

MIZORAM PUBLIC SERVICE
COMMISSION

*Technical Competitive Examinations for
Recruitment to the post of
Inspector of Legal Metrology
under Food, Civil Supplies & Consumer
Affairs Department*

Time Allowed : 2 hours

Full Marks : 150

Chemistry Paper-I

INVIGILATOR

CENTRE SUPERINTENDENT

Date of Exam. : 26/03/2010

Instructions to candidates:

- Enter your Roll No. in the box provided on the front page.
- Attempt all the questions.
- Each question is followed by probable answers. Choose the appropriate answer and mark it by putting '✓' mark on the corresponding box.
- If more than one answer boxes are marked for a question, the answer will be treated as wrong.
- On completion, you are to submit the booklet to the Invigilator.

Code Number :

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Marks Obtained :

Examiner

Scrutiniser

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1. The equation $E = h\nu$ was put forward by
- (a) Einstein (b) Planck
(c) Maxwell (d) Schrödinger
2. The value of Planck's constant is
- (a) 6.626×10^{-34} Js (b) 6.023×10^{23} Js
(c) 6.626×10^{-27} Js (d) 6.626×10^{-24} Js
3. In the uncertainty in the position of an electron is zero, the uncertainty in its momentum would be
- (a) zero (b) greater than $\frac{h}{4\pi}$
(c) less than $\frac{h}{4\pi}$ (d) infinite
4. The wave function ψ in the Schrödinger wave equation represents
- (a) probability of the electron (b) amplitude of the wave
(c) frequency of the wave (d) speed of the wave
5. A node is a surface on which probability of finding the electron is
- (a) 99% (b) 0%
(c) 50% (d) 10%
6. The ground state energy of an electron confined in a one dimensional box of length 1 \AA is
- (a) 28.1 eV (b) 46.2 eV
(c) 37.6 eV (d) 15.2 eV
7. The uncertainty in the momentum of an electron is $1 \times 10^{-5} \text{ Kg m/s}$. The uncertainty in its position will be ($h = 6.62 \times 10^{-34} \text{ Kg m}^2/\text{s}$)
- (a) $1.05 \times 10^{-28} \text{ m}$ (b) $1.05 \times 10^{-26} \text{ m}$
(c) $5.27 \times 10^{-30} \text{ m}$ (d) $5.27 \times 10^{-28} \text{ m}$
8. Principal, azimuthal and magnetic quantum numbers are respectively related to
- (a) size, orientation and shape (b) size, shape and orientation
(c) shape, size and orientation (d) shape, orientation and size
9. The dipole moment is maximum for
- (a) HCl (b) HBr
(c) HI (d) HF

10. 1 Debye is equivalent to

- (a) 3.33×10^{-30} Cm (b) 1.602×10^{-27} Cm
(c) 1.602×10^{-20} Cm (d) 3.33×10^{-12} Cm

11. Which of the following pair is expected to have the same bond order?

- (a) O_2, N_2 (b) O_2^+, N_2^-
(c) O_2^-, N_2^+ (d) O_2^-, N_2^-

12. Which of the following has zero dipole moment?

- (a) ClF (b) PCl_3
(c) SiF_4 (d) $CFCl_3$

13. The number of radial nodes in a 4d-orbital is

- (a) zero (b) one
(c) two (d) three

14. Which of the following is an ionic compound?

- (a) SO_3 (b) ICl
(c) KI (d) $CHCl_3$

15. Molten sodium chloride conducts electricity due to the presence of

- (a) free electrons (b) free molecules
(c) free sodium and chlorine atoms (d) free sodium and chloride ions

16. The stability of the ionic crystals depends principally on

- (a) high electron affinity of anion forming species
(b) the lattice energy of crystal
(c) low I.E. of cation forming species
(d) low heat of sublimation of cation forming solid

