SEAL

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Series : **a**

Question Booklet No. **320021**

DT/08/24

PAPER—II

CHEMISTRY

Invigilator's Signature

Candidate's Signature

Time : 2 Hours **Maximum Marks : 100**

ROLL NO.

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SEAL

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1. Which one of the following is a set of isoelectronic species?

[A] N_2, H_2S, CO

[B] N_2, CO_2, CN^-

[C] Ca, Mg, Cl

[D] N_2, CO, CN

2. $_{17}Cl^{35}$ and $_{17}Cl^{37}$ differ from each other in number of

[A] electrons

[B] protons

[C] nucleons

[D] mesons

3. The quantum number that is not obtained from the solution of Schrodinger's wave equation is

[A] principal quantum number

[B] azimuthal quantum number

[C] magnetic quantum number

[D] spin quantum number

4. An orbital with quantum numbers $n = 4$, $l = 3$, $m = 0$ and $s = -\frac{1}{2}$ is called

[A] 4*s* orbital

[B] 4*p* orbital

[C] 4*d* orbital

[D] 4*f* orbital

5. The radius of hydrogen atom in the ground state is 0.53 Å. The radius of Li^{2+} ion (atomic number = 3) in a similar state is

[A] 0.17 Å

[B] 0.53 Å

[C] 0.265 Å

[D] 1.06 Å

6. The outermost electronic configuration of the most electronegative element is

[A] ns^2np^3

[B] ns^2np^4

[C] ns^2np^5

[D] ns^2np^6

7. The first ionization potentials of Na, Mg, Al and Si are in the order

[A] Na < Mg > Al < Si

[B] Na > Mg > Al > Si

[C] Na < Mg < Al > Si

[D] Na > Mg > Al < Si

8. Which of the following has highest electron affinity?

[A] F

[B] Cl

[C] Br

[D] I

9. The general electronic configuration of transition elements is

[A] $ns^2\ (n-1)\ d^{10}$

[B] $ns^{1-2}\ (n-1)d^{1-10}$

[C] ns^1

[D] ns^2np^5

10. The shape and the type of hybridization about the central atom in $[I_3]^-$ are

[A] trigonal planar, sp^2

[B] pentagonal, sp^3d

[C] linear, sp^3d

[D] square pyramidal, d^2sp^3

11. The shape of sulphate ion is

[A] tetrahedral

[B] square planar

[C] trigonal bipyramidal

[D] hexagonal

12. Bond order is

[A] directly related to bond length

[B] inversely related to bond length

[C] inversely related to bond strength

[D] never fractional

13. The first important theory of coordination compounds was put forward by

[A] Pauling

[B] Slater

[C] Werner

[D] Lewis

14. The complex $CoCl_3 \cdot 5NH_3$ in aqueous solution ionizes to give a total number of chloride ions is equal to

[A] 0

[B] 1

[C] 2

[D] 3

15. The effective atomic number of iron in $[Fe(CN)_6]^{3-}$ is

[A] 34

[B] 35

[C] 36

[D] 37

16. In the spectrochemical series, the magnitude of the crystal field splitting is maximum for which ion?

[A] Cl^-

[B] F^-

[C] NO_2^-

[D] CN^-

17. The crystal field splitting energy for octahedral (Δ_o) and tetrahedral (Δ_t) complexes is related to

[A] $\Delta_t = \frac{4}{9}\Delta_o$

[B] $\Delta_t = \frac{1}{2}\Delta_o$

[C] $\Delta_o = 2\Delta_t$

[D] $\Delta_o = \frac{4}{9}\Delta_t$

18. The weight of iron which will be converted into its oxide (Fe_3O_4) by the action of 18 g of steam will be (atomic weight of Fe = 56 u)

[A] 21 g

[B] 42 g

[C] 84 g

[D] 168 g

19. In the reaction,

$$2Na_2S_2O_3 + I_2 \longrightarrow Na_2S_4O_6 + 2NaI$$

the equivalent weight of $Na_2S_2O_3$ (mol. wt. = M) is equal to

[A] M

[B] $M/2$

[C] $M/3$

[D] $M/4$

20. 5.6 liters of a gas at NTP is found to have a mass of 11 g. The molecular mass of the gas is

