SET – D

1. If one-third of HI decomposes at a particular temperature, K_c for $2HI \rightleftarrows H_2 + I_2$ is
   (A) 1/16
   (B) 1/4
   (C) 1/6
   (D) ½

2. The equilibrium constants for the reaction $Br_2 \rightleftarrows 2Br$ at 500 K and 700 K are 1×10^{-10} and 1×10^{-5} respectively. The reaction is
   (A) endothermic
   (B) exothermic
   (C) fast
   (D) slow

3. The pH of the solution containing 0.1 N HCl and 0.1 N CH_3COOH is
   (A) 0.7
   (B) 1
   (C) 1.3
   (D) 2

4. The process of hydrolysis is
   (A) always exothermic
   (B) always endothermic
   (C) either exothermic or endothermic
   (D) neither exothermic nor endothermic

5. If a solution has a pOH value of 14 at 25^0 C, H^+ concentration should be
   (A) 0
   (B) 10
   (C) 1
   (D) none

6. The vapour pressure of water at 95^0 C is found to be 634 mm. The heat of vaporization is 40593 J mol^{-1}. What would be the vapour pressure at a temperature of 100^0 C?
   (A) 500 mm
   (B) 670 mm
   (C) 700 mm
   (D) 760 mm

7. What is the number of components, number of phases and the degrees of freedom for the system $Na_2SO_4.\ 10H_2O\ (s) \rightleftarrows Na_2SO_4\ (s) + 10\ H_2O\ (g)$
   (A) 2, 3, 0
   (B) 2, 1, 3
   (C) 1, 1, 2
   (D) 2, 3, 1

8. According to the Gibbs phase rule
   (A) $F = P - C + 2$
   (B) $F = C - P + 2$
   (C) $P = F - C + 2$
   (D) $P = F - C + 1$

9. Which of the following represents the order of the extent of intensity of scattering of X-rays from the ions Na^+, Li^+, Cl^-, Br^-:
(A) $Na^+ < Li^+ < Br^- < Cl^-$
(B) $Br^- < Cl^- < Na^+ < Li^+$
(C) $Li^+ < Na^+ < Cl^- < Br^-$
(D) $Li^+ < Cl^- < Na^+ < Br^-$

10. Which of the following transitions is the highest energy transition?
(A) n to π
(B) n to π^*
(C) σ to σ^*
(D) σ to π^*

11. How many microstates are possible for a d^2 configuration, including both weak and strong field limits?
(A) $BeCl_2$
(B) $MgCl_2$
(C) $CaCl_2$
(D) $SrCl_2$

12. Myoglobin is found in
(A) Brain
(B) Heart and skeletal muscles
(C) Kidney
(D) Liver

13. Which of the following is a π-donor ligand?
(A) NH_3
(B) Cl^-
(C) CO
(D) PF_3

14. For which of the following configurations for an octahedral, first row d-block metal ion do you expect there to be an orbital contribution to the magnetic moment?
(A) t_{2g}^2
(B) t_{2g}^3
(C) $t_{2g}^6 e_g^1$
(D) $t_{2g}^4 e_g^2$

15. A chemical A is used for the preparation of washing soda to recover ammonia. When CO_2 is bubbled through an aqueous solution of A, the solution turns milky. It is used in white washing due to disinfectant nature. What is the chemical formula of A?
(A) $Ca(HCO_3)_2$
(B) CaO
(C) $CaCO_3$
(D) $Ca(OH)_2$

16. The CFSE for a high-spin d4 octahedral complex is:
(A) $-1.2\Delta_{oct}$
(B) $-0.4\Delta_{oct}$
(C) $-0.6\Delta_{oct}$
(D) $-1.2\Delta_{oct}$

17. Which of the following are the correct reasons for anomalous behaviour of lithium?
(A) Weak polarizing power
(B) Its high polarising power
(C) It has high degree of intercalation
(D) Exceptionally low ionisation enthalpy

18. All naturally occurring alpha - amino acids except glycine are optically active because
(A) They have have L-configuration
(B) They have have D-configuration
(C) Both A and B
(D) None of the above

19. When 1 mol $CrCl_3 \cdot 6H_2O$ is treated with excess of $AgNO_3$, 3 mol of AgCl are obtained. The formula of the complex is:
(A) $[CrCl_3 (H_2O)_3] \cdot 3H_2O$
(B) $[CrCl_2(H_2O)_4]Cl \cdot 2H_2O$
(C) $[CrCl(H_2O)_5]Cl_2 \cdot H_2O$
(D) $[Cr(H_2O)_6]Cl_3$

20. Indicate the complex ion which shows geometrical isomerism.
(A) $[Cr(H_2O)_4Cl_2]^+$
(B) $[Pt(NH_3)_3Cl]$
(C) $[Co(NH_3)_6]^{3+}$
(D) $[Co(CN)_5(NC)]^{3-}$

21. An aqueous pink solution of cobalt(II) chloride changes to deep blue on addition of excess of HCl. This is because_____.
(A) $[Co(H_2O)_6]^{2+}$ is transformed into $[CoCl_6]^{4-}$
(B) $[Co(H_2O)_6]^{2+}$ is transformed into $[CoCl_4]^{2-}$
(C) tetrahedral complexes have smaller crystal field splitting than octahedral complexes.
(D) Both B and C

22. Identify the optically active compounds from the following :
(A) $[Co(en)_3]^{3+}$
(B) *trans*– $[Co(en)_2 Cl_2]^+$
(C) *cis*– $[Co(en)_2 Cl_2]^+$
(D) Both A and C

23. Complexes of MX_6 and MX_5L type (X and L are unidentate) do not show geometrical isomerism because:
(A) Geometrical isomerism is not shown by complexes ofcoordination number 6
(B) Geometrical isomerism is not shown by complexes of coordination number 5
(C) Geometrical isomerism is not shown by complexes of coordination number 4
(D) None of the above

24. $([Fe(CN)_6]^{3-}$ ion shows magnetic moment corresponding to two unpaired electrons because:
(A) it has d^2sp^3 type hybridization
(B) it has d^2sp^2 type hybridization
(C) it has $d\,sp^2$ type hybrbridization
(D) none of the above

25. Which of the following actinoids show oxidation states upto +7?
(A) Am
(B) Pu
(C) U
(D) Ti

26. A gas cannot be liquefied if for the gas the temperature is greater than
(A) Critical temperature
(B) Critical pressure
(C) Critical volume
(D) Critical density

27. The unit of vander Walls constant (a) is
(A) mole atm^{-1}
(B) atm $mole^{-1}$
(C) lit^2 atm $mole^{-2}$
(D) atm lit^{-2} $mole^2$

28. If the tetrahedral sites in a ccp array of negative ions (B) were half filled with cations (A), the empirical formula of the compound would be
(A) AB
(B) AB_2
(C) A_2B_3
(D) A_2B

29. Tetragonal crystal system has the following unit cell dimensions
(A) $a = b = c$ and $\alpha = \beta = \gamma = 90°$
(B) $a = b \neq c$ and $\alpha = \beta = \gamma = 90°$
(C) $a \neq b \neq c$ and $\alpha = \beta = \gamma = 90°$
(D) $a = b \neq c$ and $\alpha = \beta = 90°$; $\gamma = 120°$

30. On addition of 1.0 ml of 10% NaCl to 10 ml gold sol in the presence of 0.0250 gm of starch, the coagulation is just stopped. The gold number of starch is
(A) 0.025
(B) 0.25
(C) 2.5
(D) 25

31. The time required to decompose half of the substance for a n^{th} order reaction is given by
(A) a^n
(B) a^{n-1}
(C) a^{n+1}
(D) a^{n-2}

32. The rate for the chemical reaction $2NO_2Cl \rightarrow 2NO_2 + Cl_2$; Rate = $k[NO_2Cl]$. The rate determining step is
(A) $NO_2Cl \rightarrow NO_2 + Cl_2$
(B) $2NO_2Cl \rightarrow 2NO_2 + Cl_2$
(C) $NO_2 + Cl_2 \rightarrow NO_2Cl + Cl$
(D) $NO_2Cl + Cl \rightarrow NO_2 + Cl_2$

