1. The photon of wavelength 400 nm corresponds to

(a) 15,000 cm^{-1} (b) 20,000 cm^{-1}

(c) 25,000 cm^{-1} (d) 40,000 cm^{-1}

2. A monochromatic radiation is incident on a solution of 0.05 molar concentration of an absorbing substance. The intensity of the radiation is reduced to one-fourth of the initial value after passing through 10 cm length of the solution. What is the molar extinction coefficient of the substance?

(a) 3.2 $dm^3\ mol^{-1}cm^{-1}$ (b) 2.5 $dm^3\ mol^{-1}cm^{-1}$

(c) 1.2 $dm^3\ mol^{-1}cm^{-1}$ (d) 0.5 $dm^3\ mol^{-1}cm^{-1}$

3. "It is only the absorbed light radiations that are effective in producing a chemical reaction." This is the statement of

(a) Beer-Lamber law (b) Stark-Einstein law

(c) Jablonski diagram (d) Grothus-Draper law

4. If two operators commute, then

(a) they are linear (b) they are Hermitian

(c) they have same eigen functions (d) they have same eigen values

5. The average distance of an electron from the nucleus in the ground state of hydrogen atom (in units of Bohr radius, a_0) is

(a) 1 (b) 2

(c) 3/2 (d) $\pi/2$

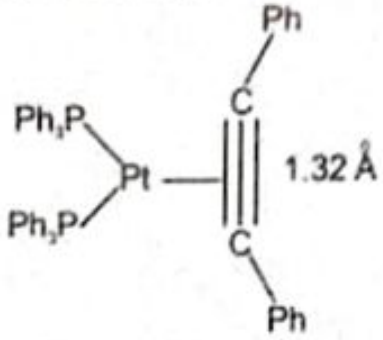
P.T.O.

6. If the azimuthal quantam number of an atom is 2, the magnetic quantum numbers can have values

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

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

7. With respect to σ and π bonding in Pt-Hl in the structure given below, which of the following represent the correct bonding:



(a) $M(\sigma) -> L(\sigma)$ and $M(\pi) -> L(\pi^*)$

(b) $L(\sigma) -> M(\pi)$ and $L(\pi) -> M(\pi)$

(c) $L(\pi) -> M(\pi)$ and $L(\sigma) -> M(\pi)$

(d) $l.(\pi) -> M(\sigma)$ and $M(\pi) -> l(\pi^*)$

8. Water plays significant role in the following reactions

The correct role of water in each reaction is

(i) $2H_2O + Ca \rightarrow Ca^{2+} + 2OH + H_2$

(ii) $nH_2O + Cl \rightarrow [Cl(H_2O)_n]$

(iii) $6H_2O + Mg^{2+} \rightarrow [Mg(H_2O)_6]^{2-}$

(iv) $2H_2O + 2F_2 \rightarrow 4HF + O_2$

(a) i. oxidant, ii. acid, iii. base, iv, reducdant

(b) i. oxidant, ii, base, iii. acid, iv. reducdant

(c) i. acid, ii, oxidant, iii. reductant, iv. base

(d) Both A and C

14. In qualitative inorganic analysis of metal ions, the ion which precipitates as sulfide in the presence of H_2S in warm dilute HCl is:

(a) Cr^{3+} (b) Al^{3+}

(c) Co^{2+} (d) Bi^{3+}

15. The correct statement regarding the observed magnetic properties of NO, O_2, B_2 and C_2 in their ground state is

(a) B_2, O_2 and NO are paramagnetic

(b) NO, B_2 and C_2 are paragmagnetic

(c) O_2, C_2 and NO are paragmagnetic

(d) O_2, B_2 and C_2 are paragmagnetic

16. Among the following, the correct statement is:

(a) The density follows the orcer Cs > Rb> Li > Na.

(b) The solubility in water follows the order,

$Cs_2CO_3 > K_2CO_3 > Na_2CO_3 > Li_2CO_3$

(c) The first ionization potential follows the order Li > K > Na >Cs.