[A] 22

[B] 32

[C] 44

[D] 88

21. The free energy change for a reversible reaction at equilibrium is

[A] zero

[B] small positive

[C] small negative

[D] large positive

22. The solubility of CO_2 gas in water increases with

[A] increase in temperature

[B] reduction of gas pressure above water

[C] increase in volume

[D] increase of gas pressure above water

23. For a hypothetical reaction

$$A(g) + B(g) \rightleftharpoons X(g) + Y(g)$$

occurring in a single step, the specific rate constants are 2.0×10^{-2} and 5.0×10^{3} respectively for the forward and the backward reactions. The value of equilibrium constant is

[A] 4.0×10^{-4}

[B] 2.5×10^{-6}

[C] 2.5×10^{5}

[D] 4.0×10^{-6}

24. In the chemical reaction of gaseous reactants and product

$$2SO_2 + O_2 \rightleftharpoons 2SO_3$$

increasing total pressure leads to

[A] increase in the amount of SO_3

[B] increase in the partial pressure of O_2

[C] increase in the partial pressure of SO_2

[D] change in the equilibrium constant

25. A solution of NH_4Cl is

[A] acidic

[B] basic

[C] neutral

[D] amphoteric

26. Conjugate base of a strong acid is

[A] a weak base

[B] a strong base

[C] a weak acid

[D] neutral

27. The pH value of 0.01 M HCl is equal to

[A] 2

[B] 12

[C] 4

[D] 10

28. Which of the following is a weak electrolyte?

[A] HCl

[B] NH_4Cl

[C] NaOH

[D] NH_4OH

29. Ostwald's dilution law is applicable to

[A] strong electrolytes

[B] weak electrolytes

[C] non-electrolytes

[D] strong as well as weak electrolytes

30. One mole of N_2 and 3 moles of H_2 are mixed in 1.0 litre flask. If 50% N_2 is converted into ammonia by the reaction,

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

then the total number of moles of gas at equilibrium is

[A] 1.5

[B] 3.0

[C] 4.5

[D] 6.0

31. Seaweeds are an important source of

[A] chlorine

[B] bromine

[C] iodine

[D] zinc

32. In roasting, the ores are generally converted into

[A] metals

[B] metal oxide

[C] hydrated metal oxides

[D] None of the above

33. The reducing agent used in thermite process is

[A] magnesium

[B] chromium

[C] aluminium

[D] iron

34. Froth floatation process may be used to increase the concentration of the mineral in

[A] bauxite

[B] chalcopyrites

[C] haematite

[D] calamine

35. White phosphorus contains

[A] P2 molecules

[B] P4 molecules

[C] P5 molecules

[D] P6 molecules

36. Which of the following gases would have the highest RMS velocity at 25 °C?

[A] Oxygen

[B] Carbon monoxide

[C] Carbon dioxide

[D] Sulphur dioxide

37. If the absolute temperature of a gas is doubled and the pressure is reduced to one-half, the volume of the gas will

[A] be doubled

[B] remain unchanged

[C] increase four-fold

[D] be reduced to 1/4th

38. The unit of the van der Waals constant a is

[A] atm L^2 mol^{-2}

[B] atm L^{-2} mol^{-2}

[C] atm L mol^{-1}

[D] atm L^{-1} mol

39. An ideal gas cannot be liquefied because

[A] its critical temperature is always above 0 °C

[B] it solidifies before becoming a liquid

[C] forces operative between its molecules are negligible

[D] its molecules are relatively smaller in size

40. How many moles of He gas occupy 22.4 litres at 30 °C and one atmospheric pressure?

[A] 0.11

[B] 0.90

[C] 1.11

[D] 1.0

41. The rate of diffusion of oxygen as compared with ozone will be

[A] 0.66 times

[B] 0.82 times

[C] 1.22 times

[D] 1.5 times

42. At higher altitude the boiling point of water lowers because

[A] atmospheric pressure is low

[B] temperature is low

[C] atmospheric pressure is high

[D] None of the above

43. With rise in temperature, viscosity of a liquid

[A] increases

[B] decreases

[C] remains constant

[D] may increase or decrease

44. Among the following which crystal will be soft and have low melting point?

[A] Metallic

[B] Covalent

[C] Ionic

[D] Molecular

45. During evaporation of a liquid

[A] the temperature of the liquid rises

[B] the temperature of the liquid falls

[C] the temperature of the liquid unaffected

[D] None of the above

46. The kinetic energy of one mole of any gas depends upon

[A] pressure of the gas

[B] nature of the gas

[C] absolute temperature of the gas

[D] volume of the gas

47. In a solid lattice the cation has left a lattice site and is located at an interstitial position, the lattice defect is