33. Glucose or fructose is converted into C_2H_5OH in the presence of
(A) Invertase
(B) Maltase
(C) Zymase
(D) Diastase

34. Which of the following has smallest de-Broglie wavelength?
(A) Electron
(B) Proton
(C) Molecule of SO_2
(D) Molecule of CO_2

35. The radial point of wave function depends on the quantum numbers
(A) n,l
(B) l,m
(C) n only
(D) l only

36. The normalized wave function for a particle in a one dimensional box, with the infinite potential barriers located at x = 0 and x = l, is
(A) $\sqrt{\frac{8}{l^3}} \sin\frac{n\pi x}{l}$
(B) $\sqrt{\frac{2}{l}} \sin\frac{n\pi x}{l}$
(C) $\frac{h^2}{8ml^2}$
(D) $\sqrt{\frac{1}{l}} \sin\frac{n\pi x}{l}$

37. The degeneracy of rotational energy levels is given by
(A) $J(J+1)$
(B) $J(J+2)$
(C) $(J+2)$
(D) $(2J+1)$

38. Which of the corresponding to lower frequency in Raman spectrum
(A) Stokes lines
(B) Stokes lines
(C) Rayleigh line
(D) Rayleigh line

39. For the photochemical synthesis of HCl from H_2 and Cl_2, the value of ϕ is
(A) One
(B) Zero
(C) Extremely high
(D) Extremely low

40. The mechanism

$$Molecule(S_0) \xrightarrow{(h\nu)\,Adsorption} S_1 \xrightarrow{Non-radiative\,(I.S.C)} T_1 \xrightarrow{Radiative} S^0 + h\nu'$$

(Ground singlet)
is of the following phenomenon
(A) Fluorescence
(B) Phosphorescence
(C) Chemiluminesence
(D) Photosensitization

41. The vapour pressure of a solution is
(A) Proportional to its total pressure
(B) Inversely proportional to concentration of solute
(C) Proportional to temperature of solution
(D) Proportional to absolute temperature of solution

42. The order of osmotic pressures of equal molar concentrations of glucose, NaCl and $BaCl_2$ is in the order
(A) Glucose > NaCl > $BaCl_2$
(B) NaCl > $BaCl_2$ > Glucose
(C) $BaCl_2$ > NaCl > Glucose
(D) Glucose > $BaCl_2$ > NaCl

43. In van der Waals gas the term which accounts for intermolecular forces is

(A) RT
(B) $V - b$
(C) $P + a/V^2$
(D) $(RT)^{-1}$

44. If the ratio of rates of diffusion of two gases A and B is 4 : 1, the ratio of their densities is
(A) 1 : 16
(B) 1 : 4
(C) 1 : 8
(D) 4 : 1

45. One mole of an ideal monoatomic gas is mixed with one mole of an ideal diatomic gas. The molar specific heat of the mixture at constant volume is

(A) 3 cal
(B) 4 cal
(C) 8 cal
(D) 5 cal

46. Which of the following 0.1 M aqueous solution will have lowest freezing point?
(A) K_2SO_4
(B) NaCl
(C) urea
(D) glucose.

47. The osmotic pressure of a solution is given by the relation
(A) $P = RT/c$
(B) $P = cT/R$
(C) $P = Rc/T$
(D) $P/c = RT$

48. Glucose is added to 1 litre water to such an extent that $\Delta T_f / K_f$ becomes equal to 1/1000, the weight of glucose added is
(A) 180 g
(B) 18 g
(C) 1.8 g
(D) 0.18 g

49. The particles of colloidal solutions lie in the size range
(A) < 10 Å
(B) > 2000 Å
(C) 10 — 2000 Å
(D) none of these

50. For a reversible reaction if the concentrations of the reactants are doubled, equilibrium constant will be
(A) doubled
(B) halved
(C) same
(D) one-fourth

51. Cu^{2+} iodide is not known because
(A) Cu^{2+} oxidises I^- to iodine
(B) Cu^{1+} oxidises I^- to iodine
(C) Cu^{2+} reduces I^- to iodine
(D) None of the above

52. Actinoids form relatively less stable complexes as compared to lanthanoids
(A) Actinoids can utilise their 5*f* orbitals along with 6*d* orbitals in bonding but lanthanoids do not use their 4*f* orbital for bonding
(B) Actinoids can utilise their 4*f* orbitals along with 5*d* orbitals in bonding but lanthanoids do not use their 5*f* orbital for bonding
(C) Actinoids can utilise their 6*f* orbitals along with 5*d* orbitals in bonding but lanthanoids do not use their 5*f* orbital for bonding
(D) Both A and B

53. Maximum covalency of nitrogen is _____.
(A) 3
(B) 5
(C) 4
(D) 6

54. A brown ring is formed in the ring test for NO_3^- ion. It is due to the formation of
(A) $[Fe(H_2O)_5 (NO)]^{2+}$
(B) $FeSO_4.NO_2$
(C) $[Fe(H_2O)_4(NO)_2]^{2+}$
(D) $FeSO_4.HNO_3$

55. In the preparation of compounds of Xe, Bartlett had taken $O_2^+Pt F_6^-$ as a basecompound because:
(A) both O_2 and Xe have same size.
(B) both O_2 and Xe have same electron gain enthalpy.
(C) both O_2 and Xe have almost same ionisation enthalpy.
(D) both Xe and O_2 are gases

56. Which of the following complex is tetrahedral ?
(A) $[PdCl_4]^{2-}$
(B) $[PtCl_4]^{2-}$
(C) $[NiCl_4]^{2-}$
(D) None of the above

57. Major component of plasma protein is
(A) Albumin
(B) Globulin
(C) Histone
(D) Valine

58. Which of the following polymers are used as fibre?
(A) Polytetrafluoroethane PTFE
(B) Polychloroprene
(C) Nylon
(D) Terylene

59. Which of the following oxides behaves as conductor or insulator depending\ upon temperature?
(A) TiO
(B) SiO_2
(C) TiO_3
(D) MgO

60. Which of the following monomers form biodegradable polymers?
(A) 3-hydroxybutanoic acid + 3-hydroxypentanoic acid
(B) Glycine + amino caproic acid
(C) Ethylene glycol + phthalic acid
(D) Both A and B

61. In the cubic close packing, the unit cell has _____.
(A) 4 tetrahedral voids each of which is shared by four adjacent unit cells.
(B) 4 tetrahedral voids within the unit cell.
(C) 8 tetrahedral voids each of the is shared by four adjacent unitcells.
(D) 8 tetrahedral voids within the unit cells

62. The correct order of the packing efficiency in different types of unit cells is _____
(A) *fcc* < *bcc* < simple cubic
(B) *fcc* > *bcc* > simple cubic
(C) *fcc* < *bcc* > simple cubic
(D) *bcc* < *fcc* > simple cubic

63. Rayon is a semi synthetic polymer and is taken as a better choice than cotton fabric because
(A) Mechanical and aesthetic properties of cellulose can be improved by acetylation
(B) Mechanical and aesthetic properties of cellulose can be improved by oxidation
(C) Mechanical and aesthetic properties of cellulose can be improved by alkylation
(D) All the above

64. Polyamides are best used as fibres because of high tensile strength. Because
(A) Strong intermolecular forces (like hydrogen bonding within polyamides) lead to close packing of chains and increase the crystalline character, hence, provide high tensile strength to polymers
(B) It is a thermoset polymer
(C) It is fibrous in nature
(D) None of the above

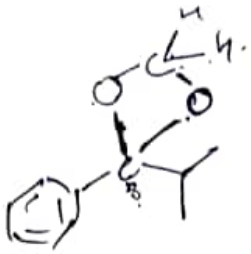
65. Which of the following features are not shown by quartz glass?
(A) This is a crystalline solid.
(B) Refractive index is same in all the directions.
(C) This is also called super cooled liquid.
(D) None of the above

