pentanone

c) 3-pentanone d) pentanal.

2. The preparation of diethyl ether by Williamson's synthesis is a / an

a) nucleophilic addition reaction

b) electrophilic addition reaction

c) electrophilic substitution reaction

d) nucleophilic substitution reaction.

[Turn over

3. In the formation of oxonium salt when etherial oxygen reacts with strong mineral acid is called

a) electronation b) protonation

c) deprotonation d) dehydration.

4. Which of the following compounds is oxidised to give ethyl methyl ketone ?

a) 2-propanol b) 2-pentanone

c) 1-butanol d) 2-butanol.

5. Ethylene dicyanide on hydrolysis using acid gives

a) Oxalic acid b) Succinic acid

c) Adipic acid d) Propionic acid.

6. The size of the anion in Frenkel defect crystal is

a) larger than the cation b) smaller than the cation

c) equal in size with cation d) both are larger in size.

7. When a liquid boils, there is

a) an increase in entropy

b) a decrease in entropy

c) an increase in heat of vaporization

d) an increase in free eneregy.

8. Change in Gibbs free energy is given by

a) $\Delta G = \Delta H + T \Delta S$ b) $\Delta G = \Delta H - T \Delta S$

c) $\Delta G = \Delta H \times T \Delta S$ d) $\Delta G = \Delta H / T \Delta S$.

9. In the reversible reaction $2\ HI\ (g) \rightleftharpoons H_2\ (g) + I_2\ (g)$ K_p is

a) greater than K_c b) less than K_c

c) equal to K_c d) 0.

10. In the Haber process the yield of ammonia is greater

a) at high pressure b) at low pressure

c) at high temperature d) in absence of catalyst.

11. Dual character of an electron was explained by

a) Bohr b) Heisenberg

c) de Broglie d) Pauli.

12. Number of spherical nodes in 2s orbital is

a) 1 b) 2

c) 3 d) 4.

13. On moving down the group, the radius of an ion

a) decreases b) increases

c) no change d) all of these.

14. Which of the following shows negative oxidation state only ?

a) Br b) F

c) Cl d) I.

15. The outer electronic configuration of chromium is

a) $3d^6\,4s^0$ b) $3d^5\,4s^1$

c) $3d^4\,4s^2$ d) $3d^3\,4s^2\,4p^1$.

16. In nitroalkanes $-NO_2$ group is converted to $-NH_2$ group by the reaction with

a) Sn/HCl b) Zn dust

c) Zn / NH_4Cl d) Zn / NaOH.

17. The tertiary nitro compound is

a) 2-nitropropane b) 1-nitropropane

c) 1-nitro-2, 2-dimethyl propane d) 2-nitro-2-methyl propane.

18. The intermediate formed in the nitration of benzene is

a) Arrenium ion b) Carbanion

c) Oxonium ion d) Nitrite ion.

19. Inversion of sucrose refers to

a) oxidation of sucrose

b) reduction of sucrose

c) hydrolysis of sucrose to glucose and fructose

d) polymerisation of sucrose.

20. A dipeptide does not have

a) two peptide units b) portions of two amino acids

c) an amido group d) salt like structure.

21. The sum of the powers of the concentration terms that occur in the rate equation is called

a) molecularity b) order

c) rate d) rate constant.

22. The phenomenon of Tyndall effect is not observed in

a) emulsion b) colloidal solution

c) true solution d) suspension.

23. Catalyst used in Deacon's method of manufacture of chlorine is

a) NO b) $CuCl_2$

c) Fe_2O_3 d) Ni.

24. Argyrol is

a) colloidal silver b) colloidal antimony

c) colloidal gold d) milk of magnesia.

25. When sodium acetate is added to acetic acid the degree of ionisation of acetic acid

a) decreases b) does not change

c) increases d) becomes zero.

26. The reagent which is added first in the separation of silver from silver coin is

a) conc. sulphuric acid b) conc. hydrochloric acid

c) conc. nitric acid d) Aqua regia.

27. ..... form(s) oxocations.

a) Lanthamide b) Actinides

c) Noble gases d) Alkali metals.

28. ..... is the oxidation state of U in UF_6.

a) + 6 b) + 4

c) + 3 d) 0.

29. The coordination number of Nickel in the complex ion $[NiCl_4]^{2-}$ is

a) + 1 b) + 4

c) + 2 d) + 6.

30. Loss of a β-particle is equivalent to

a) increase of one proton only b) decrease of one neutron only

c) both (a) and (b) d) increase of one neutron only.

