A

24104 **120 MINUTES**

1. At low pressure, van der Waal's equation is written as $\left(P + \frac{a}{V^2}\right)V = RT$. The compressibility factor is then equal to:
   A) $\left(1 - \frac{a}{RTV}\right)$ B) $\left(1 - \frac{RTV}{a}\right)$ C) $\left(1 + \frac{a}{RTV}\right)$ D) $\left(1 + \frac{RTV}{a}\right)$

2. Which of the following is correct option for free expansion of an ideal gas under adiabatic condition?
   A) $q = 0, \Delta T < 0, w \neq 0$ B) $q = 0, \Delta T \neq 0, w = 0$
   C) $q = 0, \Delta T = 0, w = 0$ D) $q \neq 0, \Delta T = 0, w = 0$

3. In the melting of ice, which one of the conditions will be more favourable?
   A) Low temperature and low pressure
   B) High temperature and high pressure
   C) High temperature and low pressure
   D) Low temperature and high pressure

4. Which of the following statements about photochemical smog is **wrong**?
   A) It has high concentrations of oxidizing agents
   B) It has low concentrations of oxidizing agents
   C) It can be controlled by controlling the release of NO_2, hydrocarbons, ozone etc.
   D) Plantation of some plants like Pinus helps in controlling photochemical smog

5. Dinitrogen and dioxygen are main constituents of air, but these do not react with each other to form oxides of nitrogen because:
   A) Oxides of nitrogen are unstable
   B) N_2 and O_2 are unreactive
   C) The reaction can be initiated only in the presence of a catalyst
   D) The reaction is endothermic and requires a very high temperature

6. The gas leaked from a storage tank of the Union Carbide plant in Bhopal gas tragedy:
   A) Methyl isocyanate B) Methyl amine
   C) Phosgene D) Ammonia

7. The difference between ΔH and ΔU, when the combustion of one mole of heptane is carried out at a temperature T, is equal to:
   A) -4 RT B) 4 RT C) 3 RT D) -3RT

8. Which one of the following is an example of thermosetting polymers?
   A) Neoprene B) Buna-N C) Nylon 66 D) Bakelite

9. Identify the true statement/s:
   1. $Lu(OH)_3$ is the least basic among hydroxides of lanthanides
   2. Eu^{2+} is a good reducing agent in solution
   3. Lanthanides have high densities
   4. Ce^{4+} can act as a reducing agent in solutions

   A) 1 & 4 only B) 1,2 & 3 only C) 3 & 4 only D) 4 only

10. Which of the following is the lunar caustic?
   A) $CuCl_2$ B) Cu_2Cl_2 C) Hg_2Cl_2 D) $AgNO_3$

11. The complex showing a spin-only magnetic moment of 2.82 B.M. is:
   A) $Ni(CO)_4$ B) $[NiCl_4]^{2-}$ C) $Ni(PPh_3)_4$ D) $[Ni(CN)_4]^{2-}$

12. Which of the following statements is **not** correct?
   A) The higher the charge density on the central ion, the greater is the stability of the complexes
   B) Chelating ligands form more stable complexes as compared to monodentate ligands
   C) The higher the oxidation state of the metal, the more stable is the complex
   D) The cyano and amine complexes are less stable than those formed by halide ions.

13. The number of angular, radial and total nodes for a 4f orbital respectively is:
   A) 4, 0, 4 B) 3, 0, 3 C) 4, 3, 4 D) 4, 1, 3

14. Consider a particle in its ground state confined to a one dimensional box in the interval (0,8). The probability of finding it in between $4.0 - \frac{\delta}{2}$ and $4.0 + \frac{\delta}{2}$ is close to: (δ is sufficiently small so that wavefunction can be taken as constant in this interval)
   A) $\frac{\delta}{4}$ B) $\frac{\delta}{3}$ C) $\frac{\delta}{2}$ D) δ

15. The correct normalized wave function for one of the sp^2 hybrid orbital is:

   A) $\frac{1}{3}\Psi_{2s} + \frac{1}{3}\Psi_{2p_x} + \frac{1}{3}\Psi_{2p_y}$

   B) $\frac{1}{\sqrt{3}}\Psi_{2s} + \frac{2}{\sqrt{3}}\Psi_{2p_x} + \frac{1}{\sqrt{6}}\Psi_{2p_y}$

   C) $\frac{1}{\sqrt{3}}\Psi_{2s} + \frac{1}{\sqrt{2}}\Psi_{2p_x} + \frac{1}{\sqrt{6}}\Psi_{2p_y}$

   D) $\frac{1}{\sqrt{3}}\Psi_{2s} + \frac{1}{2\sqrt{3}}\Psi_{2p_x} + \frac{1}{\sqrt{6}}\Psi_{2p_y}$

16. The multiplication operation $(C_3 \times C_3^2)$ gives:

A) E B) C_3^2 C) C_3 D) C_6

17. The associative law of combination of a group is:

A) ABC = CBA B) (AB)C = -(CBA)
C) (AB)C = A(BC) D) (AB)C = -A(BC)

18. Point group $D_{\infty h}$ has following symmetry elements:

A) $2C_\infty, \infty\sigma_v, 2S_\infty, C_2 \; and \; E$ B) $2C_\infty, \infty\sigma_v, \; 2S_\infty, \infty C_2, i \; and \; E$

C) $2C_\infty, \infty\sigma_v, 2S_\infty, C_2, i \; and \; E$ D) $2C_\infty, \sigma_v, 2S_\infty, \infty C_2, i, \sigma_h and \; E$

19. The intensity of spectral lines is proportional to:

A) $|< \psi_n|\mu|\psi_m >|^2$ B) $|< \psi_n|\mu|\psi_m >|$

C) $< \psi_n|\mu|\psi_m >$ D) $|< \psi_n|\mu|\psi_m >|^4$

20. Phosphorescence involves transition between:

A) Singlet to singlet B) Triplet to singlet
C) Doublet to singlet D) Singlet to triplet

