B

7035

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. Bordeaux mixture contains

a) $AgNO_3 + HNO_3$ b) $ZnSO_4 + H_2SO_4$

c) $CuSO_4 + Ca(OH)_2$ d) $KMnO_4 + HCl$.

2. The compound used in gas lamp material is

a) MnO_2 b) CeO_2

c) N_2O_5 d) Fe_2O_3.

3. The radioactive lanthanide is

a) Gadolinium b) Lutetium

c) Promethium d) Cerium.

4. An example of a chelating ligand is

a) Chloro b) Bromo

c) en d) NO_2^-.

5. Radioactivity is due to

a) stable electronic configuration b) stable nucleus

c) unstable nucleus d) unstable electronic configuration.

6. 50% of a first order reaction is completed in 20 minutes. The time required for 75% completion is

a) 60 minutes b) 10 minutes

c) 40 minutes d) 80 minutes.

7. Colloids are purified by

a) precipitation b) coagulation

c) dialysis d) filtration.

8. In case of physical adsorption, there is desorption when

a) temperature decreases b) temperature increases

c) pressure increases d) concentration increases.

9. Fog is a colloidal solution of

a) liquid in gas b) gas in liquid

c) gas in solid d) solid in gas.

10. The indicator used in the titration of ammonium hydroxide with hydrochloric acid is

a) $KMnO_4$ b) Methyl orange

c) Phenolphthalein d) Litmus.

11. Aniline differs from ethylamine in its reaction with

a) CH_3I b) $CHCl_3$ and Caustic KOH

c) HNO_2 d) CH_3COCl.

12. The compound most reactive towards electrophilic nitration is

a) Methyl benzene b) Benzene

c) Benzoic acid d) Nitrobenzene.

13. Nitro-acinitro tautomerism is exhibited by

a) nitromethane b) nitrobenzene

c) chloropicrin d) *o*-toluidine.

14. The reducing sugar among the following is

a) sucrose b) cellulose

c) glucose d) starch.

15. Which is not true of amino acid ?

a) It forms Zwitterion b) Has isoelectric point

c) Dual behaviour d) Insoluble in NaOH solution.

16. Which of the following particles having same kinetic energy, would have the maximum de Broglie wavelength ?

a) Proton b) Neutron

c) α particle d) β particle.

17. Inter-molecular hydrogen bonding is present in

a) HF b) H_2O

c) ethanol d) all of these.

18. The scale which is based on an empirical relation between the energy of a bond and the electronegativities of bonded atoms is that of

a) Pauling b) Mulliken

c) Sanderson d) Alfred Rochow.

19. An element is burnt in limited supply of air to give an oxide *A* which on treatment with water gives an acid *B*. Acid *B* on heating gives acid *C* which gives yellow precipitate with silver nitrate solution. Oxide *A* is

a) P_2O_3 b) SO_2

c) CO_2 d) NO_2.

20. The ion with maximum number of unpaired electrons is

a) Mg^{2+} b) Ti^{3+}

c) V^{3+} d) Fe^{2+}.

21. An ion leaves its regular site and occupies a position in the space between the lattice sites. This defect is called as

a) Schottky defect b) Frenkel defect

c) impurity defect d) vacancy defect.

22. When a liquid boils, there is

a) an increase in entropy

b) a decrease in entropy

c) an increase in heat of vaporisation

d) an increase in free energy.

23. The amount of heat exchanged with the surroundings at constant pressure is called

a) ΔE b) ΔH

c) ΔS d) ΔG.

24. In the reversible reaction $2HI \rightleftharpoons H_2 + I_2$, K_p is

a) greater than K_c b) less than K_c

c) equal to K_c d) zero.

25. Which of the following gaseous equilibria is favoured by increase in temperature ?

a) $N_2O_4 \rightleftharpoons 2NO_2$; $\Delta H = +59$ kJ mol^{-1}

b) $N_2 + 3H_2 \rightleftharpoons 2NH_3$; $\Delta H = -22$ k cal mol^{-1}

c) $2SO_2 + O_2 \rightleftharpoons 2SO_3$; $\Delta H = -47$ k cal mol^{-1}

d) Both (b) and (c).

26. The compound that reacts the fastest with Lucas reagent is

a) 1-butanol b) 2-butanol

c) 1-propanol d) 2-methyl-2-propanol.

27. According to Lewis concept of acids and bases, ethers are

a) acidic b) basic

c) neutral d) amphoteric.

28. Zeisel's method of detection and estimation of alkoxy group in alkaloids involves the reaction of ether with

a) HI b) Cl_2

c) PCl_5 d) $AlCl_3$.

29. Schiff's reagent gives pink colour with

a) acetone b) acetaldehyde

c) ethanol d) ether.

30. The acid that cannot be prepared from Grignard reagent is

a) Formic acid b) Acetic acid

c) Propionic acid d) Benzoic acid.

