

- The NMR spectrum of  $\text{CH}_3\text{CHFBr}$  with strong  $^1\text{H}$  and  $^{19}\text{F}$  coupling, the two different type of hydrogen environment exhibit
  - Doublet and doublet of quartet
  - Doublet and quartet
  - Double doublet and doublet of quartet
  - Two quartets
- The entropy of CO crystals at absolute zero is
  - $5.76 \text{ JK}^{-1}\text{mol}^{-1}$
  - 0
  - $0.69 \text{ JK}^{-1}\text{mol}^{-1}$
  - Cannot predict
- If  $e^{ikx}$  is an eigen function of momentum operator, its eigen value will be:
  - $\hbar$
  - k
  - $\hbar k$
  - $\hbar k/2$
- What is the degeneracy of the diatomic rotational energy level of  $6h^2/4\pi^2I$  ( $I = \text{Moment of inertia}$ )?
  - 7
  - 5
  - 3
  - 2
- Term symbol for  $\text{F}^{2+}$  ions is:
  - $^1\Sigma_g^+$
  - $^2\Sigma_u^+$
  - $^2\pi_u$
  - $^2\pi_g$
- Use Hückel theory to determine the energies of the  $\pi$  orbitals of the allyl radical system,  $\text{C}_3\text{H}_4$ .
  - $\alpha + \beta, \alpha, \alpha - \beta$
  - $\alpha + 2\beta, \alpha, \alpha - 2\beta$
  - $\alpha, \alpha, \alpha$
  - $\alpha + \sqrt{2}\beta, \alpha, \alpha - \sqrt{2}\beta$
- If two operations commute, then
  - They are Hermitian
  - They are linear
  - They have the same eigen functions
  - They have the same eigen values
- $\text{MX}_6$  is a molecule with  $\text{sp}^3\text{d}^2$  hybridization. How many  $\text{X} - \text{M} - \text{X}$  bonds are at  $180^\circ$  present in its geometry?
  - four
  - two
  - three
  - six
- Why does sodium chloride not conduct electricity in its solid form?
  - Ions in its structure are in fixed positions.
  - It contains no free electrons.
  - It has a giant covalent molecular structure.
  - Ions in its structure only have single negative and single positive charges.

10. Which statement is true about the change in symmetry on going from  $\text{BF}_3$  to  $[\text{BF}_4]^-$ ?
- A) The point group changes from  $D_{3h}$  to  $T_d$   
 B) The point group changes from  $C_{3v}$  to  $T_d$   
 C) The point group changes from  $D_{3h}$  to  $D_{4h}$   
 D) The point group changes from  $D_{3h}$  to  $C_{3v}$
11. The symmetric stretching mode for  $\text{PCl}_3$  is of  $A_1$  symmetry. In the  $C_{3v}$  character table, there are  $z$  and  $(x^2 + y^2, z^2)$  entries in the  $A_1$  row. This tells you that the symmetric stretching mode of  $\text{PCl}_3$  is:
- A) IR active and Raman inactive  
 B) IR active and Raman active  
 C) IR inactive and Raman active  
 D) IR inactive and Raman inactive
12. To check that a secondary alcohol has been completely oxidised to a ketone you can check that the IR spectrum has.
- A) absorptions at  $3500\text{ cm}^{-1}$  and  $1650\text{ cm}^{-1}$   
 B) no absorption around  $1650\text{ cm}^{-1}$   
 C) no absorption around  $3500\text{ cm}^{-1}$   
 D) no absorptions at  $3500\text{ cm}^{-1}$  and  $1650\text{ cm}^{-1}$
13. For the following four molecules: acetone, benzene, dimethyl ether, ethane (each of which contains only one type of proton) the correct order of chemical shift (in  $\delta$  units) is which of the following?
- A) Benzene > dimethyl ether > acetone > ethane  
 B) Benzene > ethane > acetone > dimethyl ether  
 C) Benzene < acetone < dimethyl ether < ethane  
 D) Benzene < ethane < acetone < dimethyl ether
14. Which of the following statements is correct about the principal moments of inertia of an XY molecule that lies on the A axis?
- A)  $I_A = 0$ , and  $I_B = I_C$                       B)  $I_A = I_B$ , and  $I_C = 0$   
 C)  $I_A > I_B$ , and  $I_B = I_C$                       D)  $I_A = I_B = I_C$
15. Which one of the following statements about the mass spectrum of  $\text{CH}_3\text{Br}$  is correct?
- A) the last two peaks are of equal size and occur at  $m/z$  values of 94 and 96  
 B) the last two peaks have abundances in the ratio 3:1 and occur at  $m/z$  values of 94 and 96  
 C) there is just one peak for the molecular ion with an  $m/z$  value of 95  
 D) there is just one peak for the molecular ion with an  $m/z$  value of 44
16. If  $p$ ,  $T$ ,  $H$ , and  $U$  are pressure, temperature, enthalpy and internal energy respectively, then the Joule-Thomson coefficient is defined as
- A)  $\left(\frac{\partial T}{\partial p}\right)_H$                       B)  $\left(\frac{\partial H}{\partial p}\right)_T$                       C)  $\left(\frac{\partial p}{\partial T}\right)_H$                       D)  $\left(\frac{\partial T}{\partial H}\right)_p$