(d) The melting point follows the order, $MgCl_2 > BeCl_2 > CaCl_2 > SrCl_2$

17. Low-spin iron (III) center is present in

(a) deoxy form of hemoglobin (b) oxy form of hemoglobin

(c) hemocyanin (d) carbonic anhydrase

31. Which of the following is not a thermodynamic function?

(a) Enthalpy (b) Work done

(c) Gibb's energy (d) Internal energy

32. A carnot engine operating between temperatures T_1 and T_2, has the efficiency of 0.4. When T_2 is lowered by 40 K, its efficiency increases to 0.5, then T_1 and T_2 are respectively

(a) 300 K and 100 K (b) 400 K and 200 K

(c) 600 K and 400 K (d) 400 K and 300 K

33. The bond energy of an O-H bond is 109 kcal/mol. When a mole of water is formed, then

(a) 109 kcal is released (b) 218 kcal is released

(c) 109 kcal is absorbed (d) 218 kcal is absorbed

34. Enthalpy is equal to

(a) $T^2\left[\frac{\partial(G/T)}{\partial T}\right]_P$ (b) $-T^2\left[\frac{\partial(G/T)}{\partial T}\right]_P$

(c) $T^2\left[\frac{\partial(G/T)}{\partial T}\right]_V$ (d) $-T^2\left[\frac{\partial(G/T)}{\partial T}\right]_V$

50. From the following E^0 values of half cells,

(i) $A + \bar{e} \rightarrow A^-$; $E^0 = -0.24V$

(ii) $B^- + \bar{e} \rightarrow B^{2-}$ $E^0 = +1.25\ V$

(iii) $C^- + 2\bar{e} \rightarrow C^{3-}$; $E^0 = -1.25\ V$

(iv) $D + 2\bar{e} \rightarrow D^{2-}$; $E^0 = +0.68\ V$

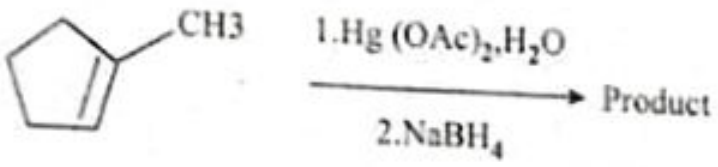
What combination of two half cells would result in a cell with the largest potential?

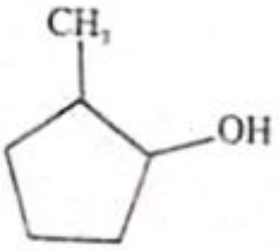
(a) (ii) and (iii)

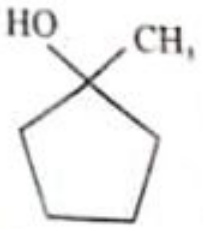
(b) (ii) and (iv)

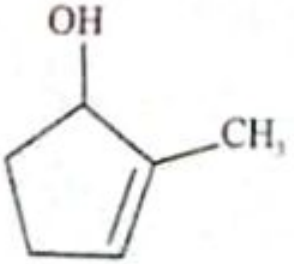
(c) (i) and (iii)

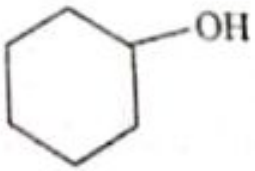
(d) (i) and (iv)

51. 

(a) 

(b) 

(c) 

(d) 

35. According to Le Chatelier's principle, maximum maximum yield of NH_3 is obtained at

(a) High pressure
(b) High temperature and low pressure
(c) Low temperature
(d) Low temperature and high pressure

36. Equimolar concentrations of H_2 and I_2 are heated at equilibrium in a 2 liter flask. At equilibrium, the forward and backward rate constants are found to be equal. What percentage of initial concentration of H_2 has reacted at equilibrium

(a) 33%
(b) 66%
(c) 50%
(d) 40%

37. What is the conjugate base of OH^-

(a) O_2
(b) H_2O
(c) O^-
(d) O^{2-}

38. The K_{SP} of $Mg(OH)_2$ is 1×10^{-12} and , 0.01 M Mg^{2+} will precipitate at the limiting pH of:

(a) 3
(b) 9
(c) 5
(d) 8

39. Which one of the following is the correct quadratic form of Ostwald's dilution law equation?

(a) $a^2C + aK - K = 0$
(b) $a^2C - aK - K = 0$
(c) $a^2C - aK + K = 0$
(d) $a^2C + aK + K = 0$

P.T.O.

