Code No.	T – 2117

Entrance Examination for Admission to the P.G. Courses in the Teaching Departments, 2024

CSS

CHEMISTRY/CHEMISTRY WITH SPECIALIZATION IN (RENEWABLE – ENERGY/FUNCTIONAL MATERIALS)

General Instructions

1. The Question Paper is having 100 Objective Questions, each carrying one mark.
2. The answers are to be (✓) 'tick marked' **only** in the "**Response Sheet**" provided.
3. **Negative marking** : **0.25 marks** will be deducted for each wrong answer .

Time : 2 Hours **Max. Marks : 100**

To be filled in by the Candidate									
Register Number	in Figures								
	in words								

Choose appropriate answer from the options in the questions.

(100 × 1 = 100 marks)

1. Azeotropic mixture are
   A. Constant temperature boiling mixture
   B. Those which boils at different temperature
   C. Mixture of two solids
   D. None of the above

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2. Which of the following is displaced by Fe?

   A. Ag B. Zn

   C. Na D. All of the above

3. In NaCl crystal, each Cl^- ion surrounded by

   A. 4 Na^+ ions B. 6 Na^+ ions

   C. 1 Na^+ ions D. 2 Na^+ ions

4. Boron nitride has the structure of the type

   A. Graphite type

   B. Diamond type

   C. Both diamond and graphite type

   D. NaCl type

5. White phosphorous is

   A. A monatomic gas

   B. P4, tetrahedral solid

   C. P8, a crown

   D. A linear diatomic molecule

6. The conditions for aromaticity is

   A. Molecules must have clouds of delocalized π-electrons

   B. Molecules must contain $(4n+2)$ π-electrons

   C. Both A and B

   D. None of the above

7. Sucrose on hydrolysis

   A. Glucose and maltose

   B. Glucose and lactose

   C. Glucose and fructose

   D. Only glucose

8. A Zwitter ion is

   A. Negatively charged ion without metal atom

   B. Heavy ion with a small charge on it

   C. An ion with positive and negative charge at different point on it

   D. A positively charged ion without a metal ion

9. The safest and the most common alternative of sugar is

   A. Glucose

   B. Aspartame

   C. Saccharin

   D. Cyclodextrin

10. Which of the following is used for making artificial silk?

A. Adipic acid
B. Starch
C. Cellulose
D. Terepthalic acid

11. The number of optical isomers of $CH_3CH(OH)CH(OH)CHO$ is

A. 1
B. 2
C. 3
D. 4

12. End product of the hydrolysis of XeF_6 is

A. XeF_4O
B. XeF_2O_2
C. XeO_3
D. XeO_6

13. Identify the gas which is readily adsorbed by activated charcoal

A. H_2
B. N_2
C. O_2
D. SO_2

14. The rate constant for a chemical reaction has unit L mol^{-1} s^{-1}, order of the reaction will be

A. 0
B. 1
C. 2
D. 3

15. The electron affinity and ionization potential of iodine are 3.43 eV and 10.5 eV respectively. The electro negativity of iodine is