17. The compound which contains ionic as well as covalent bond is

- (a) $C_2H_4Cl_2$ (b) CH_3I
(c) KCN (d) H_2O_2

18. Any one of the three equivalent resonance forms for the CO_3^{2-} ion would show around the carbon atom

- (a) three single bonds
- (b) two single and double bonds
- (c) three single bonds and one lone pair of electrons
- (d) two single bonds and two lone pair of electrons

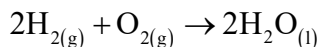
19. The bond order in peroxide ion (O_2^{2-}) is

- (a) 2.5
- (b) 1.5
- (c) 2.0
- (d) 1.0

20. How many bonds does B_2 have?

- (a) zero
- (b) one
- (c) two
- (d) three

21. For hydrogen-oxygen fuel cell with reaction



$\Delta G^\circ_{\text{f}(\text{H}_2\text{O})} = -237.2 \text{KJmol}^{-1}$. hence e.m.f. of the fuel cell is

- (a) +2.46 V
- (b) -2.46 V
- (c) +1.23 V
- (d) -1.23 V

22. Liquid junction potential can be eliminated by introducing

- (a) salt bridge
- (b) platinum electrodes
- (c) calomel electrodes
- (d) Quin-hydrone electrode

23. In electrolyte concentration cells, the two electrodes are made up of

- (a) zinc and copper
- (b) mercury and silver
- (c) same material
- (d) different material

24. The resistance of a conductor is directly proportional to

- (a) current passed
- (b) area of cross section of conductor
- (c) length of the conductor
- (d) equivalent conductance

25. The ionic strength of 0.15 molal KCl solution is
(a) 0.75 (b) 0.6
(c) 0.15 (d) 0.25
26. According to Lambert-Beer's law
(a) $\log I = \log I_0 - \epsilon bc$ (b) $\log I = \log I_0 + \epsilon bc$
(c) $\log I = \log I_0 + kb$ (d) $\log I = \log I_0 - kb$
27. Units of molar extinction coefficient are
(a) $\text{mol L}^{-1}\text{S}^{-1}$ (b) $\text{L mol}^{-1}\text{S}^{-1}$
(c) $\text{mol L}^{-1}\text{cm}^{-1}$ (d) $\text{L mol}^{-1}\text{cm}^{-1}$
28. One Einstein represents
(a) 1000 quanta of energy (b) 1000 calories of energy
(c) 1 quantum of energy (d) 1 mole quanta of energy
29. Which one of the following belongs to the third transition series?
(a) Ni (b) Ac
(c) Cd (d) Au
30. Manganese belongs to
(a) P-Block (b) first transition series
(c) second transition series (d) third transition series
31. The electronic configuration of Cu^{2+} (At. No. of Cu = 29) is
(a) $[\text{Ar}]3d^84s^1$ (b) $[\text{Ar}]3d^74s^2$
(c) $[\text{Ar}]3d^9$ (d) $[\text{Ar}]3d^64s^24p^1$
32. Transition elements have maximum tendency to form complexes because
(a) they are metals and all metals form complexes
(b) they contain incompletely filled d-orbitals
(c) their charge/size ratio is quite large
(d) of both (b) and (c)
33. The magnetic moment of a transition metal ion is found to be 3.87 B.M. The number of unpaired electrons present in it is
(a) 2 (b) 3
(c) 4 (d) 5

34. Which of the following is paramagnetic?

- (a) $V(CO)_6$ (b) $Fe(CO)_5$
 (c) $Fe(CO)_9$ (d) $Cr(CO)_6$

35. In an octahedral crystal field the t_{2g} orbitals are

- (a) raised in energy by $0.4D_0$ (b) lowered in energy by $0.4D_0$
 (c) raised in energy by $0.6D_0$ (d) lowered in energy by $0.6D_0$

36. In case of $[Ti(H_2O)_6]^{3+}$ ion the net CFSE value will be

- (a) $0.4D_0$ (b) $0.6D_0$
 (c) zero (d) $0.2D_0$

37. The complex ion $[Cu(NH_3)_4]^{2+}$ is

- (a) tetrahedral and paramagnetic (b) tetrahedral and diamagnetic
 (c) square planar and paramagnetic (d) square planar and diamagnetic