44. In the steady state approximation, if **I** is the intermediate formed, then

(a) $[\mathbf{I}] = 0$ (b) $[\mathbf{I}] \neq 0$

(c) $d[\mathbf{I}]/dt = 0$ (d) none of these

45. For an ideal gas $\mu_{J.T.}$ is

(a) zero (b) positive

(c) negative (d) infinity

46. The maximum efficiency of a steam engine operating between 100° C and 25° C is

(a) 20% (b) 22.2%

(c) 24.8% (d) 25.1%

47. The ΔH for a reaction is independent of

(a) Temperature (b) path followed

(c) initial and final states (d) volume

48. Which of the following *KCl* solutions has the lowest value of equivalent conductance?

(a) 1 M (b) 0.1 M

(c) 0.01 M (d) 0.001 M

49. At infinite dilution, the equivalent conductances of CH_3COONa, HCl and CH_3COOH are 91, 426 and 391 mho cm2 respectively at 25° C. The equivalent conductance of NaCl at infinite dilution will be .

(a) 209 (b) 391

(c) 126 (d) 908

21. Consider the following four xenon compounds: XeF_2, XeF_4, XeF_6 and XeO_3. The pair of xenon compounds expected to have non-zero dipole moment is

(a) XeF_4 and XeF_6 (b) XeF_2 and XeF_4

(c) XeF_2 and XeO_3 (d) XeF_6 and XeO_3

22. Consider the following six solid binary oxides: CaO, Al_2O_3, PbO, Cs_2O, SiO_2 and Sb_2O_3. The pair(s) of ionic oxides is(are)

(a) CaO and Al_2O_3 (b) CaO and PbO

(c) PbO and Al_2O_3 (d) SiO_2 and Sb_2O_3

23. On hydrolysis, aluminium carbide produces

(a) CH_4 (b) C_2H_6

(c) C_2H_4 (d) C_2H_2

24. The predicted geometry of TeF_4 by VSEPR is

(a) Octahedral (b) Square planar

(c) Trigonal bypyramid (d) Tatrahedral

25. The metal ion in enzyme involved in the hydration of CO_2 is:

(a) Mg (II) (b) Zn (II)

(c) Fe (II) (d) Cu (II)

26. Assuming NaCl to be completely ionized, the freezing point of 1 molal aqueous solution $\left(K_f = 1.86 \text{ kg°C mol}^{-1}\right)$ is

(a) −1.86 °C (b) −3.27 °C

(c) +1.86 °C (d) +3.27 °C

27. How much Cu metal is produced at the cathode during the electrolysis of aqueous $CuSO_4$ solution if a current of 0.10 A passes through the solution for 20 min?

(a) 6.2×10^{-4} moles (b) 1.0×10^{-5} moles

(c) 1.2×10^{-3} moles (d) 3.27×10^{-5} moles

28. Which of the following statements is incorrect?

(a) In a galvanic cell, the passage of a current through an electrolyte drives a redox reaction.

(b) Copper can be purified using an electrolytic cell.

(c) An external power supply is needed in an electrolytic cell.

(d) In a Daniell cell, a difference in electrical potentials of the two half-cells results in a flow of electrons between the half-cells.

29. $E^{\circ}\left(Ag^{+}/Ag\right)=+0.80\text{V}$. What is the value of E (at 298 K) when the concentration of the Ag^{+} ions is 0.0150 mol dm^{-3}?

(a) +0.75 V (b) +0.85 V

(c) +0.69 V (d) +0.91 V

30. Two moles of an ideal gas at 27 °C is expanded reversibly from 2 L to 20 L. Find entropy change (R=2 cal/mol K)

(a) 92.1 (b) 0

(c) 4 (d) 9.2

56. Which one of the following base is not present in RNA?

(a) Adenine (b) Cytosine

(c) Thymine (d) Uracil

57. Which of the vitamins given below is water soluble?

(a) Vitamin C (b) Vitamin D

(c) Vitamin E (d) Vitamin K

58. 1-Bromo-3 chlorocyclobutane will react with Na in ether producing?

(a) 

(b) 

(c) 

(d) 

59. But-1-ene can be converted to butane by reaction with:

(a) Zn-HCl (b) Zn-Hg

(c) Pd/H_2 (d) Sn-HCl

60. Which of the following compounds on hydrolysis gives acetylene?

(a) CaC_2 (b) Mg_2C_3

(c) Al_4C_3 (d) Cu_2Cl_2

84. The NMR spectra of the functional isomers of the molecular formula C_3H_6O show _____ and _____ signals respectively.

