5035

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. Spitting of silver can be prevented by covering the molten metal with a thin layer of

   a) borax b) charcoal

   c) sand d) silver bromide.

2. Lanthanide contraction is due to

   a) perfect shielding of 3*d* electron

   b) imperfect shielding of 3*d* electron

   c) perfect shielding of 4*f* electron

   d) imperfect shielding of 4*f* electron.

3. Which is used as a power source in long mission space probes ?

   a) Uranium-235 b) Uranium-238

   c) Plutonium-238 d) Mish metal.

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

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

5. Half-life period of a radioactive element is 100 seconds. Its average life period is

a) 100 seconds
b) 50 seconds
c) 200 seconds
d) 144 seconds.

6. Hydrolysis of an ester by dilute HCl is an example for

a) zero order reaction
b) first order reaction
c) second order reaction
d) pseudo first order reaction.

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

a) presence of charge
b) scattering of light
c) absorption of light
d) reflection of light.

8. Colloids are purified by

a) precipitation
b) coagulation
c) dialysis
d) filtration.

9. The colloid used for stomach disorder is

a) colloidal silver
b) colloidal antimony
c) colloidal gold
d) Milk of Magnesia.

10. Ostwald's dilution law is applicable in the case of

a) CH_3COOH
b) NaCl
c) NaOH
d) H_2SO_4.

11. $C_6H_5N_2Cl \xrightarrow{Cu_2Cl_2 / HCl} X$; the compound X is

a) $C_6H_5NH_2$
b) $C_6H_5NHNH_2$
c) $C_6H_5 - C_6H_5$
d) C_6H_5Cl.

12. The basic character of amines is due to

a) tetrahedral structure

b) presence of nitrogen atom

c) lone pair of electrons on nitrogen atom

d) high electronegativity of nitrogen.

13. Aniline reacts with benzoyl chloride in the presence of sodium hydroxide and gives benzanilide. This reaction is known as

a) Gattermann reaction b) Sandmeyer's reaction

c) Schotten-Baumann reaction d) Gomberg-Bachmann reaction.

14. The amino acid without chiral carbon is

a) glycine b) alanine

c) proline d) tyrosine.

15. When starch is heated to 200°C – 250°C, the product is

a) dextrin b) caramel

c) barley sugar d) cellulose.

16. The hybridisation in SF_6 molecule is

a) sp^3 b) $sp^3 d$

c) $sp^3 d^2$ d) $sp^3 d^3$.

17. Which one of the following experiments confirmed the wave nature of electron ?

a) G.P. Thomson's gold foil experiment

b) Black body radiation

c) Photoelectric effect

d) Millikan's oil-drop experiment.

18. When $X_A >> X_B$, $A - B$ bond is

a) polar covalent b) non-polar covalent

c) ionic d) metallic.

19. Among the halogen acids, the weakest acid is

a) HI b) HBr

c) HCl d) HF.

20. Which transition element shows the highest oxidation state ?

a) Os b) Tl

c) Sc d) Zn.

21. The co-ordination number of ZnS is

a) 3 b) 4

c) 6 d) 8.

22. Which of the following does not result in an increase in entropy ?

a) Rusting of iron

b) Conversion of ice to water

c) Crystallisation of sucrose from solution

d) Vaporisation of camphor.

23. Thermodynamic condition for irreversible spontaneous process at constant T and P is

a) $\Delta G < 0$ b) $\Delta S < 0$

c) $\Delta G > 0$ d) $\Delta H > 0$.

24. In the equilibrium $N_2 + 3H_2 \rightleftharpoons 2\,NH_3$, the maximum yield of ammonia will be obtained with the process having

a) low pressure and high temperature

b) low pressure and low temperature

c) high temperature and high pressure

d) high pressure and low temperature.

25. The equilibrium constant for the reaction $2A \rightleftharpoons B$ is 25 $mol^{-1}\ dm^3$ at 900 K. What is the equilibrium constant for the reaction $B \rightleftharpoons 2A$ in dm^{-3} mol at the same temperature ?

a) 25 b) 625

c) 0·04 d) 0·4.

26. The compound that reacts fastest with Lucas reagent is

a) butan-1-ol b) butan-2-ol

c) 2-methyl propan-1-ol d) 2-methyl propan-2-ol.

27. Which one of the following is a simple ether ?

a) $CH_3 - O - C_2H_5$ b) $C_6H_5 - O - CH_3$

c) $C_2H_5 - O - C_2H_5$ d) $C_3H_7 - O - C_2H_5$.

28. The IUPAC name of phenatole is

a) ethyl phenyl ether b) methyl phenyl ether

c) diethyl ether d) diphenyl ether.