21. Removal of an electron from NO molecule results in:

A) Increase in frequency (*NO*) in the IR spectrum
B) An EPR active species
C) Electrons in HOMOs being closer to the oxygen than nitrogen *2p* orbitals
D) Electrons in HOMOs being closer to the nitrogen than oxygen *2p* orbitals

22. The vibrational frequency of a homonuclear diatomic molecule is *v*. The temperature at which the population of the first excited state will be half that of the ground state is given by:

A) $\frac{h\upsilon.ln2}{k_B}$ B) $\frac{h\upsilon}{\ln 2.k_B}$ C) $\frac{\ln 2}{h\upsilon.k_B}$ D) $\frac{h\upsilon.\log 2}{k_B}$

23. The recoil energy of Mössbauer nuclide of mass 139amuis 2.5MeV. The energy emitted by the nucleus in KeV is:

A) 12.5 B) 15.0 C) 25.0 D) 20.0

24. In the EPR spectrum, methyl radical, the number of lines and their relative intensities respectively are:

A) 1 & 1 B) 3 & 1:2:1 C) 4 & 1:3:3:1 D) 4 & 1:2:2:1

25. Symmetry of the anti-bonding molecular orbital formed by the linear combination of p_x or p_y in a homonuclear polynuclear polyatomic molecule is:

A) σ_g B) σ_u C) π_g D) π_u

26. E_π for Benzene according to HMO theory is:
A) $6\alpha + 6\beta$ B) $8\alpha + 6\beta$ C) $6\alpha + 8\beta$ D) $6\alpha + 3\beta$

27. Allyl radical and allyl anion has energy levels $2\left(\alpha + \sqrt{2}\beta\right), \alpha, 3\alpha$ and $2\left(\alpha + \sqrt{2}\beta\right),\ 2\alpha, 4\alpha$ respectively. The delocalization energy of allyl radical and allyl anion respectively is:
A) $2\beta\ and\ 0.828\beta$ B) $0.828\alpha\ and\ 1.414\beta$
C) $0.828\beta\ and\ 2\beta$ D) $0.828\beta\ and\ 0.828\beta$

28. Identify the correct statement about π- molecular orbitals of benzene:
A) Only the lowest energy MO is doubly degenerate.
B) Only LUMO is doubly degenerate.
C) Only HOMO is doubly degenerate.
D) Both HOMO and LUMO are doubly degenerate.

29. HMO theory can be applied to the allene radical. The secular determinant is given by:
A) $\begin{vmatrix} \alpha - E & \beta & 0 \\ \beta & \alpha - E & \beta \\ 0 & \beta & \alpha - E \end{vmatrix}$ B) $\begin{vmatrix} \alpha - E & 0 & 0 \\ 0 & \alpha - E & \beta \\ 0 & \beta & \alpha - E \end{vmatrix}$
C) $\begin{vmatrix} \alpha - E & \beta & 0 \\ \beta & \alpha - E & 0 \\ 0 & 0 & \alpha - E \end{vmatrix}$ D) $\begin{vmatrix} \alpha - E & -\beta & 0 \\ -\beta & \alpha - E & -\beta \\ 0 & -\beta & \alpha - E \end{vmatrix}$

30. Dominant contribution of escaping tendency of a charged particle with uniform concentration in a phase depends on----- of that phase.
A) Chemical potential B) Thermal energy
C) Electric potential D) Gravitational potential

31. Activity of water at 11 bar and 298K is:
A) 1.101 B) 0.998 C) 1.007 D) 0.898

32. First order gaseous reaction is 25% complete in 30 minutes at 227℃ and in 10 minutes at 237℃. The activation energy of the reaction is closest to $(RT = 2calK^{-1}mol^{-1})$:
A) $27\ kcal\ mol^{-1}$ B) $55\ kcal\ mol^{-1}$
C) $110\ kcal\ mol^{-1}$ D) $5.5\ kcal\ mol^{-1}$

33. For an endothermic reaction, where ΔH represents the enthalpy of the reaction in $KJ\ mol^{-1}$, the E_a will be:
A) $E_a < \Delta H$ B) Zero C) $E_a = \Delta H$ D) $E_a > \Delta H$

34. For a first order reaction, $A \rightarrow B$, the temperature dependent rate constant (k) was found to follow the equation, $\log k = \frac{2000}{T} + 6.0$. The pre-exponential factor A and the activity respectively are:

A) $1.0 \times 10^6 s^{-1}$ and $9.2 KJ\ mol^{-1}$

B) $6.0\ s^{-1}$ and $16.6 KJ\ mol^{-1}$

C) $1.0 \times 10^6 s^{-1}$ and $16.6 KJ\ mol^{-1}$

D) $1.0 \times 10^6 s^{-1}$ and $38.3 KJ\ mol^{-1}$

35. Generally hydrophobic colloids are flocculated efficiently by ions of opposite type and high charge number. This is consistent with the:

A) Peptization principle B) Kraft's theory
C) Hardly-Schulze rule D) Langmuir adsorption mechanism

36. Which of the following phenomena is **not** a factor that affects polarization at an electrode?

A) Diffusion of the analyte to the electrode surface
B) Diffusion of the product from the electrode surface
C) The standard cell potential of redox couple.
D) A significant activation barrier for the reaction

37. Over potential is:

A) Difference between measured potential and reversible value which solution exhibit before passage of current
B) Measured potential.
C) Reversible potential
D) Difference between measured potential and potential of electrode.

