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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. CCl_3NO_2 is used as

a) soil sterilizing agent b) organic synthesis

c) good solvent d) antioxidant.

2. The organic compound that undergoes carbylamine reaction is

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

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

[Turn over

3. The reaction between benzene diazonium chloride and benzene in the presence of NaOH is

a) Perkin's reaction b) Gattermann's reaction

c) Sandmeyer reaction d) Gomberg-Bachmann reaction.

4. Glucose forms ..... with acetic anhydride and sodium acetate.

a) di-acetate b) tetra-acetate

c) penta-acetate d) hexa-acetate.

5. The precipitation of protein is called

a) peptisation b) denaturation

c) renaturation d) none of these.

6. A compound that reacts fastest with Lucas reagent is

a) butan-l-ol b) butan-2-ol

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

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

a) neutral b) acidic

c) basic d) amphoteric.

8. Which among the following is an unsymmetrical ether ?

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

c) $CH_3 - O - CH_3$ d) $C_6H_5 - O - CH_3$.

9. Schiff's reagent gives pink colour with

a) acetone b) acetaldehyde

c) ethyl alcohol d) methyl acetate.

10. Which order of arrangement is correct in terms of the strength of the acid ?

a) $CH_3 . CH_2 . COOH > CH_3 COOH < HCOOH < ClCH_2 . COOH$

b) $ClCH_2 . COOH < HCOOH < CH_3 COOH < CH_3 . CH_2 . COOH$

c) $CH_3 . CH_2 . COOH < CH_3 COOH < HCOOH < ClCH_2 . COOH$

d) $HCOOH > CH_3 . CH_2 . COOH < CH_3 COOH > ClCH_2 . COOH$.

11. 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.

12. The phenomenon of Tyndall's effect is not observed in

a) emulsion b) colloidal solution

c) true solution d) none of these.

13. Coconut charcoal has a great capacity of the ..... of gases.

a) adsorption b) absorption

c) desorption d) all of these.

14. Emulsifying agent is used for

a) precipitation of an emulsion b) coagulation of an emulsion

c) stabilization of an emulsion d) none of these.

15. When one coulomb of electricity is passed through an electrolyte solution the mass deposited on the electrode is equal to

a) equivalent weight b) molecular weight

c) electrochemical equivalent d) one gram.

16. The total number of atoms per unit cell in *bcc* is

a) 1 b) 2

c) 3 d) 4.

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

a) spontaneous b) non-spontaneous

c) reversible d) irreversible.

18. For the reaction $2\,Cl\,(g) \rightarrow Cl_2\,(g)$ the signs of ΔH and ΔS respectively are

a) +, − b) +, +

c) −, − d) − , +

19. In a reaction $2\,O_3 \rightleftharpoons 3\,O_2$ the value of K_c is

a) $\frac{[O_3]^3}{[O_2]^2}$ b) $\frac{[O_2]^2}{[O_3]^3}$

c) $\frac{[O_2]^3}{[O_3]^2}$ d) $\frac{[O_3]}{[O_2]}$

20. In the synthesis of NH_3 between N_2 and H_2 reaction the unit of K_p is

a) $lit^2\,mol^{-2}$ b) atm^{-2}

c) $lit\,atm^{-1}$ d) atm^{-1}.

21. The colour of Purple of Cassius is

a) purple b) blue

c) bluish green d) apple green.

22. ..... form oxocations.

a) Lanthanides b) Actinides

c) Noble gases d) Alkali metals.

23. Alloys of Lanthanides are called as

a) Misch metals b) Metalloids

c) Plate metal d) Actinides.

24. In $\left[Fe^{II} (CN)_6 \right]^{4-}$ the central metal ion is

a) Fe b) Fe^{+2}

c) Fe^{+3} d) CN^-.

25. Which one of the following particles is used to bombard $_{13}Al^{27}$ to give $_{15}P^{30}$ and a neutron ?

a) α-particle b) Deuteron

c) Proton d) Neutron.

26. Dual character of an electron was explained by

a) Bohr b) Heisenberg

c) de Broglie d) Pauli.

27. Energy levels of molecular orbitals have been determined experimentally by

a) Spectroscopic studies b) *X*-ray diffraction

c) Crystallographic studies d) none of these.

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

a) polar covalent b) non-polar covalent

c) ionic d) metallic.

29. The noble gases are unreactive because they

a) have same number of electrons

b) have an atomicity of one

c) are gases with low density

d) have stable electronic configuration.