66. The total number of atoms present in a simple cubic unit cellis one because
(A) Simple cubic unit cell has atoms at its corners, each of which is shared between eight adjacent unit cells.
(B) Simple cubic unit cell has atoms at its corners, each of which is shared between four adjacent unit cells.
(C) Simple cubic unit cell has atoms at its corners, each of whichis shared between six adjacent unit cells.
(D) None of the above

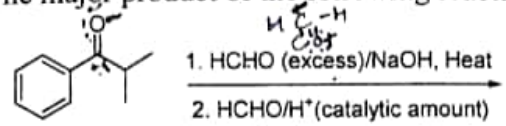
67. The correct order of different types of energies is
(A) $E_{el} >> E_{vib} >> E_{rot} >> E_{tr}$
(B) $E_{el} >> E_{rot} >> E_{vib} >> E_{tr}$
(C) $E_{el} >> E_{vib} >> E_{tr} >> E_{ro}$
(D) $E_{tr} >> E_{vib} >> E_{rot} >> E_{el}$

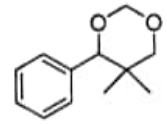
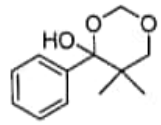
68. The criteria for electronic spin resonance is
(A) Periodic change in polarisability
(B) Spin quantum number of nuclei > 0
(C) Presence of unpaired electron in a molecule
(D) Presence of chromophore in a molecule

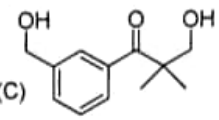
69. Which of the following has to be computed to determine transmittance and absorbance at various frequencies?
(A) Ratio of signal and noise
(B) Ratio of sample and reference spectra
(C) Sample spectra
(D) Reference spectra

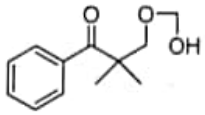


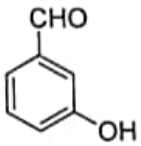
70. The major product of the following reaction sequence is

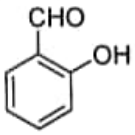


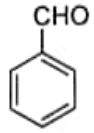
(A) 
(B) 

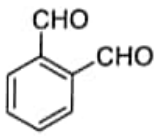
(C) 

(D) 

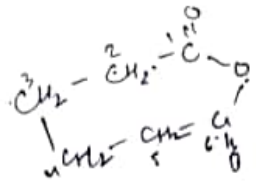
71. Which of the following compound is known as oil of bitter almonds?
(A) 

(B) 

(C) 

(D) 

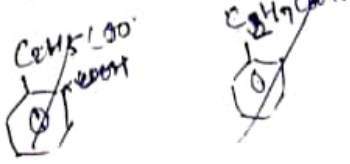
72. One letter code for 'aspartic acid' amino acid is:
(A) a
(B) K
(C) R
(D) D



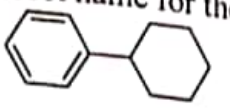
73. The IUPAC name of succinic anhydride is:
(A) Butanedioic anhydride
(B) Butanedicarboxylic anhydride
(C) Cyclobutanedioic anhydride
(D) Cyclobutanedicarboxylic anhydride

74. Which of the following is not a condensation polymer?
(A) Glyptal
(B) Nylon-66
(C) Dacron
(D) PTFE

75. Relaton between ethylbenzenecarboxylate and phenyl propanoate is:
(A) Metamer
(B) Functional Isomer
(C) Chain isomer
(D) Homologues .

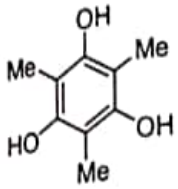


76. Which of the following is the correct name for the following compound?

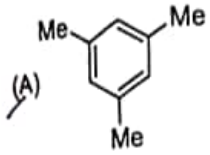


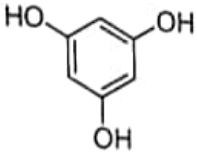
(A) Cyclohexylbenzene
(B) biphenyl
(C) Phenylcyclohexane
(D) Hexylbenzene

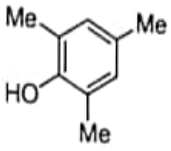
77.

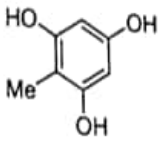


Zn powder, distillation → Product

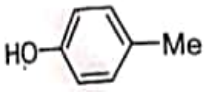
(A) 

(B) 

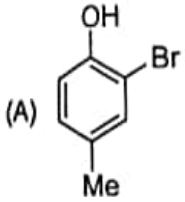
(C) 

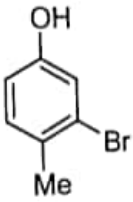
(D) 

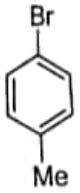
78.

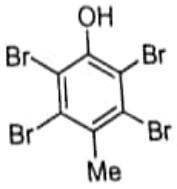


Br_2, CS_2, 5 ^{0}C → Product

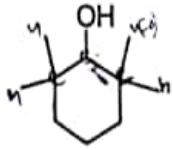
(A) 

(B) 

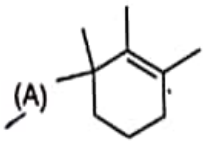
(C) 

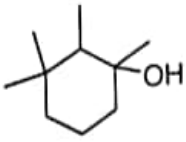
(D) 

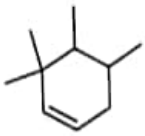
79.

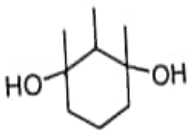


H^+, heat → Product

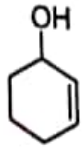
(A) 

(B) 

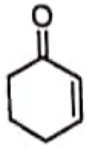
(C) 

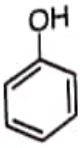
(D) 

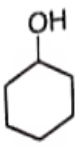
80.



$Al[OCH(CH_3)_2]_3$, acetone → Product

(A) 

(B) 

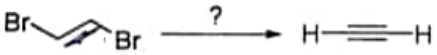
(C) 

(D) 

81. The term inverted sugar refers to an equimolar mixture of:
(A) D-Glucose and D-galactose
(B) D-Glucose and D-ribose
(C) D-Glucose and fructose
(D) D-Glucose and D-mannose

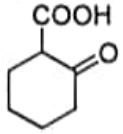
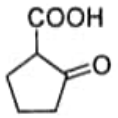
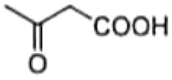
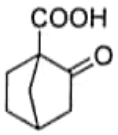
82. Bakelite is obtained from phenol by reacting with
(A) CH_3CHO
(B) HCHO
(C) HCOOH
(D) CH_3COCH_3

83. The reagent(s) for the following conversion is:

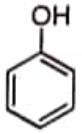
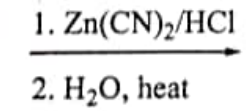


(A) Alcoholic KOH
(B) Alcoholic KOH followed by $NaNH_2$
(C) Aqueous KOH followed by $NaNH_2$
(D) Zn/MeOH

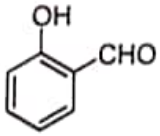
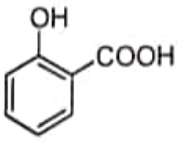
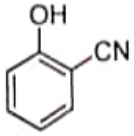
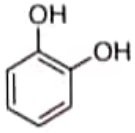
84. Which of the following compound will decarboxylate with difficulty?

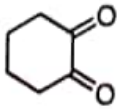
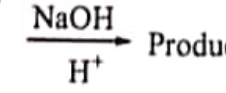
(A) 
(B) 
(C) 
(D) 

85. Which of the following compounds on hydrolysis gives propyne?
(A) CaC_2 (B) Mg_2C_3 (C) Al_4C_3 (D) Cu_2Cl_2

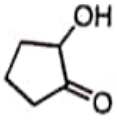
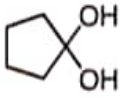
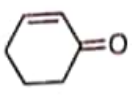
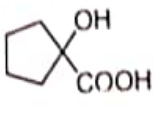
86. 


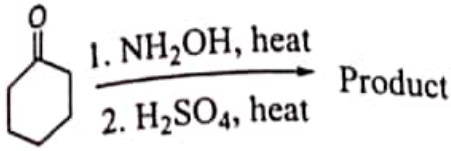
Product

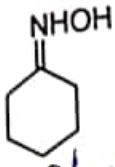
(A) 
(B) 
(C) 
(D) 

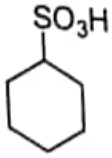
87. 