(a) 1, 2 (b) 1, 3

(c) 1, 4 (d) 1, 5

85. Methanol fuel cells are

(a) Stable at all conditions (b) Unstable at all conditions

(c) Stable at some conditions (d) Unstable at some conditions

86. Based on tacticity, the polymers are divided into.

(a) Two (b) Three

(c) Four (d) Five

87. Combination of the organic and inorganic polymers are called

(a) Element organic polymers (b) Inorganic polymers

(c) Fibres (d) Thermoplastic

88. Initiators are known to be:

(a) Stable compounds (b) Unstable compounds

(c) Partially stable compounds (d) Highly stable compounds

89. The catalyst used in the co-ordination polymerisation is_____.

(a) Ziegler-natta catalyst (b) Vanadium pent-oxid

(c) Nitric Oxide (d) Zeonar

90. Number of NMR signals obtained in CH_3COCH_3 will be

(a) 6 (b) 3

(c) 2 (d) 1

40. Following is wrong about a phase diagram.

(a) It gives information on transformation rates.

(b) Relative amount of different phases can be found under given equilibrium conditions.

(c) It indicates the temperature at which different phases start to melt.

(d) Solid solubility limits are depicted by it.

41. Which if the following statements are true about the Eutectic point on a two component (compounds A and B) phase diagram?

(a) Both compounds are solid.

(b) The melting point of the mixture is lower than the melting points of either of the individual compounds.

(c) One compound is in the liquid phase whilst the other is in the solid phase

(d) None of the above

42. The $t_{1/2}$ of a reaction is doubled as the initial concentration of the reactant is doubled. The order of the reaction is

(a) 0 (b) 1

(c) 2 (d) 1.5

43. Choose the correct statement

(a) The rate constant of a reaction decreases with temperature

(b) Order is always equal to molecularity of reaction

(c) The unit of second-order rate constant is $mol\,dm^{-3}s^{-1}$

(d) The $t_{1/2}$ of a first-order reaction is independent of the initial concentration

78. 0.1 g of metal combines with of oxygen at STP. The equivalent weight of metal is

(a) 12 (b) 24

(c) 18 (d) 36

79. Which of the following is less acidic among the given halogen compounds?

(a) $CHCl_3$ (b) CHI_3

(c) $CHBr_3$ (d) CHF_3

80. Calcium carbide reacts with heavy water to form

(a) C_2D_2 (b) CaD_2

(c) CaD_2O (d) CD_2

81. In the extraction of Ag, Zn is removed from the alloy of Zn-Ag through

(a) Cupellation (b) Fractional crystallization

(c) Distillation (d) Electrolytic refining

82. The transition zone for Raman spectra is

(a) Between vibrational and rotational levels

(b) Between electronic levels

(c) Between magnetic levels of nuclei

(d) Between magnetic levels of unpaired electrons

83. The bio diesel is the long chain of carbon atoms contains _____ group at one end.

(a) Alcohol (b) Aldehyde

(c) Ketone (d) Ester

P.T.O.

Which of the following compound is not aromatic?

(I)

(II)

(III)

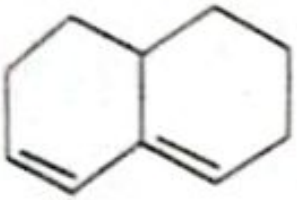
(a) Only I

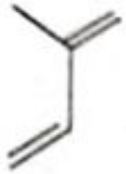
(b) Only II

(c) Only III

(d) None

Which of the following diene does not participate in Diels-Alder reaction?