38. Identify the true statement about polarography:

A) The diffusion current is caused by solution stirring
B) The addition of supporting electrolytes is necessary for migration current
C) The diffusion is proportional to the square root of concentration of electroactive species
D) The magnitude of diffusion current is proportional to the concentration of electroactive species

39. Decomposition temperature of $CaCO_3$ in thermogravimetric analysis will be highest in dynamic atmosphere of:

A) Nitrogen B) Synthesis gas
C) 1:1 mixture of O_2 and CO D) Water gas

40. The gas commonly used in generating in inductively coupled plasma atomic Emission spectroscopy (ICPAES) is:

A) Argon B) Carbon dioxide
C) Nitrous oxide D) Hydrogen

41. Appropriate reason for the deviation from the Beer's law among the following are:

1. Monochromaticity of light
2. Very high concentration of the analyte
3. Association of analyte
4. Dissociation of analyte

A) 1, 2 & 4 only B) 2, 3 & 4 only
C) 1, 3 & 4 only D) 1, 2 & 3 only

42. Carboxypeptidase contains:

A) Zn(II) and hydrolyses CO_2 B) Zn(II) and hydrolyses peptide bonds
C) Mg(II) and hydrolyses CO_2 D) Mg(II) and hydrolyses peptide bonds

43. Among the following pair of metal ions present in nature, the first one functions as an electron transfer agent and the second one catalyzes the hydrolysis reactions. The correct pair is:

A) Fe and Zn B) Mg and Fe C) Co and Mo D) Ca and Cu

44. Hemoglobin is an oxygen carrying protein. The correct statement about oxyhemoglobin is that:

A) The metal is low spin in +3 oxidation state while dioxygen is in O_2^- form
B) The metal is high spin in +3 oxidation state while dioxygen is in O_2^- form
C) The metal is low spin in +3 oxidation state while dioxygen is in neutral form
D) The metal is high spin in +3 oxidation state while dioxygen is in neutral form

45. The correct combination of number and size of rings present in a metal ion – porphine complex (including metal ion bearing chelate rings) is -----5- membered and ----- 6-membered.

A) Two, six B) Six, two C) Five, three D) Four, four

46. The O_2 coordinated to metal ion centres in oxy-myoglobin and oxy-hemocyanin exists, respectively as:

A) Superoxide and peroxide B) Superoxide and superoxide
C) Peroxide and peroxide D) Superoxide and oxygen

47. Which of the following is **not** one of the twelve principles of Green Chemistry?

A) Minimizing toxic reagents used in a synthesis
B) Minimizing the use of solvents
C) Using high temperature to speed up reactions
D) Maximizing of atom economy

48. Which of the following major aims in drug design is **not** related to pharmacodynamics of a drug?

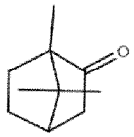
A) The reduction of side effects
B) The reduction of toxicity
C) The maximization of activity
D) The maximization of oral availability

49. To which amino acid do the proton pump inhibitors bind in proton pump?
A) Serine B) Cysteine C) Lysine D) Histidine

50. What crucial feature of a penicillin is involved in its mechanism of action?
A) Carboxylic acid B) β-lactam
C) Acyl-side chain D) Thiazelidine ring

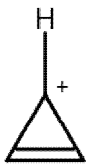
51. What are the types of chirality associated with carbon nanotubes?
A) Metallic, semiconducting, superconducting
B) Divergent, convergent, and zigzag
C) Crystalline, amorphous, and polycrystalline
D) Chiral, armchair, zigzag

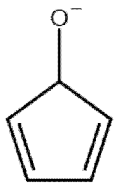
52. Identify the IUPAC name of the following compound:

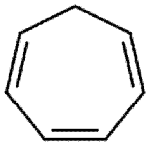


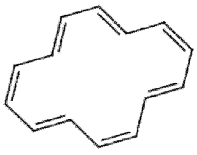
A) 1,7,7- Trimethylbicyclo[2.2.0]heptane-2-one
B) 1,7,7- Trimethylbicyclo[2.2.1]heptane-6-one
C) 1,7,7- Trimethylbicyclo[2.2.1]heptane-2-one
D) 1,2,2- Trimethylbicyclo[2.2.0]heptane-5-one

53. The species or compounds that are aromatic among the following are:

1. 

2. 

3. 

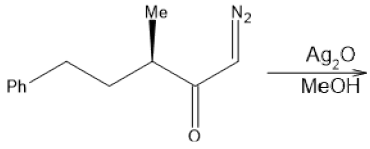
4. 

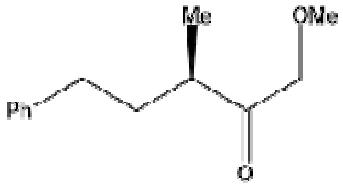
A) 3 & 4 only B) 1 & 2 only C) 2 & 4 only D) 1 & 4 only

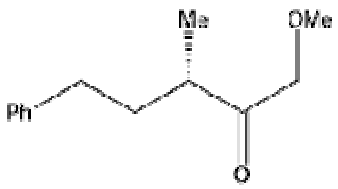
54. Which of the following ions exhibits colour in aqueous solution?
A) Sc^{3+} B) Ni^{2+} C) Ti^{4+} D) Zn^{2+}

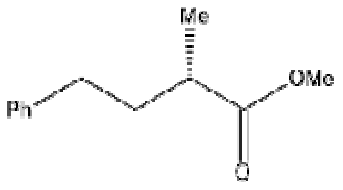
55. Identify the correct set of quantum numbers for the outermost electrons of Cesium (atomic number 55)
A) 6, 0, 0, +½ B) 5, 1, 0, +½ C) 5, 1, 1, +½ D) 6, 1, 0, +½

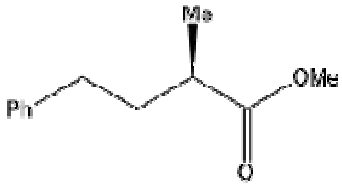
56. The major product formed in the following reaction is:



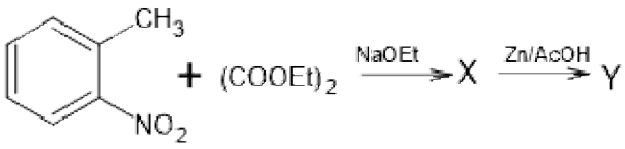
A) 