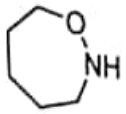
Product

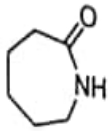
(A) 
(B) 
(C) 
(D) 

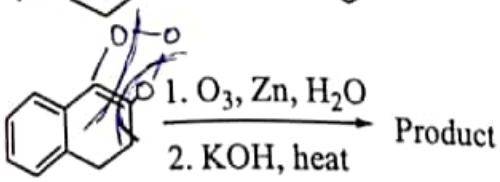
88. 

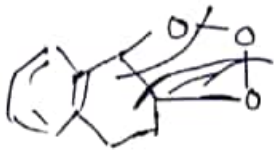
(A) 

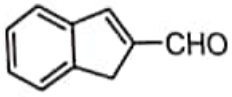
(B) 

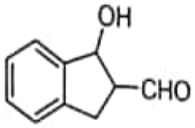
(C) 

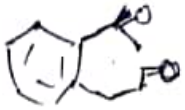
(D) 

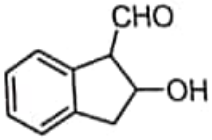
89. 

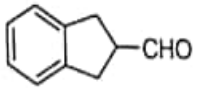


(A) 

(B) 



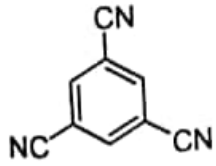
(C) 

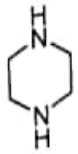
(D) 

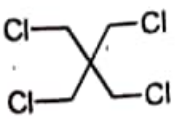
90. The antiseptic action of Detol is due to
(A) Chlorobenzene
(B) Chlroquine
(C) Chloroxylenol
(D) Chloramphenicol

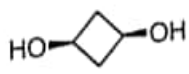
91. The most concentrated source of energy in the human body is:
(A) Fats
(B) Sugars
(C) Proteins
(D) Nucleic acids

92. Which of the following has net dipole moment?

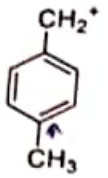
(A) 

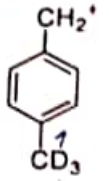
(B) 

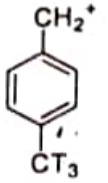
(C) 

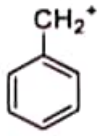
(D) 

93. Which of the following carbocation is most stable?

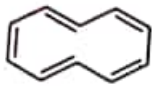
(A) 

(B) 

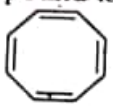
(C) 

(D) 

94. Which of the following compound is non-aromatic?



(I)

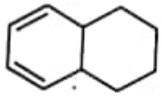


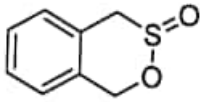
(II)

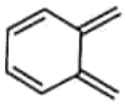
$(4n+2)\pi e^-$

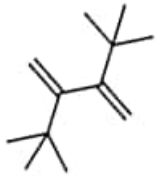
(A) Only I
(B) Only II
(C) None
(D) Both

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

(A) 

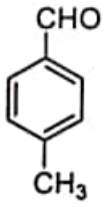
(B) 

(C) 

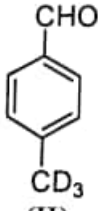
(D) 

96. Which of the following atom is NMR inactive?
(A) ^{31}P
(B) ^{19}F
(C) ^{12}C
(D) ^{13}C

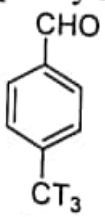
97. Correct order of carbonyl IR-stretching frequency for the following compounds is:



(I)



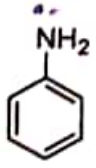
(II)

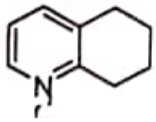


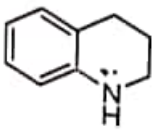
(III)

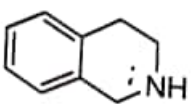
(A) I > II > III (B) III > II > I (C) III > I > II (D) II > I > III

98. Choose the strongest base among the following:

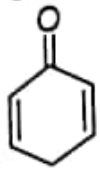
(A) 

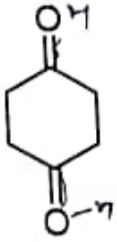
(B) 

(C) 

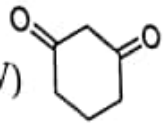
(D) 

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

(I) 

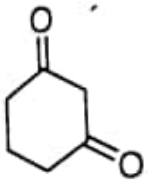
(II) 

(III) 

(IV) 

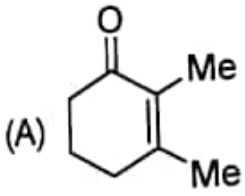
(A) I > II > III > IV (B) III > II > I > IV (C) IV > III > I > II (D) I > IV > II > III

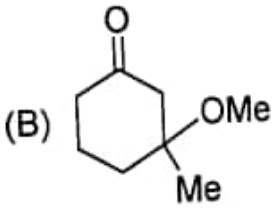
100. The major product '**A**' formed in the following reaction sequence is:

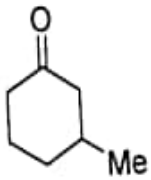


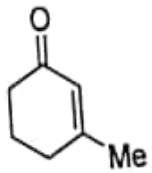
1. CH_2N_2, Et_2O
2. MeMgCl, Et_2O
3. H_3O^+

→ **A**

(A) 

(B) 

(C) 

(D) 

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Jamia Millia Islamia
M.Sc Chemistry
Year 2019

1 If one-third of HI decomposes at a particular temp. K_c for $2HI \rightleftharpoons H_2 + I_2$ is

$$2HI \rightleftharpoons H_2 + I_2$$

$\frac{1}{3}$ HI decomposes to give $1/6$ of H_2 & I_2

At eqm $K_c = \frac{[H_2][I_2]}{[HI]^2}$

$$= \frac{\frac{1}{6} \times \frac{1}{6}}{\left(\frac{1}{3}\right)^2} = \frac{1}{36} \times 9 = \frac{1}{4}$$

opt B

2. Eq. cont for $Br_2 \rightleftharpoons 2Br$ at 500K & 700K are 1×10^{-10} and 1×10^{-5} respectively. The Rx^n is

$$K_c = \frac{[Br]^2}{Br_2}$$

at 500K 1×10^{-10}

700K 1×10^{-5}

means as Temp inc Rate constant inc

So the Rx^n is endothermic

opt a

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3. The PH of a solution containing 0.1 N HCl & 0.1 N CH_3COOH is

PH of solution is bcoz of HCl only as CH_3COOH is weak acid so it ionizes to small extent and its further suppressed in presence of HCl

$$HCl \longrightarrow H^+ + Cl^-$$
$$0.1 \qquad 0.1 \quad 0.1$$

Complete Ionization $\qquad 0.1 = 10^{-1}$

$$PH = -\log [H^+]$$
$$PH = -\log [10^{-1}]$$
$$PH = 1 \log 10 \quad (\log 10 = 1)$$

$PH = 1$

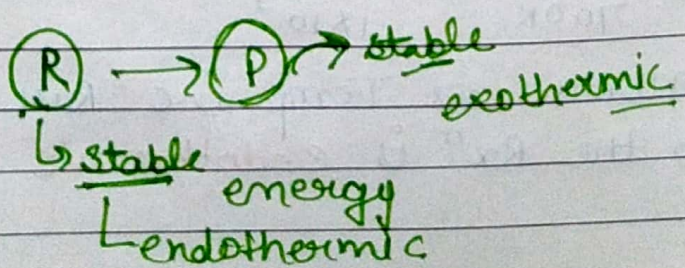
opt B

4. Hydrolysis → When H_2O breaks the Bond of any molecule

exothermic → when energy is released
endothermic → _____ absorbed

So hydrolysis can either endothermic or exothermic depends on the stability of products or Reactants

opt c



5. POH value = 14

$[H^+]$ = ?