PART – II

Note : i) Answer any *fifteen* questions.

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

31. Why is He_2 not formed ?

32. Compare the ionisation energy of nitrogen with that of oxygen.

33. Prove that P_2O_5 is a powerful dehydrating agent.

34. Why is HF not stored in silica or glass bottles ? Write the equation.

35. Write the action of aqua regia on gold.

36. The transition elements show variable oxidation states. Give reason.

37. The atomic masses of Li, He and Proton are 7·01823 amu, 4·00387 amu and 1·00715 amu respectively. Calculate the energy evolved in the reaction.

$${}_3Li^7 + {}_1H^1 \rightarrow 2\ {}_2He^4 + \text{Energy}$$

(1 amu = 931 MeV).

38. Determine the number of CsCl units per unit cell. CsCl has BCC arrangement.

39. Give the Kelvin-Planck statement of second law of thermodynamics.

40. State Le Chatelier's principle.

41. Write the Arrhenius equation and explain the terms.

42. What are parallel reactions ? Give an example.

43. Why is a colloidal system of gas in gas does not exist ?

44. The mass of the substance deposited by the passage of 10 ampere of current for 2 hours 40 minutes and 50 seconds is 9·65 g. Calculate the electrochemical equivalent.

45. Distinguish between racemic and meso forms.

46. Phenol is insoluble in $NaHCO_3$ solution but acetic acid is soluble. Give reason.

47. What happens when glycerol reacts with $KHSO_4$?

48. How is acetophenone prepared by Friedel-Crafts method ?

49. Mention the uses of oxalic acid.

50. What is Gabriel's Phthalimide synthesis ?

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. Discuss Davisson and Germer's experiment.

53. Explain how potassium dichromate is extracted from chromite ore.

54. Bring out the consequences of lanthanide contraction.

55. For the complex $K_4[Fe(CN)_6]$.

mention

a) Name

b) Central metal ion

c) Ligand

d) Co-ordination number

e) Geometry.

SECTION – B

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

57. Derive the expressions for K_c and K_p for the decomposition of PCl_5.

58. Explain the experimental determination of rate constant of acid hydrolysis of methyl acetate.

59. The *e.m.f.* of the half cell $Cu^{2+}(aq) / Cu(s)$ containing 0·01M Cu^{2+} solution is + 0·301 V. Calculate the standard *e.m.f.* of the half cell.

SECTION – C

60. How does diethyl ether react with the following reagents ?

    a) O_2 / long contact

    b) dil. H_2SO_4

    c) PCl_5.

61. Discuss the mechanism of aldol condensation.

62. Distinguish between formic acid and acetic acid.

63. Write briefly on Buna rubbers.

PART – IV

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

64. a) Explain the various factors that affect electron affinity. 5

    b) Mention the uses of silicones. 5

65. a) $[Ni(CN)_4]^{2-}$ is diamagnetic whereas $[Ni(NH_3)_4]^{2+}$ is paramagnetic. Explain. 5

    b) Explain the principle underlying the function of hydrogen bomb. 5

66. a) Explain the nature of glass. 5

    b) Write briefly on intermediate compound formation theory of catalysis with an example. 5

67. a) Explain Ostwald's dilution law. 5

b) Write notes on IUPAC convention of representation of a cell. 5

68. a) Describe the conformations of cyclohexanol. Comment on their stability. 5

b) What happens when lactic acid is

i) treated with dil. H_2SO_4

ii) heated alone

iii) oxidised with alkaline $KMnO_4$? 5

69. a) Write a note on the reduction of nitrobenzene under different conditions. 5

b) How is the structure of fructose determined ? 5

70. a) An organic compound *A* of molecular formula C_3H_6O on reduction with $LiAlH_4$ gives *B*. Compound *B* gives blue colour in Victor Meyer's test and also forms a chloride *C* with $SOCl_2$. The chloride on treatment with alcoholic KOH gives *D*. Identify *A*, *B*, *C* and *D* and explain the reactions. 5

b) An element *A* occupies group number 11 and period number 4. This metal is extracted from its mixed sulphide ore *B*. *A* reacts with dil. H_2SO_4 in presence of air and forms *C* which is colourless. With water *C* gives a blue compound *D*. Identify *A*, *B*, *C* and *D* and explain the reactions. 5

OR

c) An organic compound *A* (C_6H_6O) gives maximum of two isomers *B* and *C* when an alkaline solution of *A* is refluxed with chloroform at 333 K. *B* on oxidation gives an acid *D*. The acid *D* is also obtained by treating sodium salt of *A* with CO_2 under pressure. Identify *A*, *B*, *C* and *D* and explain the reactions. 5

d) Calculate the pH of the buffer solution containing 0·04 *M* NH_4Cl and 0·02 *M* NH_4OH. For NH_4OH K_b is $1{\cdot}8 \times 10^{-5}$. 5