38. The autoionisation of SO_2 gives the ions SO_3^{2-} and

- (a) SO^{2+} (b) SO_2^+
 (c) SO_3^+ (d) SO_3^-

39. The colour of alkali metal solutions in liquid ammonia is

- (a) blue (b) red
 (c) orange (d) yellow

40. Zeise's salt has the formula

- (a) $K[Pt(C_2H_4)Cl_3].H_2O$ (b) $Na[Pd(C_2H_4)Cl_3].H_2O$
 (c) $K[Pd(C_2H_4)Cl_3].H_2O$ (d) $Na[Pt(C_2H_4)Br_3].H_2O$

41. Which of the following is not the π -bonded organometallic compound?

- (a) $[Cr(\eta^6-C_6H_6)_2]$ (b) $[Fe(\eta^5-C_5H_5)_2]$
 (c) $K[PtCl_3(\eta^2-C_2H_4)]$ (d) $(C_2H_5)_4Pb$

42. The first law of thermodynamics can be mathematically expressed as

- (a) $C_p - C_v = R$ (b) $\Delta H = \Delta G + T\Delta S$
 (c) $A = U - TS$ (d) $\Delta U = q - w$

43. In which one of the following changes does entropy decrease?

- (a) Evaporation of water (b) Solidification of liquid
 (c) Sublimation of a solid (d) Expansion of a gas

44. The most common oxidation state of lanthanides is

- (a) +1 (b) +2
(c) -3 (d) +3

45. The Miller indices of a crystal plane which cut through the crystal axes at $2a, 3b, c$ are

- (a) (326) (b) (111)
(c) (122) (d) (222)

46. An amorphous substance is

- (a) isotropic (b) anisotropic
(c) liquid crystal (d) a liquid

47. One solid which has both Schottky and Frenkel defect is

- (a) AgBr (b) ZnCl₂
(c) MgCl₂ (d) NaCl

48. Cubic crystal system has the following unit cell dimensions

- (a) $a = b \neq c; \alpha = \beta = \gamma = 90^\circ$ (b) $a = b = c; \alpha = \beta = \gamma = 90^\circ$
(c) $a \neq b \neq c; \alpha = \beta = \gamma = 90^\circ$ (d) $a = b \neq c; \alpha = \beta = 90^\circ, \gamma = 120^\circ$

49. The total number of space groups in a crystal is

- (a) 7 (b) 14
(c) 32 (d) 230

50. Unit of k for a third order reaction is

- (a) $\text{dm}^3 \text{mol}^{-1} \text{S}^{-1}$ (b) $\text{dm}^3 \text{mol}^{-1} \text{S}^{-1}$
(c) $\text{dm}^6 \text{mol}^{-2} \text{S}^{-1}$ (d) $\text{dm}^{-3} \text{molS}^{-1}$

51. The $t_{1/2}$ of a first order reaction is 20s. The time required for 99.9% decomposition is

- (a) 400 s (b) 30 min
(c) 40 s (d) 199.9 s

52. In lanthanide contraction the size of

- (a) M³⁺ ion increases (b) M⁴⁺ ion increases
(c) M³⁺ ion decreases (d) M⁴⁺ ion decreases

53. The number of nodal planes in a P_x orbital is

- (a) one (b) two
(c) three (d) zero

54. Which of the following is not possible?

- (a) $n = 3, l = 0, m = 0$ (b) $n = 3, l = 1, m = -1$
(c) $n = 2, l = 0, m = -1$ (d) $n = 2, l = 1, m = 0$

55. Radial wave function of an orbital decides

- (a) size of the orbital (b) orientation of the orbital
(c) size and orientation of the orbital (d) none of these

56. Zeise's salt contains which type of bonds?

- (a) Ionic bond (b) Ionic and covalent bonds
(c) Hydrogen bonds (d) Ionic, covalent and coordinate bonds