$$PH + POH = 14$$

$$PH + 14 = 14$$

$$PH = 0$$

opt c

$$PH = -\log[H^+] = 0$$

$$[H^+] = 1$$

6. Vapour pressure of water at 95°C is found to be 634 mm. The heat of vaporization is 40593 J mol^{-1} Vapour pressure at temp 100°C ?

effect of temp. on vapour pressure is Given by Clausius Clapeyron eqn

95 + 273 = 368

100 + 273 = 373

$$\log \frac{P_2}{P_1} = \frac{\Delta_{vap} H}{2.303\, R} \left(\frac{1}{T_1} - \frac{1}{T_2} \right)$$

$$\log \frac{x}{634} = \frac{40593}{2.303 \times 8.314} \left(\frac{1}{368} - \frac{1}{373} \right)$$

opt d

$$\log x - \log 634 = \frac{40593}{19.147142} \left(\frac{373 - 368}{368 \times 373} \right)$$

$$= \frac{40593}{19.147142} \times \frac{5}{137264}$$

$$= \frac{202965}{262821.29}$$

$$= 0.7722$$

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(7) What is the No. of components, No. of phases & degree of freedom for the system

$$Na_2SO_4 \cdot 10H_2O(s) \rightleftharpoons Na_2SO_4(s) + 10H_2O(g)$$

Phase = 3
Com = 2
$F = C - P + 2$ → gibbs phase Rule
$F = 1$

2, 3, 1
So opt d

(8) $F = C - P + 2$. opt B

(9) More Molar mass (more at no.) means more x ray scattering

$Li^+ < Na^+ < Cl^- < Br^-$ opt c

(10)

σ to σ^* > n to σ^* > π to π^* > n to π^*

opt c is correct

Bo stable
An unstable

c
σ σ^*
n σ^*
π π^*

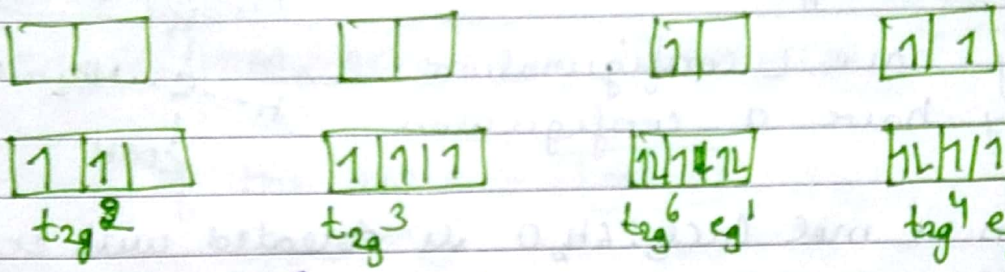
11

12 Myoglobin is found in heart & skelton muscles

(13) CO

other eg of π- donar ligands :- Oxide O_2^-, N^{3-} (Nitride), RN^{2-} (imide), alkoxide (RO^-) amide (R_2N^-), F^-

(14)



(15) $Ca(OH)_2$ lime water

To get NH_3

$2NH_4Cl + Ca(OH)_2 \longrightarrow 2NH_3 + CaCl_2 + 2H_2O$

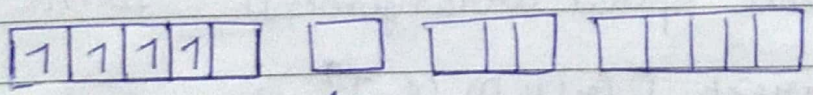
↳ this can be used for the synthesis of Washing powder ($Na_2CO_3 \cdot 10H_2O$)

$CO_2 + Ca(OH)_2 \longrightarrow CaCO_3 + H_2O$

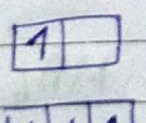
↳ give milky appearance

d^4

(16)



opt c



$1 \times 0.6 + (3)(-0.4)\Delta_o$

$0.6 - 1.2$

$= -0.6\ \Delta_o$

Ionic Compounds

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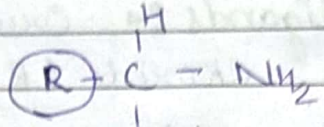
17 Lithium shows anamolus behaviour
1) High polarising power
2) High charge / size ratio
opt B

18 All naturally occuring except glycine are optically active

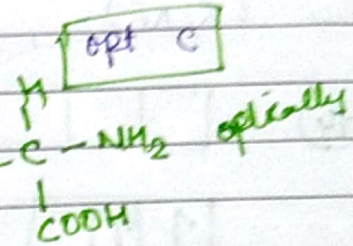


→ Simplest way to draw amino acid

This will be diff.

They have L configuration
They have d configuration

opt C



optically

19 When 1 mol $CrCl_3 \cdot 6H_2O$ is treated with excess of $AgNO_3$, 3 mole of AgCl are obtained. The formula of the complex

[ ]0

AgCl

3 moles of ~~$AgNO_3$~~ forming means there $3Cl^-$ are present outside of CN sphere

$\Rightarrow [Cr.(H_2O)_6]Cl_3$

Trick

(20) Tetrahedral Complex don't show geometrical isomerism

Sq. planer Complex MA_4, MA_3B & MAB_3 } don't show geometrical isomerism
Oct. complex MA_6, MA_5B

Because the possible spatial arrangements are equivalent

opt A is correct $[Cr(H_2O)_4Cl_2]^+$ shows g. isomerism

$Pt(NH_3)_3Cl$

MAB_3

AB_2 MA_6

MA_5B

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(21) Both B and C — opt d

$[Co(H_2O)_6]^{2+} + HCl \longrightarrow [CoCl_4]^{2-}$

Pink — Blue

Tetrahedral Complex CFSE < Δ_o CFSE

$\Delta_t = \frac{4}{9}\Delta_o$

(22) octahedral complex containing bidentate ligands show O.I

→ Reason = Non Superimposable mirror images

$M(AA)_3$ = shows

$M(AA)_2B_2$ or $M(AA)_2BC$ = only cis shows

$M(AA)B_2C_2$ = shows

thus opt d

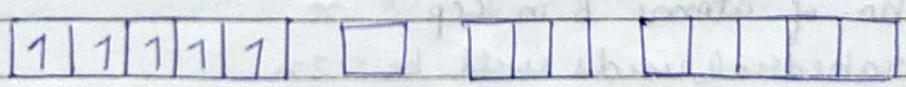
(23) None of the above — opt d

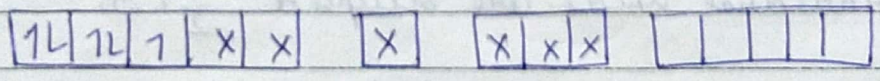
(24) $[Fe(CN)_6]^{3-}$

Fe^{3+} is central metal ion

$Fe = 3d^6 4s^2$

$Fe^{3+} = 3d^5$





d^2sp^3

(25) Pu (Plutonium)

opt b

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(26) Critical Temp. → That temp. above which the gas can't be liquified however high pressure is applied

opt a

(27) Van der walls eq^n → eq^n of state for real gas

$$\left(P + \frac{an^2}{V^2}\right)(V - nb) = nRT \quad \text{for } n \text{ moles}$$

unit of a

$$P = \frac{an^2}{V^2} \Rightarrow a = \frac{P \times V^2}{n^2} = \text{atm L}^2\text{mol}^{-2}$$

unit of b $\quad V = nb \Rightarrow b = \frac{V}{n} = L\,mol^{-1}$

opt c

(28)

Suppose the no. of atoms B in ccp = n

So no. of tetrahedral voids will be = 2n

as $\frac{1}{2}$ of Tetrahedral voids are occupied = $\frac{1}{2} \times 2n$

$= n$

A : B = n : n = 1 : 1

so the formula of compound is AB

(29) Tet
axial
axial

opt

(30)
gold
added
coagu

am

Thus

(31)

h

(29) Tetragonal crystal system

axial length → $a = b \neq c$

axial angle → $\alpha = \beta = \gamma = 90^\circ$

opt b

(30)

gold No. of starch is the amount of starch in mg added to 10 ml std. gold sol which prevents the coagulation of gold on adding 1 ml of 10% NaCl soln

amount of starch = $0.0250\ g \times 1000$

$\frac{25\ g}{1000\ g} \times 1000 = 25\ mg$

Thus gold no. is 25

opt d

(31)

Half life time of a Rxn is

$$t^{1/2} \propto \frac{1}{a^{n-1}}$$

$$t^{1/2} \propto a^{1-n}$$

Bcoz yha pe inversely ya directly mention nhi h to a^{n-1} will be correct option

opt b

(32) $2NO_2Cl \longrightarrow 2NO_2 + Cl_2$ Rate $= k[NO_2Cl]$

Mech → $NO_2Cl \xrightarrow{k_1} NO_2 + Cl$ —— (1)

$NO_2Cl + Cl \xrightarrow{k_2} NO_2 + Cl_2$

Rate does not contain the term corresponding to Cl thus rate determining step is 1

opt a

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(33) Zymase — opt c

This process is known as alcohol fermentation

(34) de-Broglie eqn is $\lambda = \frac{h}{p} = \frac{h}{mv}$

h and v are cont.