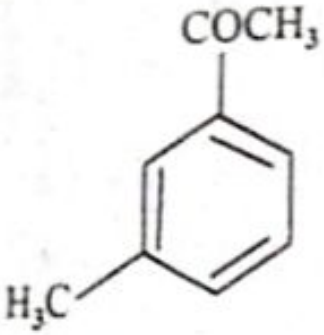
(a) 

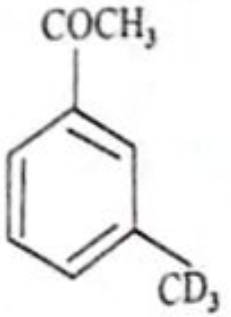
(b) 

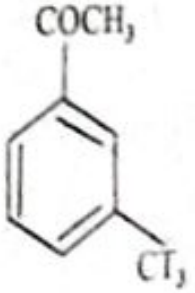
(c) 

(d) 

Correct order of carbonyl IR-stretching frequency for the following compounds is:

(I) 

(II) 

(III) 

(a) I > II > III

(b) III > II > I

(c) III > I > II

(d) II > I > III

How many ^{1}H and ^{13}C-NMR = signals will be observed for anthracene molecules?

(a) 3 and 3

(b) 3 and 4

(c) 5 and 4

(d) 4 and 4

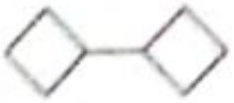
P.T.O.

97. Which one of the compound is not isomer of others?

(a) 

(b) 

(c) 

(d) 

98. The most acidic compound among the following is:

(a) 

(b) 

(c) 

(d) 

99. Which of the following is a natural fibre?

(a) Starch

(b) Rubber

(c) Cellulose

(d) Optical resolution

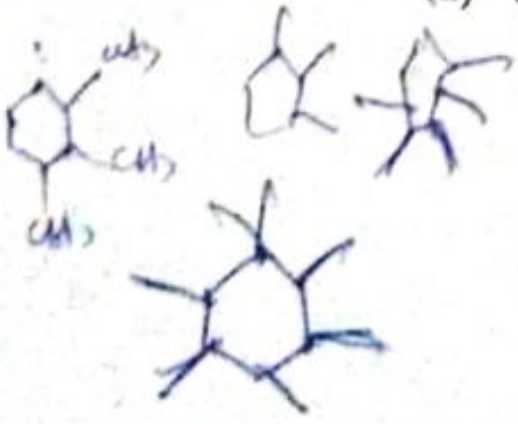
100. Total number of position isomers of trimethyl cyclohexane are:

(a) 5

(b) 6

(c) 7

(d) 8



91. Which of the region of IR spectra appears between (1400-600) cm^{-1}?

(a) Functional group region (b) Fingerprint region

(c) Low-frequency region (d) None of the mentioned

92. Which one of the following is the best heat and corrosion resistant material?

(a) Metals (b) Ceramics

(c) Polymers (d) Semi-conductors

93. Based on the important category, concrete and fibre glass are the example of

(a) Ceramics (b) Polymers

(c) Composites (d) Semi-conductors

94. Portland cement is made by calcining at temperature equals to

(a) 3000°C (b) 1500°C

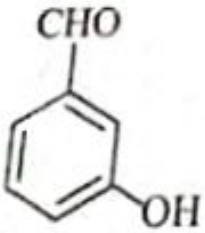
(c) 1800°C (d) 2000°C

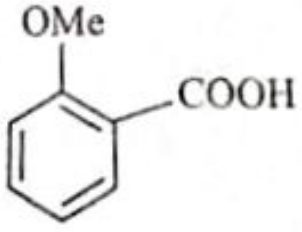
95. One letter code for 'Arginine' amino acid is:

(a) N (b) K

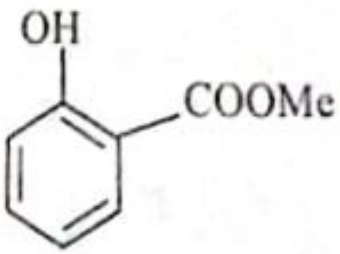
(c) R (d) A

96. Which of the following compound is known as oil of winter green?

(a) 

(b) 

(c) 

(d) 