57. Which of the following has the highest ionic character?

- (a) $MgCl_2$ (b) $CaCl_2$
(c) $BaCl_2$ (d) $BeCl_2$

58. Resonance structure can be written for

- (a) O_3 (b) NH_3
(c) CH_4 (d) H_2O

59. Total number of nodes present in a 3p orbital is

- (a) zero (b) one
(c) two (d) three

60. The d-orbital that has only two lobes is

- (a) d_{xy} (b) d_{xz}
(c) $d_{x^2 - y^2}$ (d) d_{z^2}

61. If azimuthal quantum number of an atom is 2 the magnetic quantum number can have values

- (a) 1, 0, -1 (b) 2, 1, 0, -1, -2
(c) 1, -1, -2 (d) 2, 1, 0

62. The wave function of a quantum system must be

- (a) multiple-valued, discontinuous and finite at infinity
(b) single-valued, continuous and finite at infinity
(c) single-valued, continuous and infinite at infinity
(d) single-valued, continuous and zero at infinity

63. Heisenberg's uncertainty principle rules out the exact simultaneous measurement of

- (a) probability and intensity (b) energy and velocity
(c) charge density and radius (d) position and momentum

64. An electron having an azimuthal quantum number $l=3$ is

- (a) s-electron (b) p-electron
(c) d-electron (d) f-electron

65. Out of the following, which will have maximum dipole moment?

- (a) NF_3 (b) NCl_3
(c) NBr_3 (d) NH_3

66. Which one of the following has maximum number of nodal planes?

- (a) σ_{1s}^* (b) $\sigma_{2p_2}^*$
(c) π_{2p_x} (d) $\pi_{2p_y}^*$

67. A true covalent bond is formed by

- (a) transference of electrons from one atom to the other
(b) mutual sharing of electrons
(c) one sided sharing of electrons
(d) none of the above three processes

68. The species C_2 has

- (a) one s bond and one p bond (b) both p bonds
(c) both s bonds (d) none of these

69. Which of the following contains maximum number of electrons in the antibonding molecular orbitals?

- (a) O_2 (b) O_2^{2-}
(c) O_2^- (d) O_2^+

70. Lanthanide contraction is observed in

- (a) Gd (b) At
(c) Xe (d) Ac

71. Electrochemical devices in which chemical energy of the fuel is directly converted into electrical energy is known as

- (a) concentration cell (b) fuel cell
(c) electrolytic cell (d) standard cell

72. The unit of cell constant is

- (a) cm^2 (b) cm^3
(c) cm^{-1} (d) cm^{-2}

73. The resistance of a conductor is 5×10^{-2} ohms. Conductance is equal to

- (a) 200 mhos (b) 20 mhos
(c) 500 mhos (d) 50 mhos

74. The units of specific conductance are

- (a) m^2 (b) mS^{-1}
(c) Sm^{-1} (d) Sm^{-2}

75. The units of molar conductance are

- (a) $\text{Sm}^2\text{mol}^{-1}$ (b) m^2S^{-1}
(c) Sm^{-1} (d) $\text{m}^2\text{S}^{-1}\text{mol}^{-1}$

76. The number of transition series is

- (a) 2 (b) 3
(c) 4 (d) 5

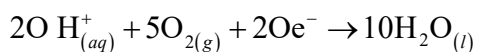
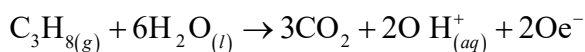
77. Quantum efficiency of a photochemical reaction is equal to

- (a) the quanta of radiation absorbed
(b) the number of molecules absorbing radiation
(c) the number of molecules reacting per quantum of radiation absorbed
(d) the number of molecules reacting after absorbing radiation

78. The equation relating the mean ionic activity coefficient to the ionic strength of the solution is known as

- (a) Arrhenius equation (b) Debye-Hückel limiting law
(c) Debye equation (d) Bragg's equation

79. For the propane-oxygen fuel cell the two half cell reactions are



$\Delta G = -2108\text{kJmol}^{-1}$. The cell potential is

- (a) 1.09 V (b) -1.09 V
(c) 1.09 mV (d) 10.9 V

80. Strong electrolytes which exist as ions even in the solid state and is completely ionised in solution at all concentrations. This is according to