30. Ferrochrome is an alloy of

a) Cr, C, Fe, Ni b) Cr, Co, Ni, C

c) Fe, Cr d) Cr, Ni, Fe.

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. Calculate the effective nuclear charge experienced by the 4*s* electron in potassium atom. ($s = 16{\cdot}8$).

33. Write about the Holme's signal.

34. Write the uses of Helium.

35. Why do transition elements form complex ?

36. What is spitting of silver and how is it prevented ?

37. In the following radioactive decay :

$$_{92}X^{232} \rightarrow {}_{89}Y^{220},$$

how many α and β particles are ejected ?

38. What is a vitreous state ?

39. What is the entropy change of an engine that operates at 100°C when 453·6 kcal of heat is supplied to it ?

40. Define reaction quotient.

41. What are simple and complex reactions ?

42. Define Activation energy.

43. What is tanning ?

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

45. What are the conditions for a compound to be optically active ?

46. Write the dye test for phenol.

47. How is allyl alcohol obtained from glycerol ?

48. What is Rosenmund's reduction ? What is the purpose of adding $BaSO_4$ in it ?

49. Formic acid reduces Tollen's reagent but acetic acid does not. Give reasons.

50. What is Gabriel's phthalimide synthesis ?

51. In what way are antacids important ?

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 O_2 molecule by molecular orbital theory.

53. Explain the extraction of silver from its chief ore.

54. What is lanthanide contraction ? Discuss its causes and any two consequences.

55. For the complexes $K_4 [Fe (CN)_6]$. $[Cu (NH_3)_4] SO_4$ mention

    a) IUPAC names

    b) Central metal ion

    c) Ligand

    d) Co-ordination number.

SECTION – B

56. Explain the characteristics of free energy (G).

57. Apply Le Chatelier's principle to contact process of manufacture of SO_3 .

58. Explain the experimental determination of rate constant for decomposition of H_2O_2 in aqueous solution.

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 (E°) of Zn^{2+}, Zn and Ni^{2+}, Ni half cells are – 0·76 V and – 0·25 V respectively.

SECTION – C

60. Discuss the isomerism exhibited by ethers.

61. Give the mechanism for Claisen or Claisen-Schmidt reaction.

62. How is oxalic acid manufactured from sodium formate ?

63. Write a brief note on rocket propellants.

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 ? 5

b) Discuss the structure of interhalogen compounds of AX and AX_5 type. 5

65. a) Give the postulates of Werner's theory. 5

b) Write a note on radio carbon dating. 5

66. a) Explain Bragg's spectrometer method. 5

b) What is electro-osmosis ? Explain. 5

67. a) Explain Quinonoid theory of indicators. 5

b) Derive the relation between e.m.f. and free energy. 5

68. a) Write a short account on *cis-trans* isomerism. 5

b) Write the mechanism of bromination of salicylic acid. 5

69. a) Distinguish between primary, secondary and tertiary amines. 5

b) How is the structure of fructose determined ? 5

70. a) An organic compound (*A*) of molecular formula C_6H_6O gives violet colour with neutral $FeCl_3$. *(A)* gives maximum of two isomers *(B)* and *(C)* when an alkaline solution of *(A)* is refluxed with CCl_4. *(A)* also reacts with $C_6H_5N_2Cl$ to give the compound *(D)* which is a red orange dye. Identify *(A)*, *(B)*, *(C)* and *(D)*. Explain with suitable chemical reactions. 5

b) An element (*A*) belonging to Group No. 11 and Period No. 4 is extracted from the pyrite ore. *(A)* reacts with oxygen at two different temperatures forming compounds *(B)* and *(C)*. (*A*) also reacts with conc. HNO_3 to give *(D)* with the evolution of NO_2 . Find out *(A)*, *(B)*, *(C)* and *(D)*. Explain the reactions. 5

OR

c) An aromatic aldehyde *(A)* of molecular formula C_7H_6O which has the smell of bitter almonds on treatment with $(CH_3CO)_2O$ and CH_3COONa to give compound *(B)* which is an aromatic unsaturated acid. *(A)* also reacts with *(A)* in the presence of alc. KCN to give dimer *(C)*. Identify *(A)*, *(B)* and *(C)*. Explain the reactions. 5

d) Calculate the pH of a buffer solution, containing 0·2 mole per litre CH_3COONa and 0·15 mole per litre CH_3COOH. K_a for acetic acid is $1{\cdot}8 \times 10^{-5}$. 5