A. 3.48
B. 1.5
C. 2.0
D. 2.48

16. The ionic radii of A^+ and B^- ions are 0.98×10^{-10} m and 1.81×10^{-10} m. The coordination number of each ion is

A. 8
B. 4
C. 8 and 4
D. 6

17. The paramagnetic species is

A. BaO_2 B. SiO_2

C. TiO_2 D. KO_2

18. The polymeric species $(SN)_X$ is a/an

A. Three Dimensional conductor B. Two dimensional conductor

C. Insulator D. One dimensional conductor

19. Which of the following lanthanoid does NOT show luminescence?

A. Eu^{3+} B. Lu^{3+}

C. Tb^{3+} D. Pm^{3+}

20. Nuclear particles which are presently thought to hold the nuceus together are

A. Protons B. Neutrons

C. Electrons D. Mesons

21. The property measured in Thermo Gravimetric Analysis

A. Change in weight B. Rate of change in weight

C. Heat evolved or absorbed D. Change in temperature

22. Number of naturally occurring actinides are

A. One B. Two

C. Three D. Four

23. The absorbance of solution having 20% transmittance is

A. 0.301 B. 0.699

C. 1.301 D. 1.699

24. In the dichromate dianion

A. 4 Cr-O bonds are equivalent B. All Cr-O bonds are equivalent

C. 6 Cr-O bonds are equivalent D. All Cr-O bonds are not equivalent

25. On increasing the temperature, the conductivities of copper wire and $CuSO_4$ solution respectively

A. Increase, Decrease
B. Decrease, Increase
C. Increase, Increase
D. Decrease, Decrease

26. X–rays of wavelength 0.154nm are diffracted from a crystal at angle of 14.17°, Assuming that n=1, calculate the distance between layers in the crystal

A. 0.3145 nm
B. 3.145 nm
C. 31.45 nm
D. 314.5 nm

27. Which of the following method (s) use to generate free radicals?

A. Thermal cracking
B. Photolytic Bond hemolysis
C. Electron transfer
D. All of the above

28. The mildest reducing agent which reduces only carbonyl group in presence of nitro, carboxyl, double bond and ester group, is

A. $LiAlH_4$
B. $Na\text{-}NH_3$
C. $NaBH_4$
D. $H_2\text{-}Ni$

29. Which of the following oxide has the highest percentage in a usual sample of Portland cement?

A. SiO_2
B. CaO
C. Al_2O_3
D. SO_2

30. In $Fe_2(CO)_9$, the two iron atoms are

A. Linked only directly
B. Linked directly along with 3 CO molecules as bridging ligands
C. Linked only through 3 CO molecules as bridging ligands
D. Joined through one CO group as bridging ligands

31. The forces acting between noble gases are

A. Vander Waals force
B. Ion-dipole force
C. London-dispersion force
D. Magnetic force

32. The ozonolysis of a triple bond produces

A. A mixture of aldehyde/ketone and carboxylic acid
B. A mixture of aldehydes/ketones
C. A mixture of carboxylic acids
D. CO_2 and H_2O

33. Which of the following is an example of an electrophilic substitution?

A. Chlorination of methane
B. Dehydration of ethanol
C. Nitration of benzene
D. Polymerization of ethylene

34. $(CH_3)CMgCl$ on reaction with D_2O produces

A. $(CH_3)_3CD$
B. $(CH_3)_3OD$
C. $(CD_3)_3CD$
D. $(CD_3)OD$

35. The correct order of ease of hydrolysis of acid derivatives is

A. Ester > amide > acid chloride
B. Amide > ester > acid chloride
C. Amide > acid chloride > Ester
D. Acid chloride > ester > amide

36. Which of the following is the most stable carbonium ion?

A. $C_6H_5^-C^+H$
B. $CH_3=C^+H_2$
C. $(CH_3)_2C^+H$
D. $CH_3C^+H_2$

37. For a reaction to be spontaneous at all, temperatures

A. ΔG and ΔH should be negative
B. $\Delta G = \Delta H = 0$
C. ΔG and ΔH should be positive
D. $\Delta H < \Delta G$

38. The molecular velocity of any gas is proportional to the

A. Absolute temperature

B. Square of the absolute temperature

C. Square root of the absolute temperature

D. None of these

39. Chemical equilibrium is dynamic in nature because

A. The equilibrium is maintained rapidly

B. The concentration of reactants and products become same at equilibrium

C. The concentration of reactants and products are constant but different

D. Both the forward and reverse reaction occur at all times with same speed

40. The pH of a 0.001 M solution of hydrochloric acid is

A. 1 B. 3

C. 5 D. 10

41. The elements on the right side of the periodic table are

A. Metals B. Metalloids

C. Non-metals D. Transition metals

42. Which of the following molecule has a dipole moment?

A. CO_2 B. BF_3

C. CH_4 D. $CHCl_3$

43. For a real gas, PV is a constant over a small range of pressures, at

A. Boyle's temperature B. Critical temperature

C. Inversion temperature D. Ordinary temperature

44. The density of a 3M $Na_2S_2O_3$ (Mw=158) solution is 1.25 gm^{-1}. Find the percent by weight of sodium thiosulphate