- (a) Debye-Hückel theory (b) Arrhenius theory
 (c) Ostwald's theory (d) Lewis theory

81. The autoionisation of liquid ammonia gives the ions NH_4^+ and

- (a) NH_4^- (b) NH_2^-
 (c) NH_3^+ (d) NH_2^+

82. The formula of ferrocene is

- (a) $[\text{Fe}(\text{CN})_6]^{3-}$ (b) $[\text{Fe}(\text{CN})_6]^{2-}$
 (c) $\text{Fe}(\text{C}_5\text{H}_5)_2$ (d) $\text{Fe}(\text{CO})_5$

83. In $\text{Ni}(\text{CO})_4$, hybridisation of Ni is

- (a) sp^3 (b) dsp^2
 (c) sp^3d (d) sp^3d^2

84. General electronic configuration of the transition elements is

- (a) $(n-1)d^{1-10}ns^{1-2}np^{1-6}$ (b) $(n-1)d^{1-10}ns^2$
 (c) $(n-1)d^{1-10}ns^{1-2}$ (d) $(n-1)d^{1-10}ns^1np^1$

85. An orbital with the quantum numbers $n = 4$ $l = 3$ $m_l = 0$ $m_s = -1/2$ is called

- (a) 3s (b) 3p
 (c) 4d (d) 4f

86. 75% of first order reaction was completed in 32 minutes, when was 50% of the reaction completed?

- (a) 4 minutes (b) 8 minutes
 (c) 16 minutes (d) 24 minutes

87. A substance whose initial concentration a moles/litre reacts according to zero order kinetics. The time it takes for completion of the reaction is

- (a) $\frac{2a}{k}$ (b) $\frac{a}{k}$
 (c) $\frac{a}{2k}$ (d) $\frac{k}{a}$

88. In Bragg equation n represents

- (a) principal quantum number (b) number of atoms
 (c) number of electrons (d) order of diffraction

89. In a simple cubic cell an atom at the corner contributes to the unit cell

- (a) 1 part (b) $\frac{1}{2}$ part
(c) $\frac{1}{4}$ part (d) $\frac{1}{8}$ part

90. For a second order reaction the $t \frac{1}{2}$ is related to the initial concentration of the reactant $[A_0]$ as

- (a) $t \frac{1}{2} \propto [A_0]$ (b) $t \frac{1}{2} \propto [A_0]^{\frac{1}{2}}$
(c) $t \frac{1}{2} \propto \frac{1}{[A_0]}$ (d) $t \frac{1}{2} \propto \frac{1}{[A_0]^{\frac{1}{2}}}$

91. For a given reaction the logarithm of the concentration of reactant plotted against time gave a straight line with negative slope. The order of the reaction is

- (a) 3 (b) 2
(c) 1 (d) 0

92. The order of a reaction is

- (a) never zero
(b) never fractional
(c) an experimentally determined quantity
(d) equal to the concentration of the reactant

93. If the rate of a reaction is given by $r = K[A]^2[B]^{\frac{1}{2}}$ the units of the rate constant are

- (a) s^{-1} (b) $dm^3mol^{-1}s^{-1}$
(c) $dm^{-9/2}mol^{3/2}s^{-1}$ (d) $dm^{9/2}mol^{-3/2}s^{-1}$

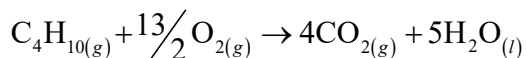
94. Lanthanide for which +2 and +3 oxidation states are common is

- (a) La (b) Nd
(c) Ce (d) Eu

95. The liquid junction potential arises mainly due to difference in

- (a) size of the ions (b) velocity of ions
(c) concentration of ions (d) none of these