PART – II

Note : i) Answer any *fifteen* questions.

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

31. What is the significance of negative electronic energy ?

32. Why is electron affinity of fluorine less than that of chlorine ?

33. Write a note on plumbo solvency.

34. What happens when phosphorus acid is heated ?

35. Why do transition elements form complexes ?

36. Why are Zn^{2+} salts colourless while Ni^{2+} salts are coloured ?

37. The half-life period of a radioactive element is 100 seconds. Calculate the disintegration constant.

38. What are superconductors ?

39. State Trouton's rule.

40. Dissociation equilibrium constant of HI is $2{\cdot}06 \times 10^{-2}$ at 458°C. At equilibrium, concentration of HI and I_2 are 0·36 M and 0·15 M respectively. What is the equilibrium concentration of H_2 at 458°C ?

41. Give three examples for opposing reactions.

42. Define pseudo-first order reaction.

43. What is Brownian movement ? Give reason.

44. Define electrochemical equivalent. What is its unit ?

45. Write briefly on 'Racemic mixture' with an example.

46. How is phenolphthalein prepared ?

47. How will you convert 2-methyl-2-propanol into 2-methyl propene ?

48. How is urotropine prepared ? Mention its important use.

49. Write two tests to identify carboxylic acids.

50. What is diazotisation ? Give an example.

51. What are chromophores ? Give two examples.

PART – III

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

SECTION – A

52. Explain the formation of N_2 molecule by molecular orbital theory.

53. How is zinc extracted from its chief ore ?

54. Mention the uses of lanthanides.

55. In the coordination complex $\left[Co \left(NH_3 \right)_6 \right] Cl_3$, mention the following :

    a) IUPAC name of the complex

    b) Ligand

    c) Central metal ion

    d) Co-ordination number

    e) Nature of complex.

SECTION – B

56. Describe the characteristics of free energy *G*.

57. Discuss the effect of temperature and pressure on the following equilibrium :

$$N_2O_4(g) \rightleftharpoons 2\,NO_2(g) \quad \Delta H = +59{\cdot}0 \text{ kJ/mole.}$$

58. Derive an equation for the rate constant of a first order reaction.

59. Write an account on Cell terminology.

SECTION – C

60. Distinguish between aromatic ethers and aliphatic ethers.

61. Explain the reaction mechanism of Cannizzaro reaction.

62. What happens when lactic acid is

    i) treated with dilute H_2SO_4

    ii) treated with PCl_5

    iii) oxidised with acidified $KMnO_4$?

63. Give the characteristics of a dye.

PART – IV

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

64. a) How do electronegativity values help to find out the nature of bonding between atoms ?

    b) Describe in detail how noble gases are isolated by Dewar's process.

65. a) Explain co-ordination and ionisation isomerism with suitable examples.

    b) List the medicinal uses of radioactive isotopes.

66. a) Explain Bragg's spectrometer method in crystal study.

    b) Give any 5 main differences between physical adsorption and chemical adsorption.

67. a) Write the postulates of Arrhenius theory of electrolytic dissociation.

    b) Write a brief account on the relation between EMF and free energy.

68. a) Discuss *cis-trans* isomerism with a suitable example.

b) Account for the reducing nature of Formic acid.

69. a) Distinguish between primary, secondary and tertiary amines.

b) Elucidate the structure of fructose.

70. a) An organic compound (*A*) C_3H_8O answers Luca's test within 5 – 10 min and on oxidation forms (*B*) C_3H_6O. (*B*) on further oxidation forms (*C*) $C_2H_4O_2$ which gives effervescence with $NaHCO_3$. (*B*) also undergoes iodoform reactions. Identify *A*, *B*, *C*. Explain the reactions involved.

b) Compound *A* is a sulphate compound of group II element. This compound is also called as Blue Vitriol. The compound undergoes decomposition at various temperatures.

$$A \xrightarrow{100°C} B \xrightarrow{230°C} C \xrightarrow{720°C} D$$

Identify the compounds *A*, *B*, *C* and *D* and give equations.

OR

c) An organic compound (*A*) of molecular formula C_2H_6O liberates hydrogen with metallic sodium. Compound (*A*) on heating with excess of conc. H_2SO_4 at 440 K gives an alkene (*B*). Compound (*B*) when oxidised by Baeyer's reagent gives compound (*C*). Identify *A*, *B*, *C* and explain the above reactions.

d) Calculate the pH of 0·1 M CH_3COOH solution. Dissociation constant of acetic acid is $1{\cdot}8 \times 10^{-5}$.