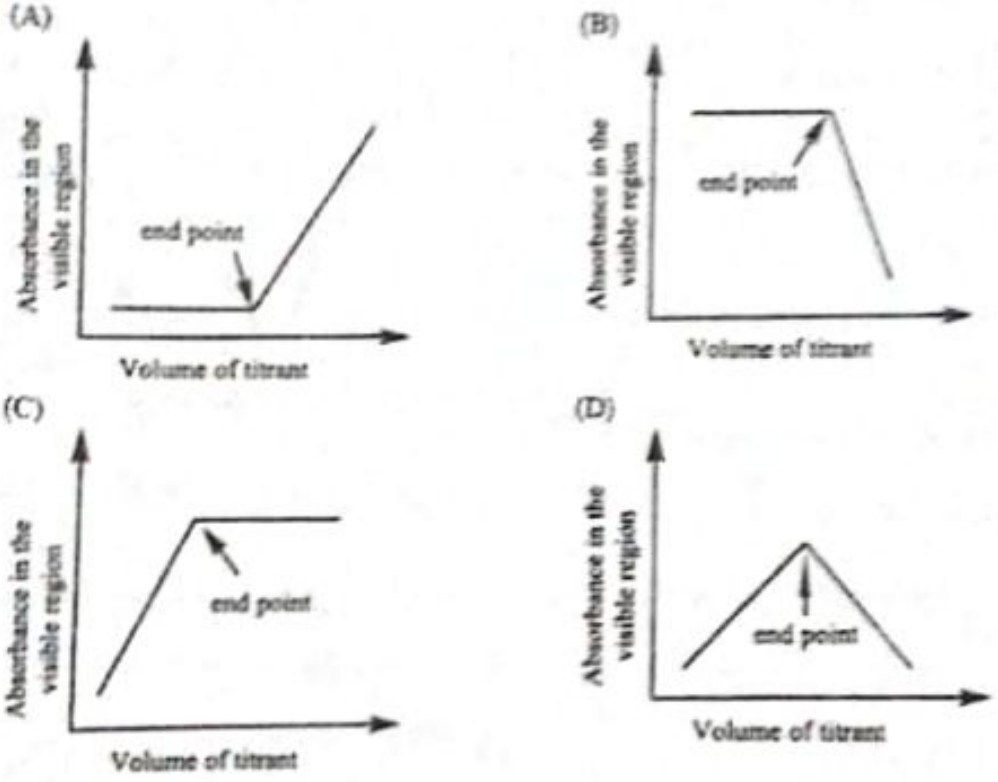
P.T.O.

18. Given that the crystal field stabilization energy for $\left[Co(H_2O)_6\right]^{2+}$ is 7360 cm^{-1} the calculated value of Δ_0 in kJ mol^{-1}

(a) Between 109-111 (b) Between 120-121

(c) Between 50-60 (d) Between 48-32

19. Which plot represents a spectrophotometric titration, where the titrant alone absorbs light in the visible region?

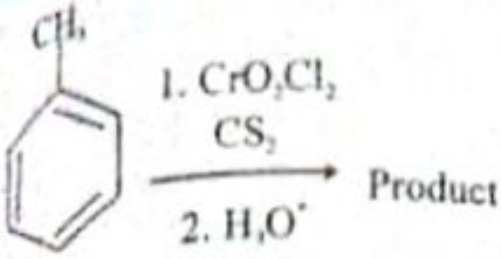


20. NaF, KF, MgO and Cao are crystalline solids. They have NaCl structure. Their lattice energies vary in the order

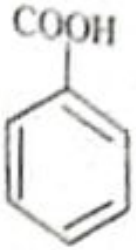
(a) NaF<KF <MgO<CaO (b) KF <NaF<CaO<MgO

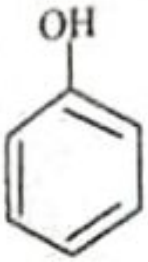
(c) MgO<CaO,NaF<KF (d) CaO<MgO<KF<NaF

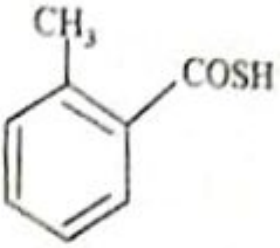
P.T.O.



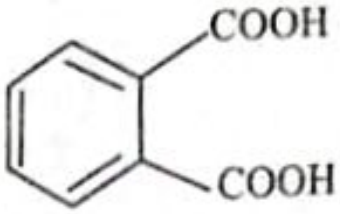
(a) 

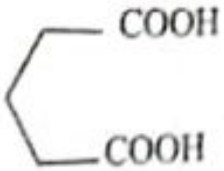
(b) 

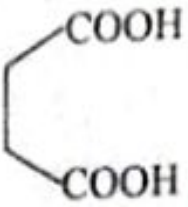
(c) 

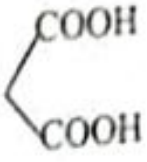
(d) 

62. Which of the following compound will not give cyclic compound on heating?

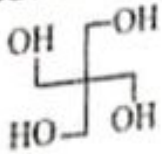
(a) 

(b) 

(c) 

(d) 

63. Total number of aldol reactions involved in the following transformation is:

$CH_3CHO + HCHO \xrightarrow{\text{conc. aq NaOH}}$ 

(a) 1

(b) 2

(c) 3

(d) 4

P.T.O.