29. The compound used in the preparation of the tranquilizer sulphonal is

a) acetone b) acetophenone

c) isopropyl alcohol d) glycol.

30. The isomerism exhibited by CH_3CH_2COOH and CH_3COOCH_3 is

a) metamerism b) position

c) chain d) functional.

PART – II

Note : i) Answer any *fifteen* questions.

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

31. Explain bond order.

32. The electron affinities of beryllium and nitrogen are almost zero. Why ?

33. Write a note on plumbosolvency.

34. H_3PO_3 is diprotic. Why ?

35. Why do transition elements form complexes ?

36. How is chrome plating done ?

37. Explain the principle behind the hydrogen bomb.

38. What are superconductors ?

39. Calculate the change of entropy for the process, water (liq) to water (vapour, 373 K) involving $\Delta H_{vap} = 40850$ J. mol^{-1} at 373 K.

40. State Le Chatelier's principle.

41. What is activation energy ?

42. What are parallel reactions ? Give one example.

43. What are promoters ? Give one example.

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

45. Mesotartaric acid is an optically inactive compound with chiral carbon atom. Justify.

46. How is phenol prepared by Dow's process ?

47. How does glycerol react with $KHSO_4$?

48. What is Urotropine ? Give its use.

49. Give tests for Salicylic acid.

50. Compound *A* is yellow coloured liquid and it is called oil of mirbane. *A* on reduction with tin and HCl gives *B*. *B* answers carbylamine test. Identify *A* and *B*.

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 oxygen molecule by molecular orbital theory.

53. How is potassium dichromate prepared from chrome iron ore ?

54. How are lanthanides extracted from monazite sand ?

55. Mention the function of haemoglobin in natural process.

SECTION – B

56. State 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 zinc-silver cell at 25°C when $[Zn^{2+}] = 0{\cdot}10$ M and $[Ag^{+}] = 10$ M.

E°_{cell} at 25°C = 1·56 volts.

SECTION – C

60. Give any three methods of preparing diethyl ether.

61. Explain the mechanism of Cannizzaro reaction.

62. Account for the reducing nature of formic acid.

63. Write notes on anaesthetics.

PART – IV

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

64. a) How is ionic radius determined by Pauling's method ?

b) How are noble gases isolated from air by Ramsay-Rayleigh's method ?

65. a) Explain hydrate and linkage isomerisms with suitable examples.

b) Write briefly about radio carbon dating.

66. a) Explain Bragg's spectrometer method in the study of crystals.

b) How are colloids prepared by chemical methods ?

67. a) What are the evidences in favour of Arrhenius theory of electrolytic dissociation ?

b) Write the IUPAC conventions for writing cell diagram with examples.

68. a) Describe the conformations of cyclohexanol and comment on their stability.

b) Explain

i) Kolbe's electrolytic reaction and

ii) trans-esterification reaction.

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

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

70. a) Compound (*A*) with molecular formula C_6H_6O gives violet colour with neutral $FeCl_3$, reacts with $CHCl_3$ and NaOH and gives two isomers (*B*) and (*C*) with molecular formula $C_7H_6O_2$.

Compound (*A*) reacts with ammonia at 473 K in the presence of $ZnCl_2$ and gives compound (*D*) with molecular formula C_7H_7N. Compound (*D*) undergoes carbylamine test. Identify (*A*), (*B*), (*C*) and (*D*) and explain the reactions.

b) (*A*) is a reddish brown metal. It belongs to group 11 and period 4 of the periodic table. When heated below 1370 K, (*A*) gives a black compound (*B*). When heated above 1370 K, (*A*) gives a red compound (*C*). With concentrated nitric acid, (*A*) liberates NO_2 gas and gives compound (*D*). Identify (*A*), (*B*), (*C*) and (*D*). Explain the reactions.

OR

c) Compound (*A*) with molecular formula C_2H_4O reduces Tollen's reagent. (*A*) on treatment with HCN gives compound (*B*). Compound (*B*) on hydrolysis with an acid gives compound (*C*) with molecular formula $C_3H_6O_3$. Compound (*C*) is optically active. Compound (*C*) on treatment with Fenton's reagent gives compound (*D*) with molecular formula $C_3H_4O_3$. Compounds (*C*) and (*D*) give effervesence with $NaHCO_3$ solution. Identify the compounds (*A*), (*B*), (*C*) and (*D*) and explain the reactions.

d) Ionic conductances at infinite dilution of Al^{3+} and SO_4^{2-} are

189 $ohm^{-1}\ cm^2\ gm\ equiv^{-1}$ and 160 $ohm^{-1}\ cm^2\ gm\ equiv^{-1}$. Calculate equivalent and molar conductance of the electrolyte at infinite dilution.