96. For *n*-butane-oxygen fuel cell involving the overall cell reaction



the value of *n* to be used in the equation $\text{DG}^\circ = -nFE^\circ$ is

- (a) 12 (b) 24
(c) 26 (d) 20

97. Tetrahedral complexes are generally high spin. This is because

- (a) $\Delta t < p$ (b) $\Delta t > p$
(c) $\Delta t = p$ (d) none of these

98. Which of the following compound contains one unpaired electrons in the 4p orbital?

- (a) $[\text{Cu}(\text{NH}_3)_2]^+$ (b) $[\text{Cu}(\text{NH}_3)_4]^{2+}$
(c) $[\text{Cu}(\text{CN})_6]^{3-}$ (d) $[\text{Ni}(\text{CN})_4]^{2-}$

99. A graph is plotted between $\ln[R]$ and *t* give a straight line then the slope is equal to
{ $\ln[R]$ = concentration of the reaction left, *t* = time}

- (a) *K* (b) $-K$
(c) $\frac{1}{K}$ (d) K^2

100. The specific rate constant of a first order reaction depends on the

- (a) concentration of reactant (b) concentration of product
(c) time (d) temperature

101. If for any reaction the rate constant is equal to the rate of reaction at all concentration the order is

- (a) zero (b) one
(c) two (d) three

102. Zr and Hf have almost equal atomic and ionic radii because of

- (a) diagonal relationship (b) lanthanide contraction
(c) actinide contraction (d) both belong to f-block element

103. Which of the following statements about LiCl and NaCl is wrong?

- (a) LiCl has lower melting point than NaCl
(b) LiCl dissolves more in organic solvents whereas NaCl does not
(c) LiCl would ionise in water more than NaCl
(d) Fused LiCl would be less conducting than fused NaCl

104. Which of the following will provide the most efficient overlap?

- (a) s-s (b) s-p
(c) sp^2-sp^2 (d) sp-sp

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

- (a) 2 J (b) infinity
(c) zero (d) 1 J

106. If doubling the initial concentration of a reactant doubles $t^{1/2}$ of the reaction the order of the reaction is

- (a) 3 (b) 2
(c) 1 (d) 0

107. Gibbs free energy G , and enthalpy H , and entropy S are related to one another by

- (a) $G = H + TS$ (b) $G = H - TS$
(c) $G = H + S$ (d) $G = H - S$

108. According to second law of thermodynamics a process is spontaneous, if during the process

- (a) $\Delta S_{univ} > 0$ (b) $\Delta S_{univ} = 0$
(c) $\Delta H_{syst} > 0$ (d) $\Delta S_{univ} = \Delta S_{syst}$

109. For a reaction to be spontaneous at all temperatures

- (a) ΔG and ΔH should be negative (b) $\Delta H = \Delta G = 0$
(c) ΔG and ΔH should be positive (d) $\Delta H < \Delta G$

110. Which of the following statement is true? The entropy of the universe

- (a) increases and tends towards maximum value
(b) decreases and tends towards zero
(c) remains constant
(d) decreases and increases with a periodic rate

111. By increasing the temperature by 10°C the rate of forward reaction at equilibrium is increased by a factor of 2. The rate of backward reaction by this increase in temperature

- (a) increases by a factor greater than two (b) decreases by a factor less than two ..
(c) remains unaffected (d) increases by a factor two

112. The temperature coefficient of the rate of reaction is 2.3. How many times will the rate of reaction increase if the temperature is raised by 25K?