9. The molecular orbital of a diatomic molecule changes sign when rotated by 180° around the molecular axis. The molecular orbital is:

(a) σ (b) π

(c) δ (d) φ

10. The compound that exhibits sharp bands at 3300 cm^{-1} and 2150 cm^{-1} is

(a) 1-butyene (b) 2-butyene

(c) Butyronitirile (d) Buty l amine

11. Correct trend in the bond order is

(a) $O_2^+ > O_2^2 > O_2^-$ (b) $O_2^- > O_2^+ > O_2^{2-}$

(c) $O_2^{2-} > O_2^- O_2 +$ (d) $O_2^+ > O_2^- > O_2^{2-}$

12. The correct order of wavelength $(\lambda \max)$ of the halide to metal charge-transfer ban;d of $\left[Co(NH_3)_5 Cl\right]^{2+}$ (I), $\left[Co(NH_3)_5 Br\right]^{2+}$ (II) and $\left[Co(NH_3)_5 I\right]^{2+}$ (III), is

(a) III < II < I (b) I < II < III

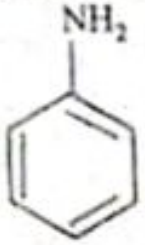
(c) II < III < I (d) I < III < II

13. The total number of degrees of freedom of an HBr molecule that is constrained to translate along a straight line but does not have any constraints for its rotation and vibration is

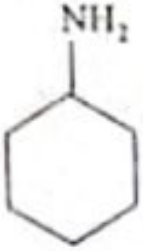
(a) 6 (b) 5

(c) 4 (d) 3

73. Arrange the following in increasing order of pKa value?

(I) 

(II) 

(III) 

(a) I > II > III

(b) III > II > I

(c) III > I > II

(d) II > I > III

74. The carboxyl functional group (-COOH) is present in:

(a) Ascorbic acid

(b) Squaric acid

(c) Barbituric acid

(d) None of these

75. Arrange the following in decreasing order of percentage enol content.

(I) 

(II) 

(III) 

(IV) CH_3CO_2Et

(a) I > IV > II > III

(b) III > II > I > IV

(c) IV > III > I > II

(d) I > II > III > IV

76. The electronic transitions responsible for the volour of K2Cr2O7 is

(a) $\pi \rightarrow \pi^*$

(b) $\sigma \rightarrow \pi$

(c) $\sigma \rightarrow \sigma$

(d) $d \rightarrow d$

77. Iron obtained from chalcopyrite is

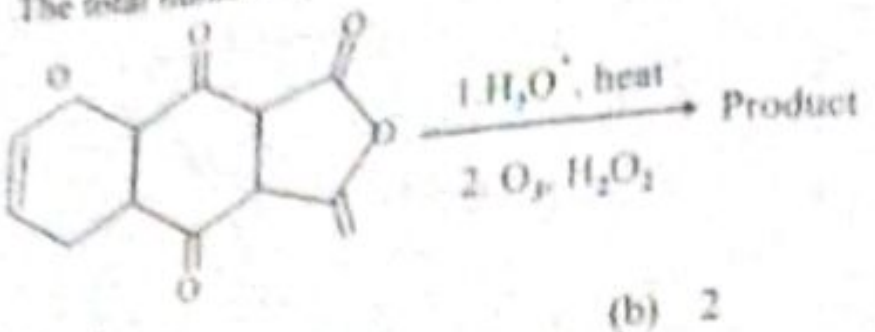
(a) $FeSiO_3$

(b) FeO

(c) Fe_2O_3

(d) FeS

64. The total number of carboxylic acid groups in the product is:



(a) 1 (b) 2

(c) 3 (d) 4

65. The main constituents of cell membranes are:

(a) Simple triglycerides (b) Waxes

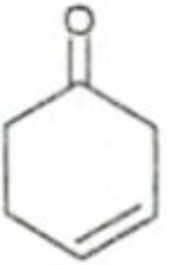
(c) Proteins (d) Phospholipids

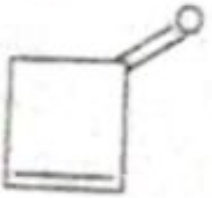
66. Which compound has the highest melting point?