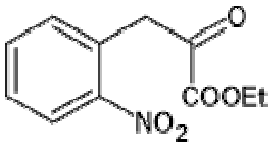
B) 

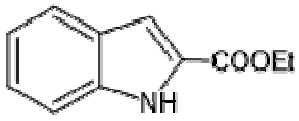
C) 

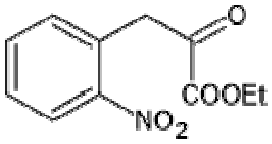
D) 

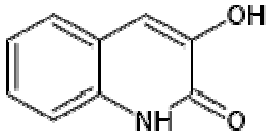
57. In the following reaction sequence, structures of the major products X and Y are:

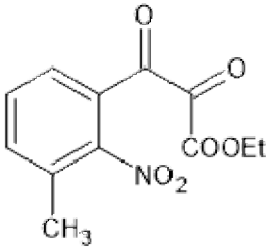


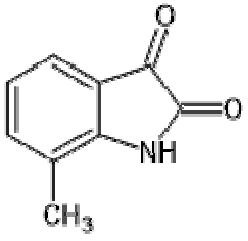
A) X is 

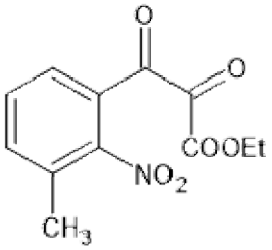
Y is 

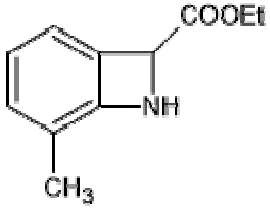
B) X is 

Y is 

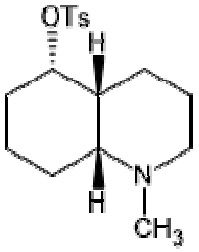
C) X is 

Y is 

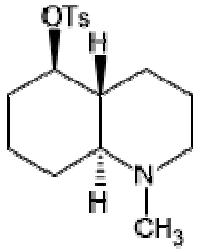
D) X is 

Y is 

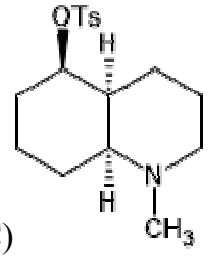
58. Among the following decahydroquinoline toluenesulphonates, the one that yields 9-methylamino-E-non-5-enal as a major product upon aqueous solvolysis is:



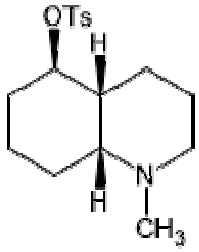
A)



B)

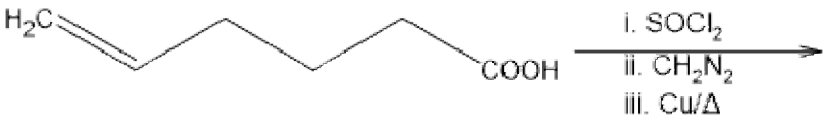


C)

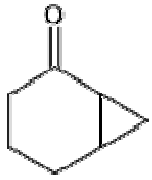


D)

59. The major product in the following transformation is:



A)



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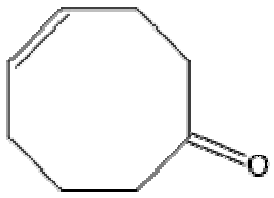
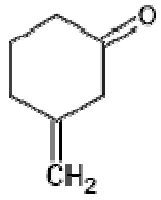


C)



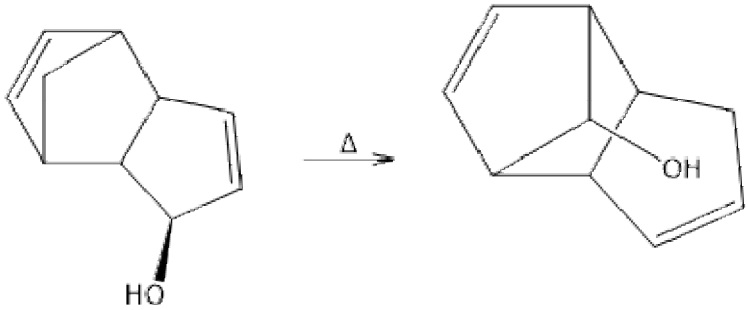
D)

60. Addition of BH_3 to carbon-carbon double bond is:

A) Anti-Markovnikov syn addition
B) Anti-Markovnikov anti addition
C) Markovnikov syn addition
D) Markovnikov anti addition

61. Tollen's test is NEGATIVE for:
A) Mannose B) Sucrose C) Maltose D) Glucose

62. The pericyclic reaction given below is an example of:



A) [1,3]-sigmatropic shift B) [3,3]-sigmatropic shift
C) [3,5]-sigmatropic shift D) [1,5]-sigmatropic shift

63. From carboxymethyl-cellulose column at pH 6.0 arginine, valine and glutamic acid will elute in the order:
A) Arginine, valine, glutamic acid
B) Arginine, glutamic acid, valine
C) Glutamic acid, arginine, valine
D) Glutamic acid, valine, arginine

64. Which of the following elements will have the lowest first ionization energy?
A) Mg B) Li C) Rb D) Ca

65. The correct order of increasing ionic radius:
A) $Na^+ > Mg^{2+} > Li^+ > Be^{2+}$ B) $Be^{2+} < Li^+ < Mg^{2+} < Na^+$
C) $Be^{2+} < Li^+ < Na^+ < Mg^{2+}$ D) $Li^+ < Be^{2+} < Na^+ < Mg^{2+}$