- (a) 4.92 (b) 8.02
(c) 11.82 (d) 5.4

113. A system absorbs 15 kJ of heat and does 5 kJ of work. The internal energy change is
- (a) 20 kJ (b) 10 kJ
(c) 5 kJ (d) -10 kJ
114. Which of the following are the units of work?
- (a) kg ms^{-1} (b) $\text{kg m}^2\text{s}^{-2}$
(c) $\text{kgm}^2\text{s}^{-1}$ (d) Latm
115. According to Kirchoff's equation which factor affects the heat of reaction?
- (a) Pressure (b) Temperature
(c) Volume (d) Molecularity
116. A substance which does not have a sharp melting point is
- (a) KCl (b) glass
(c) ice (d) diamond
117. The maximum efficiency of a steam engine operating between 100°C and 25°C is
- (a) 20% (b) 22.2%
(c) 25% (d) 30%
118. The heat change at constant volume q_v is equal to
- (a) ΔG (b) RT
(c) ΔU (d) ΔH
119. If the rate constant K of a reaction is $1.6 \times 10^{-3} (\text{mol/L})\text{min}^{-1}$ the order of the reaction is
- (a) zero (b) one
(c) two (d) three
120. The third law of thermodynamics states that in the limit $T \rightarrow 0$
- (a) $G = 0$ (b) $H = 0$
(c) $U = 0$ (d) $S = 0$
121. The effect of increasing pressure on the following equilibrium $\text{H}_2\text{O}_{(s)} \rightleftharpoons \text{H}_2\text{O}_{(l)}$ will cause
- (a) the equilibrium to shift in forward direction
(b) the equilibrium to shift in backward direction
(c) no effect on equilibrium
(d) none of these
122. For which of the following reaction $\Delta H = \Delta U$

- (a) $C + O_2 \rightarrow CO_2$ (b) $C + \frac{1}{2}O_2 \rightarrow CO$
(c) $N_2 + O_2 \rightarrow 2NO$ (d) $N_2O_4 + \frac{1}{2}O_2 \rightarrow N_2O_5$

123. The free energy change (ΔG) of a given process is -85.77 kJ at 25°C and -83.68 kJ at 35°C. The change in enthalpy (ΔH) for the process at 30°C is

- (a) -248 kJ (b) +126 kJ
(c) -148 kJ (d) +248 kJ

124. When equal number of cations and anions are missing from their lattice sites the defect is called

- (a) Frenkel defect (b) Schottky defect
(c) Impurity defect (d) Non-stoichiometric defect

125. In a first order reaction $A \rightarrow B$ if k is rate constant and initial concentration of the reactant A is 0.5 M then the half life is

- (a) $\frac{\ln 2}{k}$ (b) $\frac{0.693}{0.5k}$
(c) $\frac{\log 2}{k}$ (d) $\frac{\log 2}{k\sqrt{0.5}}$

126. How many kinds of space lattices are possible in a crystal?

- (a) 23 (b) 7
(c) 230 (d) 14

127. Due to Frenkel defect, the density of the ionic solids

- (a) increases (b) decreases
(c) does not change (d) changes

128. Covalent character is maximum in

- (a) NaF (b) Na_2O
(c) Na_3N (d) all have equal covalent character

129. Lanthanide contraction is due to increase in

- (a) shielding by 4f electrons (b) effective nuclear charge
(c) atomic number (d) size of 4f-orbital

130. For a first order reaction what fraction of a reactant remains after 40 minutes, if $t_{1/2}$ is 20 minutes?

- (a) $\frac{1}{4}$ (b) $\frac{1}{2}$
(c) $\frac{1}{8}$ (d) $\frac{1}{6}$

131. If $\Delta_0 < P$ the correct electronic configuration for d^4 system will be

- (a) $t_{2g}^4 e_g^0$ (b) $t_{2g}^3 e_g^1$
 (c) $t_{2g}^0 e_g^4$ (d) $t_{2g}^2 e_g^2$

132. The active mass of a solid in heterogeneous equilibrium is taken as

- (a) zero (b) unity
 (c) very large (d) very small

133. For the reaction $2\text{NH}_{3(g)} \rightleftharpoons \text{N}_{2(g)} + 3\text{H}_{2(g)}$ the units of K_p will be

- (a) atm (b) $(\text{atm})^3$
 (c) $(\text{atm})^{-2}$ (d) $(\text{atm})^2$

134. The relation between K_p and K_c for the reaction $2\text{NO}_{(g)} + \text{Cl}_{2(g)} \rightarrow 2\text{NOCl}_{(g)}$ is

- (a) $K_p = K_c$ (b) $K_p = K_c (RT)$
 (c) $K_p = \frac{K_c}{RT}$ (d) $K_p = \frac{K_c}{(RT)^2}$