[A] vacancy defect

[B] interstitial defect

[C] Frenkel defect

[D] Schottky defect

48. The second order Bragg diffraction of X-rays with $\lambda = 1.0$ Å from a set of parallel planes in a metal occurs at an angle of 60°. The distance between the scattering planes in the crystal is

[A] 0.575 Å

[B] 1.00 Å

[C] 1.15 Å

[D] 2.00 Å

49. In crystal structure of sodium chloride, the arrangement of Cl-ions is

[A] f.c.c.

[B] b.c.c.

[C] both f.c.c. and b.c.c.

[D] None of the above

50. The hybridization of carbon in the structure of benzene is

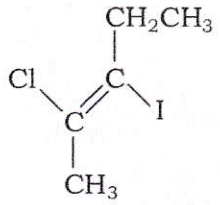
[A] *sp*

[B] sp^2

[C] sp^3

[D] dsp^2

51. IUPAC name for the following compound is



[A] *cis*-2-chloro-3-iodo-2-pentene

[B] *trans*-2-chloro-3-iodopent-2-ene

[C] *trans*-3-iodo-4-chloro-3-pentene

[D] *cis*-3-iodo-4-chloro-3-pentene

52. Structures, CH_3COCH_3 and $CH_2 = CH(OH)CH_3$ represent

[A] functional isomerism

[B] metamerism

[C] keto-enol tautomerism

[D] position isomerism

53. A mixture of equal parts of (+) and (–) enantiomers is called

[A] racemic mixture

[B] homogeneous mixture

[C] equilibrium mixture

[D] resonance hybrid

54. An important chemical method to resolve a racemic mixture makes use of the formation of

[A] a meso compound

[B] enantiomers

[C] diasteromers

[D] racemates

55. A functional isomer of 1-butyne is

[A] 2-butyne

[B] 1-butene

[C] 2-butene

[D] 1,3-butadiene

56. Which of the following will show geometrical isomerism?

[A] Propene

[B] 1-butene

[C] Isobutylene

[D] 1,2-dibromobutane

57. On heating sodium phenoxide with methyl iodide, we get

[A] anisole

[B] diethyl ether

[C] diphenyl ether

[D] phenol

58. Glycerol is a

[A] primary alcohol

[B] monohydric alcohol

[C] secondary alcohol

[D] trihydric alcohol

59. Which one of the following compounds will be most readily attacked by an electrophile?

[A] Benzene

[B] Chlorobenzene

[C] Toluene

[D] Phenol

60. Aromatic aldehydes, in the presence of cyanide ion as catalyst, are converted into acyloins. This reaction is called

[A] Perkin reaction

[B] Benzoin condensation

[C] Cannizzaro reaction

[D] Claisen condensation

61. Which of the following compounds gives a ketone with Grignard's reagent?

[A] Ethyl alcohol

[B] Formaldehyde

[C] Ethanenitrile

[D] Methyl iodide

62. The product **B** in the following sequence of reactions is

$$HC \equiv CH \xrightarrow[20\%\ H_2SO_4]{1\%\ HgSO_4} \mathbf{A} \xrightarrow[H_2O]{CH_3MgX} \mathbf{B}$$