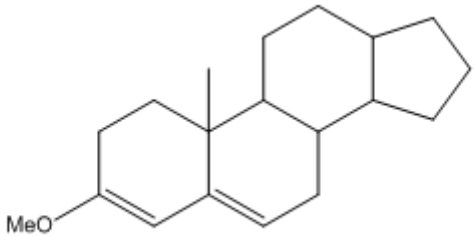
66. Number of lone pairs and bond pairs attached to Xenon in XeO_3 is:
A) 1, 3 B) 0, 3 C) 1, 6 D) 3, 6

67. Assertion (A): Pyridine is a weaker base than pyrrole
Reason (R) : pKa of pyridine is 5.2 and that of pyrrole is 23

A) Both A and R are true and R is the correct explanation of A
B) Both A and R are true but R is not the correct explanation of A
C) Both A and R are false
D) A is true but R is false

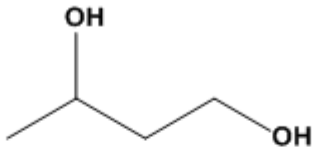
68. Which of the following compounds with molecular formula $C_{10}H_{12}O_3$ shows δ 7.86 (d, 2H), 6.88 (d, 2H), 4.29 (q, 2H), 3.9 (s, 3H), 1.3 (t, 3H) ppm?
A) 4-Ethoxy acetophenone
B) Ethyl 4-ethoxy benzoate
C) Ethyl 4-Methoxy benzoate
D) 4-Methoxyacetophenone

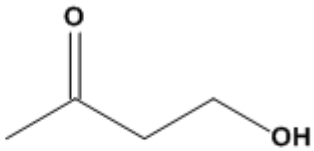
69. Calculate λmax of the following compound:

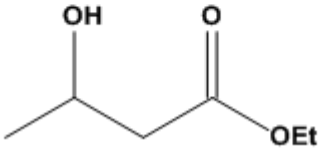


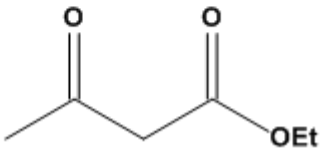
A) 352 B) 240 C) 280 D) 220

70. Which is the reduction product of ethyl 3-oxobutanoate with $NaBH_4$ in methanol?

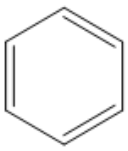
A) 

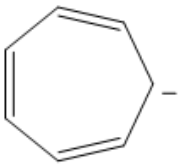
B) 

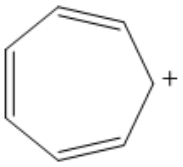
C) 

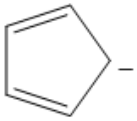
D) 

71. Which of the following is **not** aromatic?

A) 

B) 

C) 

D) 

72. Which of the following statements best describes a lead compound?

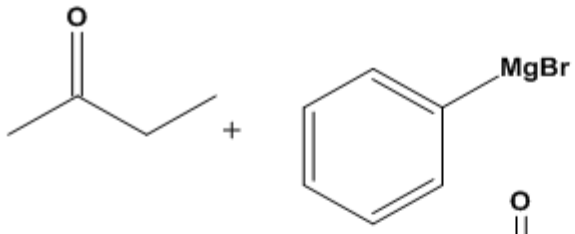
A) A compound that contains the element lead.

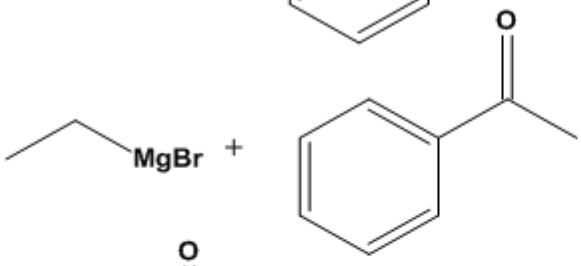
B) A compound from the research laboratory that is chosen to go forward for preclinical and clinical trials.

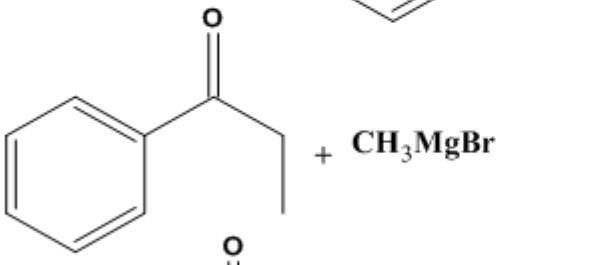
C) A molecule that shows some activity or property of interest and serves as the starting point for the development of a drug

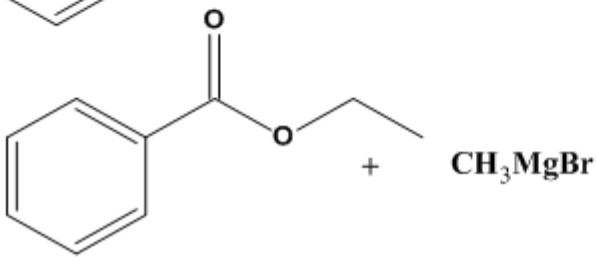
D) The first compound of a structural class of compounds to reach the market

73. Which pair of reactants for a Grignard reaction does **not** give 2-phenylbutan-2-ol after an aqueous workup?

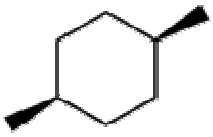
A) 

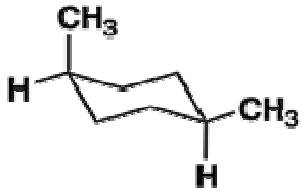
B) 

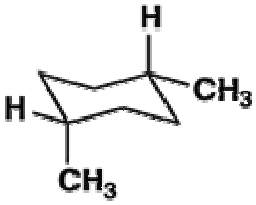
C) 

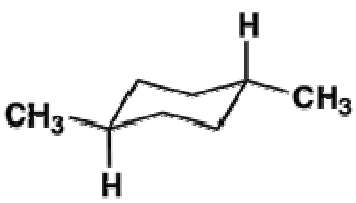
D) 

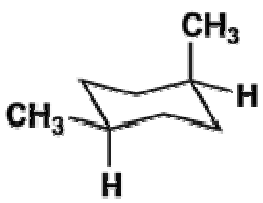
74. Which structure is different from the following?