A. 32.92%
B. 36.92%
C. 37.92%
D. 42.92%

45. The heating of pyrites to remove sulphur is known as

A. Bessemerisation
B. Calcination
C. Roasting
D. Smelting

46. The formation of bakelite results by the reaction between

A. Urea and formaldehyde
B. Phenol and formaldehyde
C. Ethylene glycol and dimethyl terephthate
D. Tetra methylene glycol and hexamethylene disisocyanate

47. Propene can be converted into 1-proponal by

A. Hydration
B. Hydroboration-oxidation
C. Reaction with alkaline $KMnO_4$
D. Reaction with dil. NaOH solution

48. Which of the following ions give crimson colour in the flame?

A. Ba^{2+}
B. K^{+}
C. Ca^{2+}
D. Sr^{2+}

49. Formic acid and acetic acid may be distinguished by reaction with

A. Sodium
B. Dilute acidic permanganate
C. 2, 4 di nitrophenyl hydrazine
D. Sodium ethoxide

50. When a solid is converted into liquid, entropy

A. Becomes zero
B. Decreases
C. Increases
D. Remains the same

51. In which of the following arrangements, a metal would have least density?

A. bcc

B. ccp

C. hcp

D. In all three arrangements, the density would be same

52. In the phenomenon of osmosis, the membrane allow passage of

A. Solute only

B. Solvent only

C. Both solute and solvent

D. None of these

53. If E_a of a reaction is zero. K is equal to (A is the frequency factor)

A. Zero

B. Infinity

C. A^2

D. A^{-1}

54. The physical states of the dispersing phase and dispersion medium in colloid like pesticide spray respectively, are

A. Gas, liquid

B. Solid, gas

C. Liquid, solid

D. Liquid, gas

55. ESR spectra are observed in _____ region

A. Microwave

B. Radiofrequency

C. X–ray

D. UV-Visible

56. Which of the following diatomic molecules will not give a rotational spectrum?

A. N_2

B. CO

C. NO

D. HF

57. The enthalpy change in a reaction does not depend upon

A. the state of reactions and products

B. the nature of the reactants and products

C. different intermediate steps in the reaction

D. initial and final enthalpy of the reaction

58. Absence of an Sn axis denotes

A. geometrical isomerism
B. Optical activity
C. A trans isomer
D. A tetrahedral point group

59. The HOMO in CO is

A. π-bonding
B. π-antibonding
C. σ-bonding
D. σ-antibonding

60. CeO_2 contain special variety of glass, which cuts off ultraviolet rays, is known as

A. crookes glass
B. jena glass
C. flint glass
D. pyrex glass

61. Green Chemistry aims to

A. grows trees around chemical factories
B. reduce environmental degradation
C. reduce costs of chemical process
D. both B and C