$\lambda \propto \frac{1}{m}$ — opt c

imp

* high Mass, small wavelength

Thus Molecule of SO_2 has smallest wavelength

(35) • Radial part of wave fun. depends on n and l

• Angular part of wave fun. depends on l and m

opt a

(36)

Normalised wave function for 1-D Box is

$\psi = \sqrt{\frac{2}{L}} \sin \frac{n\pi x}{L}$ — opt B

(37) $(2J+1)$ opt d

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(38) Stokes lines — opt B

as Same freqency = Rayleigh line

High frequency = Antistokes lines

(39) extremely high

ϕ is Quantum yield → No of moles of product formed per quanta of light absorbed by the photosensitive agent — opt C

(40) Phosphorescence — opt B

When singlet to singlet transition — Fluorescence

$S_0 \xrightarrow[\text{absorption}]{} S_1 \xrightarrow[\text{fluorescence}]{} S_0$

$S_0 \xrightarrow[\text{absorption}]{} S_1 \xrightarrow[ISC]{} T_1 \xrightarrow{\text{Phosphorescence}} S_0$

(41) Vapour pressure depends on 2 factors mainly

- Temp → Vapour pressure $\propto$ Temp
- Intermolecular force → $V.P \propto \frac{1}{\text{Intermolecular force}}$

opt c

(42) osmotic pressure is colligative property

more is the no. of particles more osmotic pressure

$\pi = iCRT$

as molar conc. is same so more no of particles more Osmotic pressure

$BaCl_2 > NaCl > glucose$

i for $BaCl_2$ = 3

i for NaCl = 2

i for glucose = 1

opt c

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(43) a is the measure of magnitude of attractive force $\left(P + \frac{a}{V^2}\right)$

b is the measure of effective size of gas molecules $(V - b)$

Opt c

(44)

$\frac{r_1}{r_2} = \sqrt{\frac{d_2}{d_1}}$ r is for rates of diffusion, d is for density

$\frac{r_1}{r_2} = \sqrt{\frac{d_2}{d_1}} = \frac{4}{1}$

$\frac{d_2}{d_1} = \frac{16}{1}$

$d_1 : d_2 = 1 : 16$

Opt a

(45) C_v for Monoatomic gas $= \frac{3}{2} R$

C_v for diatomic gas $= \frac{5}{2} R$

The Molar specific heat for Mix. is $\left(\frac{3}{2}R + \frac{5}{2}R\right)/2$

$= 4R/2 = 2R$

$2 \times 8.314\ J = 16.628\ J$

$1\ cal = 4.184\ J$

$\frac{16.628}{4.184} = 3.97 \approx 4\ C$

Opt B

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(47) osmotic pressure $\pi = CRT$

$P = CRT$

$\frac{P}{C} = RT$ → opt d

(48)

$\Delta T_f = K_f \times \frac{w_2}{M_2} \times \frac{1000}{w_1}$ $M_2 = 180$ for glucose

$\frac{\Delta T_f}{K_f} = \frac{1}{1000} = \frac{w_2 \times 1000}{180 \times w_1}$ $w_2 = 180$

opt a

(49) 1 - 1000 nM , 10 - 1000 Å opt c

(50) eqm constant will be same as eqm Cont. value is not affected by conc. opt c

(51) Since I(-1) is a powerful reducing agent it reduce +2 to +1 of Cu. hence CuI_2 does not exist

Soft - soft and hard - hard Combinations are stable

Cu(+1) is more soft acid than Cu(+2)

I(-1) is soft Base opt a

Thus CuI is stable than CuI_2 and hence it exists

(52) Actinoide form relatively more stable complexes as compared to lanthanide Because actinoide can utilise 5f orbitals along with 6d orbitals in Bonding opt a

Lanthanoids do not use their 4f orbitals for Bonding

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(53) Maximum Covalency of Nitrogen is 4

Covalency → how many bonds it is forming
O.S → How much charge it have

opt c

(54) $[Fe(H_2O)_5 \overset{+1}{NO}]\overset{+1}{SO_4}$

opt a

Penta aquanitrosyl iron (II) sulfate ✗
Penta aquanitrosonium iron(I) sulfate ✓

(55) $O_2 + PtF_6 \longrightarrow O_2^{+}[PtF_6]^{-}$

$Xe + PtF_6 \longrightarrow Xe^{+}[PtF_6]^{-}$

strong oxidising agent

as it oxidise O_2 it must will oxidise Xe
as they almost have same Ionisation enthalpy

opt c

(56) $[NiCl_4]^{2-}$
sp^3 hybridisation
paramagnetic

opt c

(57) Proteins in plasma
→ antibody proteins
→ Coagulation factors
→ Proteins albumin & fibrinogen

which maintain serum osmotic pressure

opt a

(58) Nylon

opt c

(59)

(60)

(61)

(62)

(59) SiO_2 opt b

at lower temp → Behaves like Insulator

at high temp → Behaves like Conductor

(60) Imp. Biodegradable polymers & Monomers

Polymer → PHBV (Poly-β-hydroxybutyrate-co-β-hydroxy valerate)

Poly (glycollic acid) Poly (lactic acid)

Nylon 2 Nylon 6

opt d

Monomers →

3-hydroxybutanoic acid + 3 hydroxypentanoic acid

Glycine + amino caproic acid

~~Glycer~~ Glycollic acid + lactic acid

(61)

In a cubic close packing the unit cell has 8 tetrahedral voids within it

In ccp = 8 (tetrahedral) + 4 (octahedral) = 12

In hcp = 12 (tetrahedral) + 6 (octahedral) = 18

opt d

(62) Packing efficiency :- The percentage of the total space filled by the particles is called Packing efficiency

$$P.E = \frac{\text{Vol. of sphere}}{\text{Vol of unit cell}}$$

FCC = 0.74 BCC = 0.68 Simple = 0.524

FCC > BCC > Simple Cubic

opt b

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(63) Rayon is semi synthetic polymer made of cellulose Mechanical and asthetic properties of cellulose can be improved by acetylation

opt A

(64)

Because in polyamides they have high tensile strength as they have strong intermolecular force (like H Bonding), this lead to close packing of chains & inc. the crystalline character, hence provide high tensile strength to polymers

opt a

(65) Quartz glass is an amorphous solid

opt a

(66) Simple cubic unit cell has atoms at its corners, each of which is shared b/w eight adjacent unit cells