A) 

B) 

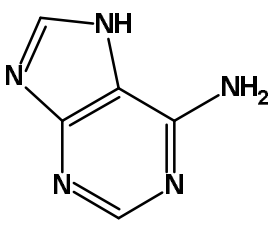
C) 

D) 

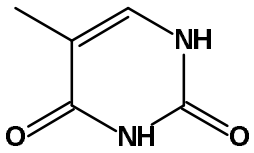
75. Which of the following is **not** true about the structure of camphor?
A) Bicyclic compound
B) All carbon atoms are sp3 hybridised
C) IUPAC name is 1,7,7-trimethylbicyclo[2,2,1]heptan-2-one
D) Contains two chiral centres

76. Which of the following statements is true?
A) Edman reagent and Sangers reagent are phenylisothiocyanate and 1-fluoro-2,4-dinitrobenzene respectively
B) Edman reagent react to N -terminal and Sangers reagent react to C -terminal end
C) Glycine can not be detected with both reagents
D) The product of the reaction between amino acid and Edmans reagent is phenylhydantoin

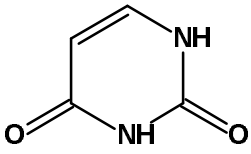
77. The structures of the nucleic acid bases given below are respectively:



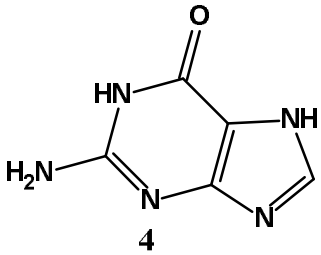
1



2



3

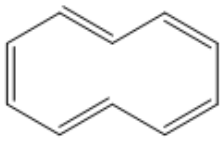


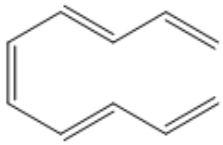
4

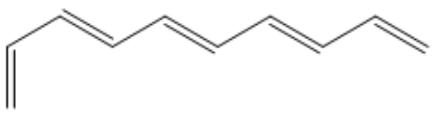
A) Adenine (A), guanine (G), cytosine (C) and thymine (T)
B) Adenine (A), guanine (G), thymine (T) and uracil (U)
C) Adenine (A), cytosine (C), thymine (T), and uracil (U)
D) Adenine (A), thymine (T), uracil (U) and guanine (G)

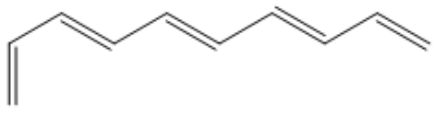
78. The second order Bragg diffraction of X-rays with $\lambda = 1.00$ Å from a set of parallel planes in a metal occurs at an angle 60°. The distance between the scattering planes in the crystal
A) 2.00 Å B) 1.00 Å C) 0.575 Å D) 1.15 Å

79. Which of the following is the correct structure of (3E,5Z,7E)-deca-1,3,5,7,9-pentaene:

A) 

B) 

C) 

D) 

80. Select the correct statements about ozone:
1. O-O bond lengths are equal
2. Ozone is diamagnetic in nature
3. O-O-O bond angle is 116^0
4. Thermal decomposition of ozone is endothermic
5. The ozone layer is a region of Earth's stratosphere

A) 1, 2, 3, 4 & 5 B) 1, 4 & 5 only
C) 1, 2, 3 & 5 only D) 2, 3 & 4 only

81. Among the following complexes **(K-P)**
$K_3[Fe(CN)_6]$ **(K)**, $[Co(NH_3)_6]Cl_3$ **(L)** , $Na_3[Co(C_2O_4)_3]$ **(M)** , $[Ni(H_2O)_6]Cl_2$ **(N),** $K_2[Pt(CN)_4]$ **(O)** and $[Zn(H_2O)_6](NO_3)_2$ **(P)** the diamagnetic complexes are:

A) K, L, M, N B) K, M, O, P C) L, M, O, P D) L, M, N, O

82. Consider the following cell reaction:
$2Fe_{(s)} + O_2 + 4H^+_{(aq)} \rightarrow 2Fe^{2+}_{(aq)} + 2H_2O_{(l)}$ $E^0 = 1.67V$ at $[Fe^{2+}] = 10^{-3}$ M, P (O^2)= 0.1 atm and pH=3, the cell potential at 25^0C is:

A) 1.47 V B) 1.77V C) 1.87 V D) 1.57 V

83. How much charge is required for the reduction of $\mathbf{Cr_2O_7^{2-}} \rightarrow 2Cr^{3+}$?
A) 5F B) 6F C) 9F D) 12F

84. The decomposition of NH_3 on platinum surface is zero order reaction. If $k = 3 \times 10^{-3}$ mol L^{-1} s^{-1} the rate of production of H_2 is:
A) $9 X10^{-3}$ mol L^{-1} s^{-1} B) $6 X10^{-3}$ mol L^{-1} s^{-1}
C) $4.5 X10^{-3}$ mol $L^{-1}s^{-1}$ D) $3 X10^{-3}$ mol L^{-1} s^{-1}

85. Assertion (A): Rate of reaction doubles when concentration of reactant is doubled if it is a first order reaction.
Reason (R): Rate constant also doubles.