62. During Bhopal tragedy the gas released was

A. potassium isothiocyanate
B. m phosgene
C. methyl isocyanate
D. ammonia

63. Which of the following has the regular tetrahedral structure?

A. SF_4
B. BF_4^-
C. XeF_4
D. $[Ni(CN)_4]^{2-}$

64. The spectrum of He is similar to

A. H
B. Na
C. Li^+
D. He^+

65. Gold dissolve in aquaregia and forms

A. $AuCl_2$ B. $AuCl_3$

C. $HAuCl_4$ D. AuCl

66. The highest boiling point is expected for

A. iso-Octane B. n-Octane

C. 2,2,3,3- tetra-Methyl butane D. n-Butane

67. The molarity of pure water at 4°C

A. 1M B. 5M

C. 2.5M D. 55.5M

68. Brass is an alloy of

A. Copper and Zinc B. Copper and Iron

C. Iron and Zinc D. Tin and Copper

69. Which of the following has highest lattice energy?

A. KF B. CsF

C. NaF D. RbF

70. Iodine is an example of

A. Ionic Crystal B. Covalent crystal

C. Molecular Crystal D. Metallic crystal

71. The potential for a hydrogen electrode of pH = 10 is

A. 0.00 V B. –0.591

C. 0.591 D. –0.059V

72. The number of vibrational degrees of freedom in $C_6H_5CH_3$ will be

A. 39 B. 15

C. 18 D. 40

73. The percentages of a constituent A in a compound AB were found to be 48.32, 48.36, 48.23, 48.11 and 48.38 percent. What is the mean deviation in it?

A. 0.09 B. 1.9

C. 0.9 D. 9

74. Many free reactions are Inhibited by substances like

A. Hydrogen peroxide B. Benzoyl peroxide

C. Hydroquinone D. Finely divided metals

75. In an S_N2 reaction there is

A. Partial racemization

B. Complete racemization

C. Complete inversion

D. A little inversion and mostly racemization

76. U-235 may be separated from natural uranium by a process called

A. Ionisation B. Electrolysis

C. Precipitation D. Gaseous diffusion

77. The catalyst used in lead chamber process of H_2SO_4 manufacture is

A. platinum B. oxides of nitrogen

C. nickel D. vanadium compounds

78. Williamson's synthesis is used for the preparation of

A. acid B. ester

C. ether D. alcohol

79. The pyramidine bases present in DNA are

A. Cytosine and adenine B. Cytosine and guanine

C. Cytosine and thymine D. Cytosine and uracil

80. Hyperconjugation involves the overlap of the following orbitals

A. $\sigma - \sigma$ B. $\sigma - p$

C. $p - p$ D. $\pi - \pi$

81. In a reversible isothermal process, the change in internal energy is

A. zero B. positive

C. negative D. none of these

82. For a first order reaction the plot of log [*A*]*t* Vs *t* is linear with a

A. positive slope and zero intercept

B. positive slope and non zero intercept

C. negative slope and zero intercept

D. negative slope and non zero intercept

83. The reaction of water with sodium and potassium is

A. endothermic B. reversible

C. exothermic D. irreversible and endothemic

84. In which part of the atmosphere, ozone layer is present?

A. Stratosphere B. Troposphere

C. Mesosphere D. Thermosphere

85. The value of the ionic product of water depends on

A. on volume of water

B. on temperature

C. changes by adding acid or alkali

D. always remain constant

86. Buckminister fullerene is

A. pure graphite B. C-60

C. diamond D. C-90

87. The major product obtained on interaction of phenol with sodium hydroxide and carbon dioxide is

A. benzoic acid
B. salicylaldehyde
C. salicylic acid
D. phthalic acid

88. Which out of the following has the largest size?

A. Mg^{2+}
B. Na^{+}
C. Rb^{+}
D. Li^{+}

89. The rate of a chemical reaction doubles for every 10°C rise in temperature. If the temperature is increased by 60°C the rate of reaction increases by