[A] acetone

[B] acetic acid

[C] isopropyl alcohol

[D] ethanol

63. Which of the following is least acidic?

[A] C_2H_5OH

[B] C_6H_5OH

[C] CH_3COOH

[D] $ClCH_2COOH$

64. In presence of acid, hydrolysis of methyl cyanide gives

[A] methylamine

[B] acetic acid

[C] methyl alcohol

[D] formic acid

65. The reaction between CO_2 and a Grignard reagent will yield

[A] an alkene

[B] an alcohol

[C] a carboxylic acid

[D] an alkylmagnesium halide

66. Which of the following cannot reduce Fehling's solution?

[A] Glucose

[B] Acetic acid

[C] Formaldehyde

[D] Acetaldehyde

67. In the following reaction,

$$CHCl_3 + C_6H_5NH_2 \xrightarrow{KOH} \mathbf{A} + 3\mathbf{B} + 3\mathbf{C}$$

the product **A** is

[A] phenyl cyanide

[B] phenyl isocyanide

[C] ethylene chloride

[D] chlorobenzene

68. Which one of the following is a typical example of zwitterion?

[A] Aniline

[B] Acetamide

[C] Aminophenol

[D] Glycine

69. The nature of glycosidic bond present in the structure of starch is

[A] $\beta-(1 \rightarrow 4)$-glycosidic bond

[B] $\alpha-(1 \rightarrow 4)$-glycosidic bond

[C] $\alpha-(1 \rightarrow 4)$-glycosidic bond and $\alpha-(1 \rightarrow 6)$-glycosidic bond

[D] None of the above

70. Which one of the following is ***not*** present in DNA?

[A] Adenine

[B] Cytosine

[C] Uracil

[D] Guanine

71. Adenosine consists of

[A] adenine and α-D-ribose

[B] adenine and β-D-ribose

[C] adenine and 2-deoxy-ribose

[D] None of the above

72. Which of the following is ***not*** present in nucleoside?

[A] Nucleobase

[B] Pentose sugar

[C] Phosphate

[D] None of the above

73. Sugar molecule present in the structure of RNA is

[A] α-D-ribose

[B] β-D-ribose

[C] β-D-deoxyribose

[D] glucose

74. Among the following, which is ***not*** optically active amino acid?

[A] Glycine

[B] Lysine

[C] Alanine

[D] Serine

75. The change in specific optical rotation of D-glucose in aqueous solution with time to an equilibrium value is called

[A] optical rotation

[B] mutarotation

[C] anomers

[D] None of the above

76. Which of the following is ***not*** a monosaccharide?

[A] Ribose

[B] Galactose

[C] Glycogen

[D] Fructose

77. The plant hormone responsible for fruit ripening is

[A] auxin

[B] cytokinin

[C] ethylene

[D] traumatic

78. The hormone that regulates retention of water in the kidney is

[A] oxytocin

[B] thyroxin

[C] vasopressin

[D] prolactin

79. Which of the following vitamins' deficiency causes scurvy?

[A] Vitamin A

[B] Vitamin C

[C] Vitamin D

[D] Vitamin K

80. Which of the following is also known as vitamin A?

[A] Riboflavin

[B] Retinol

[C] Thiamine

[D] Pyridoxin

81. The carbohydrate, which cannot be digested by the human digestive system, is

[A] starch

[B] glucose

[C] fructose

[D] cellulose

82. For a reversible isothermal process in equilibrium, the entropy change is given by the expression

[A] $\Delta S = \frac{T}{q_{rev}}$

[B] $\Delta S = \frac{q_{rev}}{T}$

[C] $\Delta S = \frac{\Delta V}{T}$

[D] $\Delta S = \frac{\Delta E}{T}$

83. Entropy change of a system and its surroundings in equilibrium

[A] increases

[B] decreases

[C] remains constant

[D] either increases or decreases

84. $\Delta H_{combustion}$ of a compound is

[A] positive

[B] negative

[C] zero

[D] positive or negative

85. Which law of thermodynamics introduces the concept of entropy?

[A] First law

[B] Second law

[C] Zeroth law

[D] Third law

86. Which among the following is an extensive property of the system?

[A] Temperature

[B] Refractive index

[C] Volume

[D] Viscosity

87. Heat exchanged in a chemical reaction at constant temperature and pressure is called

[A] enthalpy

[B] entropy

[C] internal energy

[D] free energy

88. The enthalpies of formation of $C_2H_4(g)$, $CO_2(g)$ and $H_2O(l)$ at 25 °C and 1 atm. pressure are 52 kJ mol^{-1}, –394 kJ mol^{-1} and –286 kJ mol^{-1} respectively. The enthalpy of combustion of $C_2H_4(g)$ will be