A) Both A and R are true and R is the correct explanation of A
B) Both A and R are true but R is NOT the correct explanation of A
C) A is true but R is false
D) A is false and R is true

86. A colourless aqueous solution contains nitrates of two metals, X and Y. When it was added to an aqueous solution of NaCl, a white precipitate was formed. This precipitate was found to be partially soluble in hot water to give a residue P and a solution Q. The residue P was soluble in aq. NH3 and also in excess sodium thiosulfate. The hot solution Q gave a yellow precipitate with KI. The metals X and Y, respectively, are:

A) Ag and Pb B) Ag and Cd C) Cd and Pb D) Cd and Zn

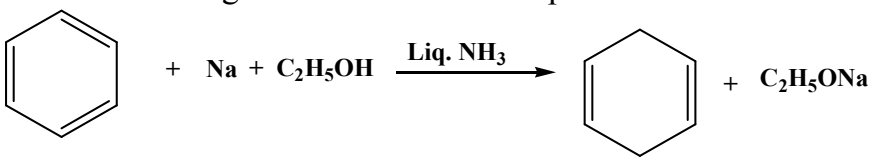
87. The standard enthalpies of formation of $CO_2(g)$, $H_2O(l)$ and glucose(s) at 25^0C are –400 kJ/mol, –300 kJ/mol and –1300 kJ/mol, respectively. The standard enthalpy of combustion per gram of glucose at 25^0C is:

A) +2900 kJ B) – 2900 kJ C) –16.11 kJ D) +16.11 kJ

88. Polydispersity index (PDI) is defined a -----where Mw and Mn are the weight average and number average molecular masses respectively.

A) Mw x Mn B) Mw/Mn C) Mn/Mw D) Mw – Mn

89. The reaction given below is an example of :



A) Birch reduction B) Hydride transfer reduction
C) Clemmenson reduction D) Wolf-Kishner reduction

90. Classify the following species as electrophiles (E) and nucleophiles (N) in the routine organic synthesis.
SO_3, Cl^+, CH_3NH_2, H_3O^+, BH_3, CN^-

A) E= SO_3, Cl^+, BH_3 ; N= CH_3NH_2 , H_3O^+, CN^-
B) E=Cl^+, H_3O^+ ; N= CH_3NH_2, SO_3, BH_3, CN^-
C) E= H_3O^+, Cl^+, BH_3 ; N= CH_3NH_2 , H_3O^+, CN^-, SO_3
D) E= SO_3, Cl^+, BH_3, H_3O^+ ; N= CH_3NH_2 , CN^-

91. $BaTi[Si_3O_9]$ is a class of:

A) Orthosilicate B) Cyclic silicate
C) Chain silicate D) Sheet silicate

92. In photosynthesis, the predominant metal present in the reaction centre of photosystem II is:

A) Zn B) Cu C) Mn D) Fe

93. The reaction Sucrose + Water→ Glucose + Fructose under alkaline condition is a pseudo first order reaction. The reaction has a half life of 16.8minutes. Calculate the time required for the reduction of sucrose concentration from 8mM to 1mM

A) 16.8 B) 33.6 C) 50.4 D) 67.2

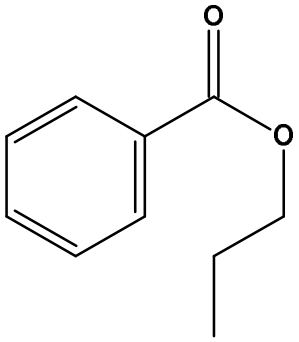
94. The ratio of relative intensities for the two peaks at m/z 94 and 96 in the mass spectrum of methyl bromide (CH_3Br) is:

A) 1:3 B) 3:1 C) 1:1 D) 1:2

95. The number of terminal carbonyl groups present in $Fe_2(CO)_9$ is:

A) 6 B) 3 C) 9 D 2

96. According to IUPAC rules what is the name of the compound shown below?



A) Benzyl propanoate B) Phenyl propanoate
C) Phenyl butanoate D) 1-Propyl benzoate

97. What is orbital angular momentum quantum number, *l*, of the electron which is most likely to be removed when ground state aluminium is ionized ?
A) 1 B) 0 C) 2 D) 3

98. Considering 0.1M aqueous solutions of each of the following which solution has the lowest pH?
A) Na_2CO_3 B) Na_3PO4 C) NaCl D) CH_3COONa

99. The method of zone refining is used to prepare ultra pure samples of:
A) Cu B) Ag C) Au D) Ge

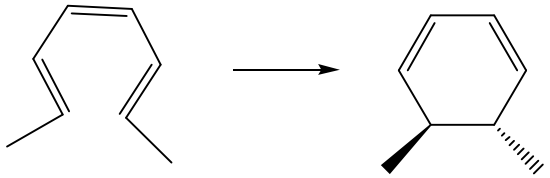
100. Which of the following is an out of plane bending vibration?
A) Twisting B) Scissoring
C) Rocking D) Symmetric stretching

101. The spectral line due to transition from □=0 to □=2 transition is called:
A) Fundamental band B) First overtone
C) Second overtone D) Base peak

102. What happens to vapour pressure of water when sodium chloride is added into it?
A) Decreases B) Increases C) No change D) Expand

103. The hybridisation of central atoms in I_3^-, ClF_3 and SF_4 respectively are:
A) sp, sp^3d and dsp^2 B) sp^3d, sp^2 and dsp^2
C) sp, sp^2 and sp^3d D) sp^3d, sp^3d and sp^3d

104. The Woodward-Hoffman condition to bring out the following transformation is:



A) Δ , Conrotatory B) Δ, Disrotatory
C) h□, Disrotatory D) h□, conrotatory

105. What is styx number of B_2H_6:

A) 2002 B) 2001 C) 2202 D) 2022

106. Which of the following is a hard acid?

A) Li^+ B) Cu^+ C) Ag^+ D) Au^+

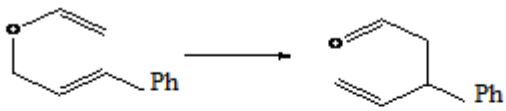
107. Which of the following is a metal carbene complex used as catalyst in organic synthesis?