A. 20 times
B. 32 times
C. 64 times
D. 128 times

90. The bond order of N_2^{+} is

A. 1.5
B. 3.0
C. 2.5
D. 2.0

91. How many unpaired electrons are there in cobaltocene molecule?

A. 0
B. 1
C. 2
D. 3

92. The Claisen condensation is often used in preparing

A. beta-hydroxyl ester
B. alpha- hydroxyl ester
C. gamma-keto ester
D. beta-keto ester

93. Photoelectric effect is maximum in

A. Cs
B. Na
C. K
D. Li

94. Nitrobenzene on reduction with $LiAlH_4$ in presence of ether forms

A. aniline
B. p-amino phenol
C. azobenzene
D. none of these

95. Hydrolysis of HCN gives

A. pyruvic acid
B. cinnamic acid
C. oxalic acid
D. formic acid

96. The name of the reaction which converts aldehydes into alkanes of same number of carbon atoms is called as

A. Cannizzaro's reaction
B. Clemmensen's reaction
C. Aldol condensation
D. Perkin's reaction

97. Aldehydes can be purified by forming a precipitate with

A. $NaHSO_3$
B. Tollen's reagent
C. Fehling solution
D. Na_2CO_3

98. The ratio of first Bohr's radius of hydrogen, He^+ and Li^{2+} respectively is

A. 6:3:2
B. 2:3:6
C. 1:0.5:0.33
D. Both A and C

99. The energy of hydrogen bonds of the order of

A. 140 KJ/mole
B. 4 KJ/mole
C. 400 KJ/mole
D. 40 KJ/mole

100. Lack of vitamin B_1 causes

A. scurvy
B. dermatitis
C. beri beri
D. lip inflammation

ANSWER SHEET

1	A	B	C	D	E	26	A	B	C	D	E	51	A	B	C	D	E	76	A	B	C	D	E
2	A	B	C	D	E	27	A	B	C	D	E	52	A	B	C	D	E	77	A	B	C	D	E
3	A	B	C	D	E	28	A	B	C	D	E	53	A	B	C	D	E	78	A	B	C	D	E
4	A	B	C	D	E	29	A	B	C	D	E	54	A	B	C	D	E	79	A	B	C	D	E
5	A	B	C	D	E	30	A	B	C	D	E	55	A	B	C	D	E	80	A	B	C	D	E
6	A	B	C	D	E	31	A	B	C	D	E	56	A	B	C	D	E	81	A	B	C	D	E
7	A	B	C	D	E	32	A	B	C	D	E	57	A	B	C	D	E	82	A	B	C	D	E
8	A	B	C	D	E	33	A	B	C	D	E	58	A	B	C	D	E	83	A	B	C	D	E
9	A	B	C	D	E	34	A	B	C	D	E	59	A	B	C	D	E	84	A	B	C	D	E
10	A	B	C	D	E	35	A	B	C	D	E	60	A	B	C	D	E	85	A	B	C	D	E
11	A	B	C	D	E	36	A	B	C	D	E	61	A	B	C	D	E	86	A	B	C	D	E
12	A	B	C	D	E	37	A	B	C	D	E	62	A	B	C	D	E	87	A	B	C	D	E
13	A	B	C	D	E	38	A	B	C	D	E	63	A	B	C	D	E	88	A	B	C	D	E
14	A	B	C	D	E	39	A	B	C	D	E	64	A	B	C	D	E	89	A	B	C	D	E
15	A	B	C	D	E	40	A	B	C	D	E	65	A	B	C	D	E	90	A	B	C	D	E
16	A	B	C	D	E	41	A	B	C	D	E	66	A	B	C	D	E	91	A	B	C	D	E
17	A	B	C	D	E	42	A	B	C	D	E	67	A	B	C	D	E	92	A	B	C	D	E
18	A	B	C	D	E	43	A	B	C	D	E	68	A	B	C	D	E	93	A	B	C	D	E
19	A	B	C	D	E	44	A	B	C	D	E	69	A	B	C	D	E	94	A	B	C	D	E
20	A	B	C	D	E	45	A	B	C	D	E	70	A	B	C	D	E	95	A	B	C	D	E
21	A	B	C	D	E	46	A	B	C	D	E	71	A	B	C	D	E	96	A	B	C	D	E
22	A	B	C	D	E	47	A	B	C	D	E	72	A	B	C	D	E	97	A	B	C	D	E
23	A	B	C	D	E	48	A	B	C	D	E	73	A	B	C	D	E	98	A	B	C	D	E
24	A	B	C	D	E	49	A	B	C	D	E	74	A	B	C	D	E	99	A	B	C	D	E
25	A	B	C	D	E	50	A	B	C	D	E	75	A	B	C	D	E	100	A	B	C	D	E

ROUGH WORK

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