(a) p-Dibromobenzene (b) o-Dibromobenzene

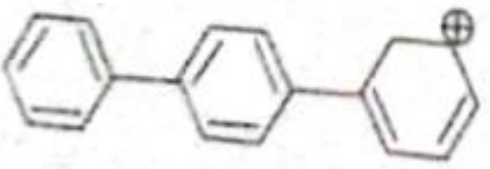
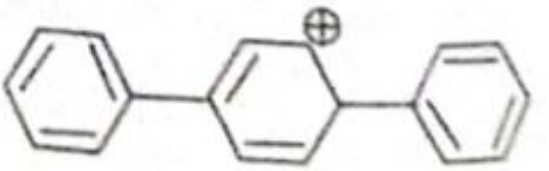
(c) m-Dibromobenzene (d) Bromobenzene

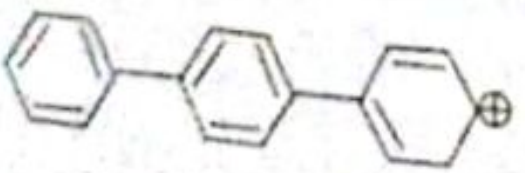
67. Which of the following has maximum dipole moment?

(a)  (b) 

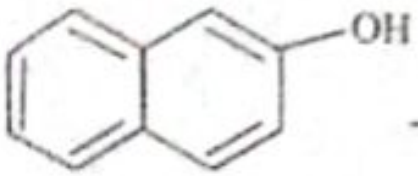
(c)  (d) 

68. The most stable carbocation is:

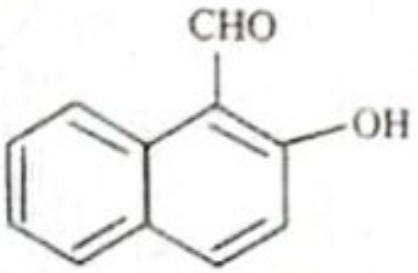
(a)  (b) 

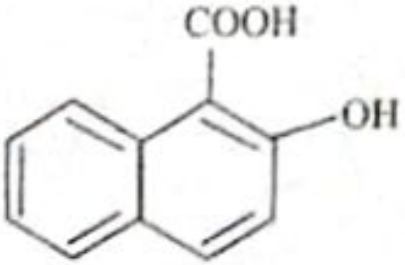
(c) 

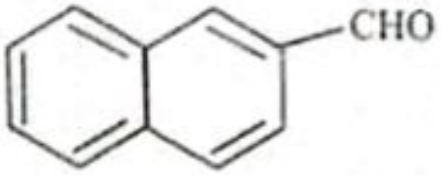
(d) All have same stability

52. 

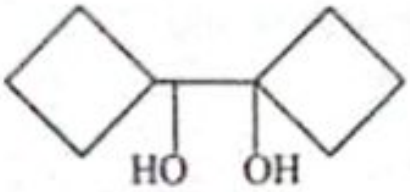
$\xrightarrow[KOH]{CHCl_3}$ Product

(a) 

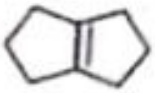
(b) 

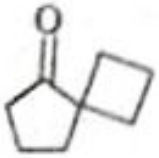
(c) 

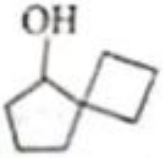
(d) None of these

53. 

$\xrightarrow[3.\ H^+]{1.\ H^+ \quad 2.\ NaBH_4}$ Product

(a) 

(b) 

(c) 

(d) 

54. Cellulose on hydrolysis yields

(a) β-D-Fructose (b) β-D-Glucose

(c) α-D-Glucose (d) α-D-Fructose

55. Which of the following amino acids is not optically active?

(a) Glycine (b) Alanine

(c) Cysteine (d) Phenylalanine

P.T.O.