→ Contribution by a particle on the corners of unit cell = $\frac{1}{8}$

8 atoms present $\frac{1}{8} \times 8 = 1$

opt a

(67) The correct order is $E_{el} > E_{vib} > E_{rot} > E_{tr}$

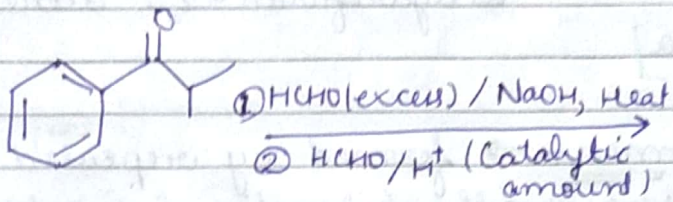
opt a

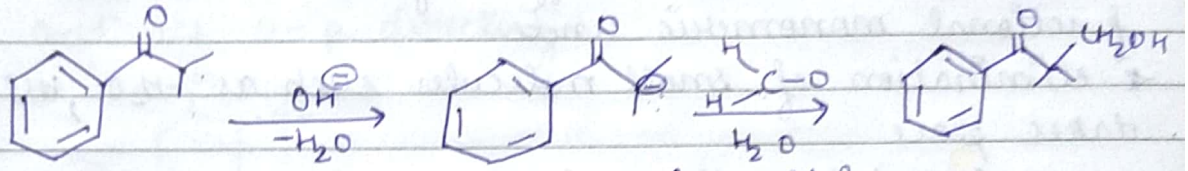
(68) Presence of unpaired e^- in a molecule is the criteria for e^- spin resonance

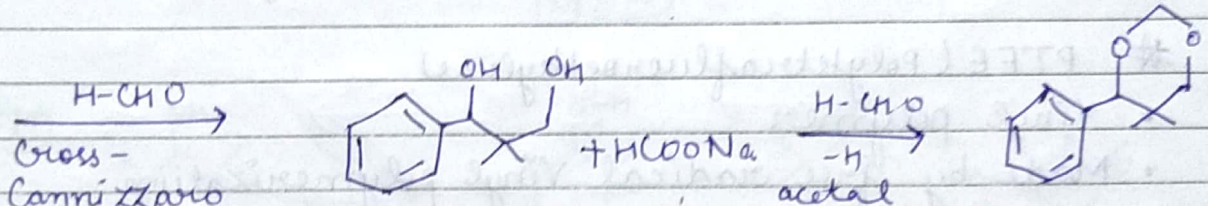
opt c

(69) The ratio of sample and reference spectra needs to be computed to determine transmittance & absorbance [opt B]

(70)

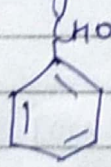






[opt a]

(71) Benzeldehyde is known as oil of Bitter almonds



[opt c]

(72) One letter code means the alphabet with which one can represent amino acid

One letter Code	Three letter Code	Amino acid
C	Cys	Cysteine
D	Asp	Aspartic acid
E	Glu	Glutamic acid

[opt d]

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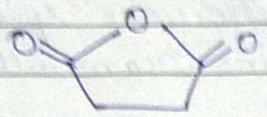
(73) 

Butanedioic anhydride

Other names :-
Oxolane - 2,5- dione
Dihydrofuran - 2,5- dione

opt a

(74)

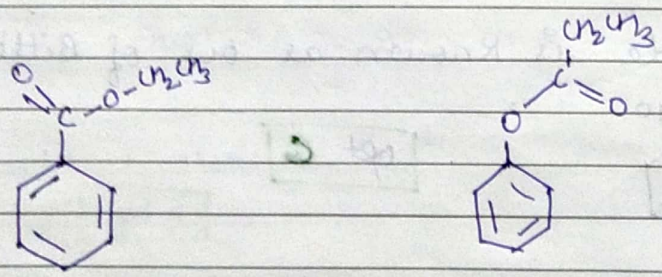
Condensation Polymers → formed by repeated Condensation Rx^n b/w 2 diff. bifunctional or tri-functional monomeric units

* elimination of small molecules such as $-H_2O$, HCl etc takes place

eg :- Nylon 6 , Nylon 6-6 , Dacron (terylene) Mylar, Lexan , Kevlar , Nomex , Glyptal

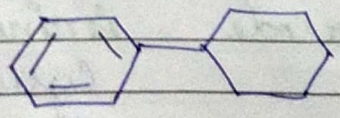
PTFE (Polytetrafluoroethylene)
- Vinyl polymer
- Made by free radical vinyl polymerization
- used in Non- stick cookwares
- Teflon is brand name for PTFE

opt d

(75) 

Metamer

opt a

(76) 

Phenylcyclohexane

opt c

(77)

(78)

(79)

(80)

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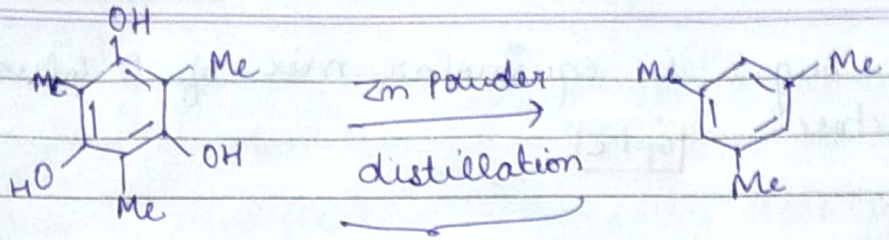
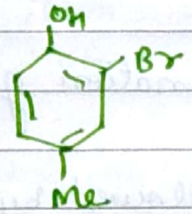
(77) 

This reagents brings complete reduction of –OH gp

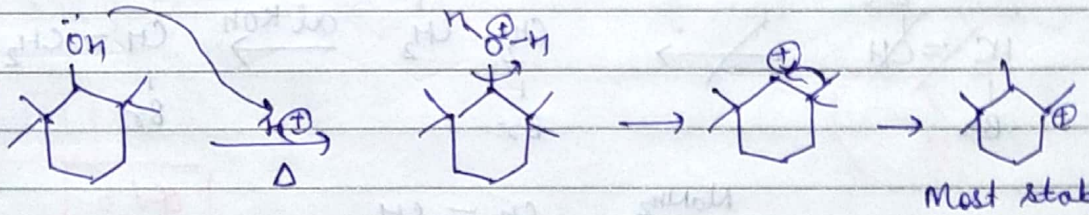
opt a

(78) Br_2 / Cs_2 means bromination at one place and its o-p directing

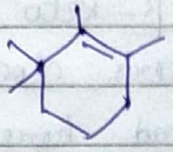
So 

this will be the product

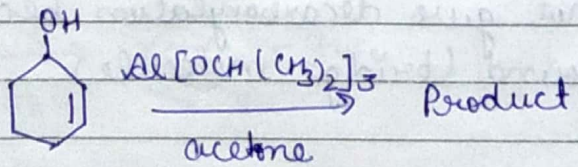
opt a

(79) 

Most stable carbocation

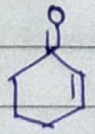


opt a

(80) 

This reagents is selectively used to oxidize 2° alcohols to ketones

• known as oppenauer oxidation



opt a

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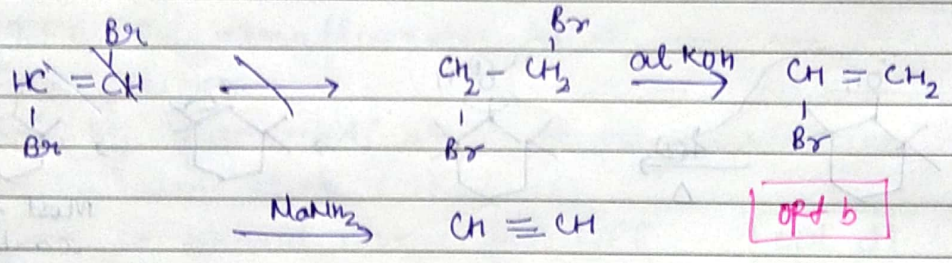
(81) Inverted sugar is equimolar mix. of D-Glucose and D-fructose [opt c]

(82) Bakelite
- 1st plastic made from synthetic components
- It is a thermosetting phenol formaldehyde Resin
- formed from a condensation Rx^n of phenol & formaldehyde (HCHO)

[opt b]

(83) Vicinal dihalides on dehydrohalogenation gives alkynes
Reagents used are alcoholic KOH followed by soda-amide



[opt b]

(84) β-Keto acid undergo decarboxylation & β-Keto esters does not undergo
and here [opt d] will not give decarboxylation because it is an unstable compound (bridge molecule)