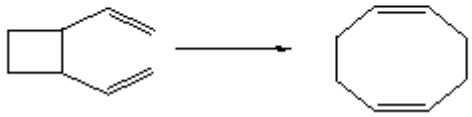
A) Grubbs catalyst B) Wilkinson catalyst
C) Zeigler- Natta catalyst D) Both A and B

108. The ligand system present in vitamin B_{12} is:

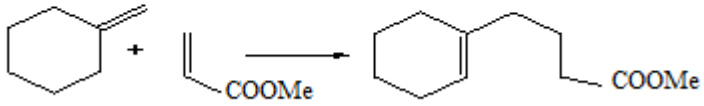
A) Cyanide B) Corrin
C) Crown ether D) Phthalocyanine

109. Which of the following reactions is classified as an electrocyclic reaction?

A) 

B) 

C) 

D) 

110. Number of sigma bonds and pi bonds present in allene is:
A) 6 and 2 B) 2 and 6 C) 4 and 4 D) 3 and 2

111. What is the symmetry point group pf XeF_4?
A) C_{3v} B) C_{2V} C) D_{4h} D) D_{3h}

112. Which of the following is **not** a greenhouse gas?
A) Carbon dioxide B) Methane
C) Nitrous oxide D) Nitrogen

113. Calculate percentage atom economy in the following reaction.
Cyclohexene + Bromine → 1,2- Dibromo cyclohexane

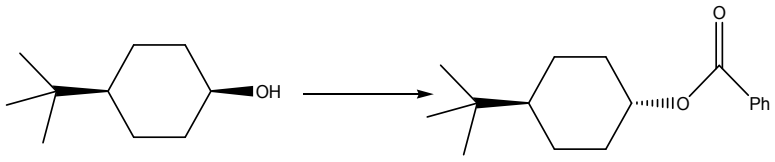
A) 65 B) 52 C) 100 D) 25

114. What is the hybridisation of carbon atoms in C-60 fullerene?
A) sp B) sp^2 C) sp^3d D) sp^3d^2

115. In differential thermal analysis (DTA):
A) The temperature differences between the sample and reference are measured as a function of temperature
B) The differences in heat flow into the reference and sample are measured as a function of temperature
C) The change in the mass of the sample is measured as a function of temperature
D) The glass transition is observed as a sharp peak

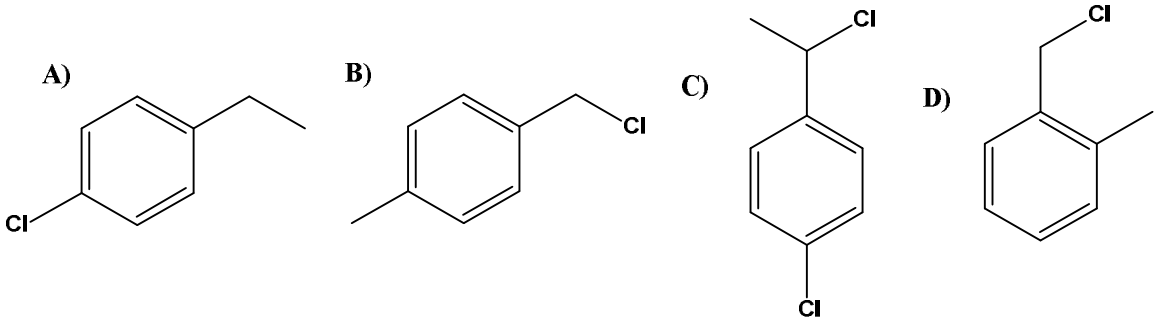
116. Dispersed phase and dispersion medium for Foam are:
A) Solid, liquid B) Gas , liquid
C) Liquid, gas D) Liquid, liquid

117. The most suitable reagent combination bring out the following transformation:



A) PhCOCl, pyridine B) DCC and PhCOOH
C) PhBr, CO and $Pd(PPh_3)_4$ D) DEAD, PPh_3 and PhCOOH

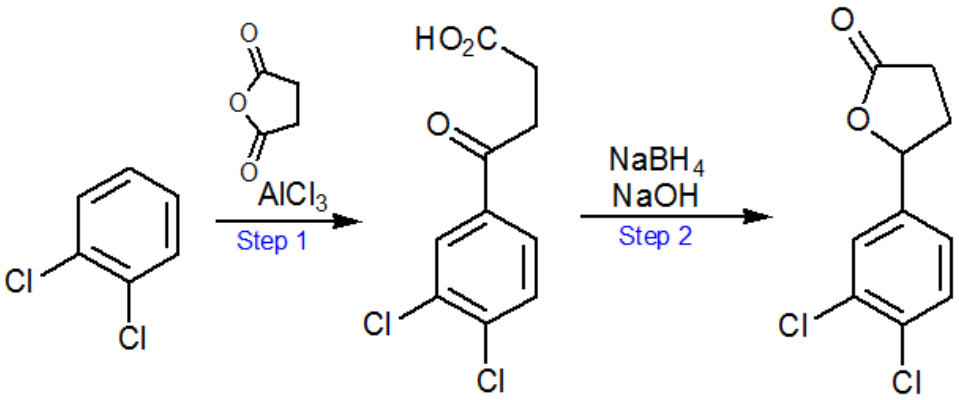
118. A compound shows 1 H NMR peaks at δ values (in ppm) 7.31 (2H), 7.21 (2H), 4.5 (2H) and 2.3 (3H) . The structure of the compound:



119. Which of the following is **not** true about the structure of cholesterol?

A) Cholesterol contains a double bond.
B) Cholesterol contains a OH group.
C) Cholesterol contains three six membered rings
D) Cholesterol contains three terminal methyl groups

120. What sort of selectivity is observed in step 1 of the following synthesis?



A) Chemo selectivity
B) Regioselectivity
C) Stereospecificity
D) Enantioselectivity