[A] +1412 kJ mol^{-1}

[B] –1412 kJ mol^{-1}

[C] +141.2 kJ mol^{-1}

[D] –141.2 kJ mol^{-1}

89. Energy required to dissociate 4 g of gaseous hydrogen into free gaseous atoms is 208 kcal at 25 °C. The bond energy of H — H bond will be

[A] 10.4 kcal

[B] 104 kcal

[C] 1040 kcal

[D] 1.04 kcal

90. Two moles of an ideal gas expand spontaneously into a vacuum. The work done is

[A] 1 J

[B] 2 J

[C] 4 J

[D] zero

91. According to third law of thermodynamics, the entropy at 0° K is zero for

[A] elements in their stable form

[B] perfectly crystalline solids

[C] substances at 1 atm and 25 °C

[D] gaseous substances only

92. In which one of the following compounds the oxidation number of oxygen is positive?

[A] H_2O_2

[B] OF_2

[C] Na_2O_2

[D] H_2O

93. The oxidation number and covalency of sulphur in sulphur molecule (S_8) are

[A] 0 and 2

[B] +6 and 8

[C] 0 and 6

[D] +6 and 2

94. In the reaction,

$3Cl_2 + 6NaOH \longrightarrow NaClO_3 + 5\,NaCl + 3\,H_2O$

the element which loses as well as gains electron is

[A] Na

[B] O

[C] Cl

[D] None of the above

95. The violent reaction between sodium and water is an example of

[A] reduction

[B] oxidation

[C] redox reaction

[D] neutralization reaction

96. In galvanic cell

[A] oxidation occurs at cathode

[B] oxidation occurs at anode

[C] no reaction occurs at cathode

[D] reduction occurs at anode

97. During the electrolysis of fused NaCl, which reaction occurs at anode?

[A] Chloride ions are oxidised

[B] Chloride ions are reduced

[C] Sodium ions are oxidised

[D] Sodium ions are reduced

98. The molar conductivity of weak electrolyte at infinite dilution can be obtained from

[A] Ostwald's law

[B] Kirchhoff's law

[C] Kohlrausch's law

[D] Faraday's law

99. When the cell reaction attains a state of equilibrium, the EMF of the cell is

[A] zero

[B] positive

[C] negative

[D] not definite

100. Calculate the EMF of the cell at 25 °C

$Cr(s)\,|\,Cr^{+3}(0{\cdot}1M)\,||\,Fe^{+2}(0{\cdot}01M)\,|\,Fe(s)$

if, $E^{\circ}_{Cr^{+3}/Cr} = -0{\cdot}74V$ $\quad E^{\circ}_{Fe^{+2}/Fe} = -0{\cdot}45V$

[A] +0.3 V

[B] –0.3 V

[C] +0.26 V

[D] –0.26 V

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FINAL ANSWER KEY OF

LECTURER (DIET) 2024

CHEMISTRY

SET- A

Q NO.	ANS
1	D
2	C
3	D
4	D
5	A
6	C
7	A
8	B
9	B
10	C
11	A
12	B
13	C
14	C
15	B
16	D
17	A
18	B
19	A
20	C
21	A
22	D
23	D
24	A
25	A

Q NO.	ANS
26	A
27	A
28	D
29	B
30	B
31	C
32	B
33	C
34	B
35	B
36	B
37	C
38	A
39	C
40	B
41	C
42	A
43	B
44	D
45	B
46	C
47	C
48	C
49	A
50	B

Q NO.	ANS
51	B
52	C
53	A
54	C
55	D
56	B
57	A
58	D
59	D
60	B
61	C
62	C
63	A
64	B
65	C
66	B
67	B
68	D
69	C
70	C
71	B
72	C
73	B
74	A
75	B

Q NO.	ANS
76	C
77	C
78	C
79	B
80	B
81	D
82	B
83	C
84	B
85	B
86	C
87	A
88	B
89	B
90	D
91	B
92	B
93	A
94	C
95	C
96	B
97	A
98	C
99	A
100	C