(85) Mg_2C_3

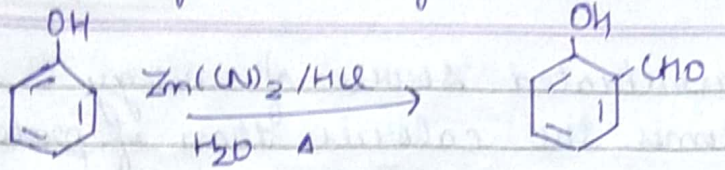
$$Mg_2C_3 + 4H_2O \longrightarrow 2Mg(OH)_2 + C_3H_4$$

[opt b]

Gatterman Rxn → used for formylation of aromatic Ring

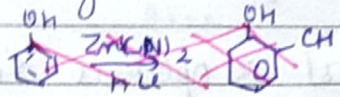
Generally used Reagent HCl + HCN in presence of catalyst AlCl3

(86)

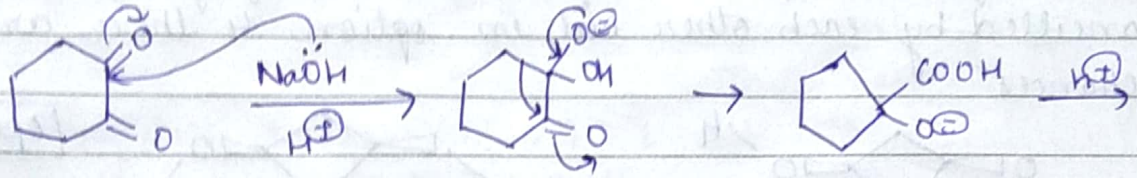


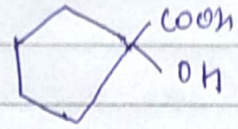
opt a

Adams modification → Replacing HCN with $Zn(CN)_2$ can give 90% of yield



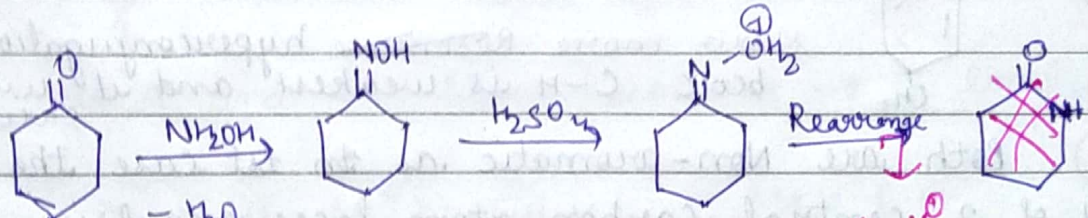
(87)

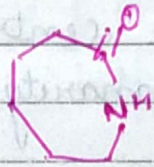




opt d

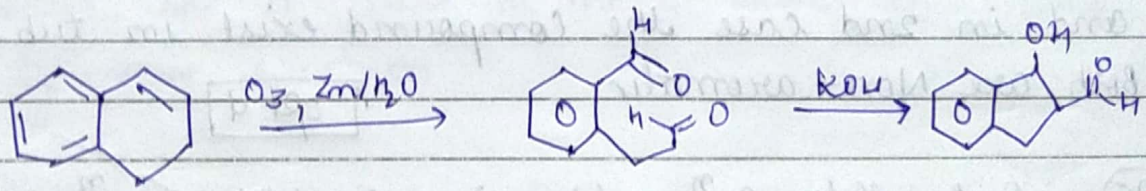
(88)

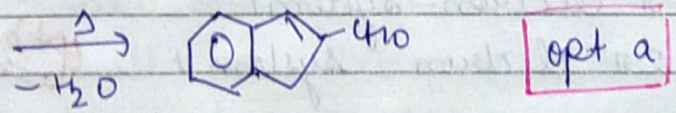




opt d

(89)





opt a

(90) chloroxylenol and Terpineol are responsible for antiseptic properties of dettol

opt c

Chloramphenicol is used as an antibiotic

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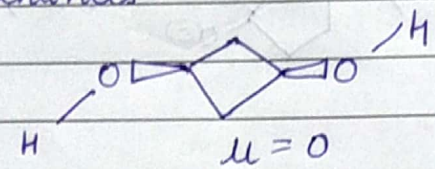
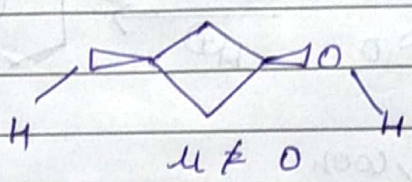
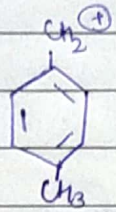
(91) Fat → Most concentrated source of energy
Contain 2.25 times the calories than of protein or carbohydrates
opt a

(92) In first 3 options dipole moment of group are cancelled by each other but in option 4 there are 2 chances
opt d





(93) 

is most stable carbocation as it will show more ~~Resonance~~ hyperconjugation bcoz C–H is weakest and it will break easily

(94) Both are Non-aromatic as in 1st case the H of 2 central carbon atom faces repulsion so the planarity needed for hyperconjugation is not there.
and in 2nd case the compound exist in tub shaped Both are Non-aromatic
opt d

(95) Diels Alder Rxn → (4+2) cycloaddition Rxn
means the diene (4 π electron system)
Unsaturated Comp. (2 π electron system)
opt b

as in opt b the compound has 6 π electrons so it will not show diels alder Rxn

(96) Those species with even no. of protons and neutrons are NMR inactive eg ^{12}C or ^{16}O
so opt c

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97) IR stretching freq $\propto \frac{1}{\text{mass}}$

Mass order III > II > I

IR st. freq order I > II > III

Secondly :- More hyperconyugation / Resonance → ~~More~~ less double bond ch. b/w carbonyl gp Thus less stretching freq.

Hyperconyugation order → III > II > I

IR st. freq → I > II > III

opt a

98) More basic means localised electron so that it can easily donate e^-

Now opt a and c show Resonance → No localised e^-

opt b → N is sp^2 hybridised → More E.N

opt d → N is sp^3 ——— → less E.N

means opt d will be more basic. as it will easily give electron

99) In I after enol formation the Ring will get aromatised hence its enol content is very high

In IV the H-between 2 carbonyl gp is very acidic and thus it will easily undergo enol formation

So I > IV > II > III will be order

opt d

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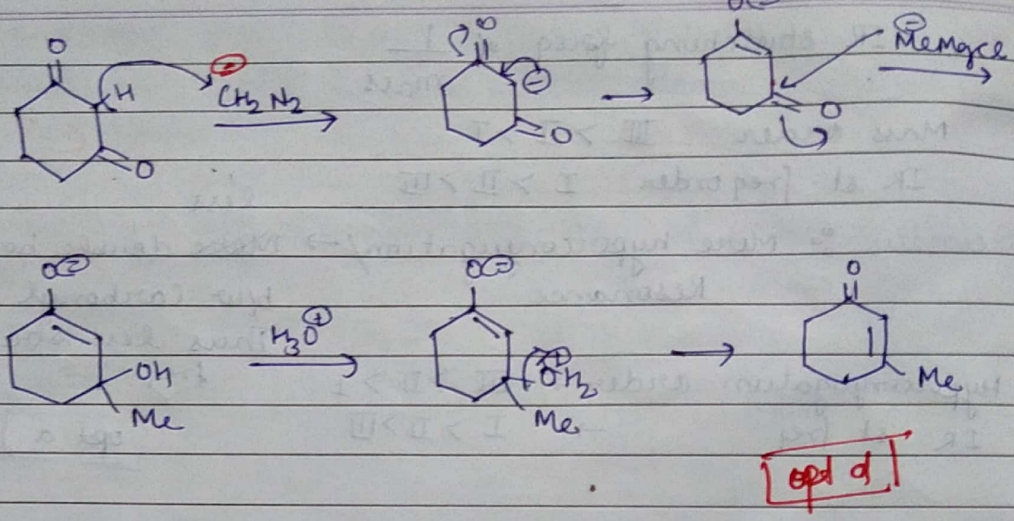

Ans d