135. For the reaction $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightarrow 2\text{SO}_{3(g)}$ the entropy

- (a) increases (b) decreases
 (c) remains unchanged (d) none of these

136. Which of the following has Frenkel defect?

- (a) sodium chloride (b) graphite
 (c) diamond (d) silver bromide

137. Bragg's law is given by

- (a) $n\lambda = 2\theta \sin \theta$ (b) $n\lambda = 2d \sin \theta$
 (c) $2n\lambda = d \sin \theta$ (d) $n\lambda = \frac{1}{2} d \sin \theta$

138. Which of the following has the highest percentage of ionic character in its bonding?

- (a) LiI (b) MgCl_2
 (c) CsF (d) CsI

139. Which of the following does not obey 18-electron rule?

- (a) $\text{Cr}(\text{CO})_6$ (b) $\text{Mn}(\text{CO})_{10}$
 (c) $\text{Fe}(\text{CO})_5$ (d) $\text{V}(\text{CO})_6$

140. The expected spin-only magnetic moments (B.M.) for $[\text{Fe}(\text{CN})_6]^{4-}$ and $[\text{FeF}_6]^{3-}$ respectively are
(a) 1.73 and 1.73 (b) 1.73 and 5.92
(c) 0 and 1.73 (d) 0 and 5.92
141. The correct order of increasing C-O bond length of CO, CO_3^{2-} and CO_2 is
(a) $\text{CO}_3^{2-} < \text{CO}_2 < \text{CO}$ (b) $\text{CO}_2 < \text{CO}_3^{2-} < \text{CO}$
(c) $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$ (d) $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$
142. In terms of polar character which one of the following order is correct?
(a) $\text{NH}_3 < \text{H}_2\text{O} < \text{HF} < \text{H}_2\text{S}$ (b) $\text{H}_2\text{S} < \text{NH}_3 < \text{H}_2\text{O} < \text{HF}$
(c) $\text{H}_2\text{O} < \text{NH}_3 < \text{H}_2\text{S} < \text{HF}$ (d) $\text{HF} < \text{H}_2\text{O} < \text{NH}_3 < \text{H}_2\text{S}$
143. Which of the following diatomic molecules would be stabilised by the removal of an electron?
(a) C_2 (b) CN
(c) N_2 (d) O_2
144. Identify the reaction which is not affected by increase in pressure.
(a) $\text{N}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{NO}_{(g)}$ (b) $2\text{SO}_{2(g)} + \text{O}_{2(g)} \rightleftharpoons 2\text{SO}_{3(g)}$
(c) $\text{PCl}_{5(g)} \rightleftharpoons \text{PCl}_{3(g)} + \text{Cl}_{2(g)}$ (d) $\text{N}_{2(g)} + 3\text{H}_{2(g)} \rightleftharpoons 2\text{NH}_{3(g)}$
145. Across the lanthanide series the basicity of the lanthanide hydroxides
(a) increases (b) decreases
(c) first increases and then decreases (d) first decreases and then increases
146. The co-ordination number of platinum in the complex $[\text{Pt}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}_2$ is
(a) 2 (b) 4
(c) 6 (d) 8
147. Which of the following has highest polarising power?
(a) Na^+ (b) K^+
(c) Mg^{2+} (d) Al^{3+}
148. In case of ethyne the bonds between two carbon atoms are
(a) 1 s (b) 1 s and 1 p
(c) 1 s and 2 p (d) 1 s and 3 p
149. Two elements have electronegativities 1.2 and 3.0. Bond between them would be
(a) ionic (b) polar covalent
(c) co-ordinate (d) metallic

150. Which of the following represents correct relationship of bond length?

- (a) $N_2^+ < N_2$ while $NO^+ < NO$ (b) $N_2^+ < N_2$ while $NO < NO^+$
- (c) $N_2 < N_2^+$ while $NO^+ < NO$ (d) $N_2 < N_2^+$ while $NO < NO^+$

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