17. 40 ml of 0.1 M HCl is mixed with 10 ml of 0.45 M NaOH. Calculate the pH of resultant solution.  
 A) 2                      B) 7                      C) 14                      D) 12
18. The entropy of a monoatomic gas can be evaluated using  
 A) Boltzmann equation                      B) Sackur-Tetrode equation  
 C) Nernst-Einstein equation                      D) Clausius- Clapeyron equation
19. Which one of the following statements most accurately relates the properties of a liquid at room temperature with its vapour pressure?  
 A) A liquid with a low vapour pressure will probably have a high surface tension and a high boiling point.  
 B) A liquid with a low vapour pressure will probably have a low surface tension and a high boiling point.  
 C) A liquid with a high vapour pressure will probably have a low surface tension and a high boiling point.  
 D) A liquid with a low vapour pressure will probably have high intermolecular forces and a low boiling point.
20. KCl crystallises in the same type of lattice as does NaCl. Given that  $r_{\text{Na}^+}/r_{\text{Cl}^-} = 0.55$  and  $r_{\text{Na}^+}/r_{\text{K}^+} = 0.74$ , calculate the ratio of the side of the unit cell for KCl to that for NaCl  
 A) 0.732                      B) 1.224                      C) 1.414                      D) 1.122
21. X mL of H<sub>2</sub> gas effuses through a hole in a container in 5 seconds. The time taken for the effusion of the same volume of the gas specified below under identical conditions is:  
 A) 55 seconds : CO<sub>2</sub>                      B) 25 seconds : CO  
 C) 20 seconds : O<sub>2</sub>                      D) 10 seconds : He
22. Which of the following relations are incorrect?  
 1.  $\left(\frac{\partial H}{\partial S}\right)_P = T$ ,                      2.  $\left(\frac{\partial G}{\partial T}\right)_V = -S$ ,                      3.  $\left(\frac{\partial E}{\partial T}\right)_P = T$ ,                      4.  $\left(\frac{\partial E}{\partial V}\right)_S = -P$   
 A) 1 and 2 only    B) 2 and 3 only    C) 3 and 4 only    D) 1 and 3 only
23. Choose the wrong statement  
 A) The electronic partition function is equal to the statistical weight factor.  
 B) Fermion and boson probability distributions become more and more like the Boltzmann distribution as the energy increases.  
 C) The entropy increases with increasing molar mass.  
 D) Molecular partition functions are equally factored into translational, rotational and vibrational and electronic factors

24. Find the increase in equilibrium concentration of  $\text{Fe}^{3+}$  ions if  $\text{OH}^-$  ions concentration decreases to 1/4th in the following reaction

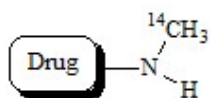


- A) 8 times      B) 16 times      C) 4 times      D) 64 times
25. Under the same reaction conditions, initial concentration of 1.155 mol/L of a substance becomes half in 60 seconds and 15 seconds through first- order and zero-order kinetics respectively. Ratio of the rate constant for first -order and zero- order of the reaction is:  
A) 1.2 mol/L      B) 0.9 mol/L      C) 0.6 mol/L      D) 0.3 mol/L
26. An Eyring plot allows you to find the activation parameters  $\Delta H^\ddagger$  and  $\Delta S^\ddagger$  from the temperature ( $T$ ) dependence of the rate constant ( $k$ ). What would you plot against what in a typical Eyring graph?  
A)  $\ln k$  against  $1/T$       B)  $\ln(k/T)$  against  $1/T$   
C)  $\ln(k/T)$  against  $T$       D)  $\ln(1/T)$  against  $kT$
27. Which of the following is incorrect about Transition state theory?  
A) It is based on statistical mechanics  
B) The formation of activated complex to be rapid  
C) The decomposition of activated complex is slow  
D) The formation of activated complex is the rate determining step
28. Consider the overall reaction of the rechargeable nickel-cadmium battery:  
 $\text{NiO}_2(\text{s}) + \text{Cd}(\text{s}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow \text{Ni}(\text{OH})_2(\text{s}) + \text{Cd}(\text{OH})_2(\text{s})$   
Which of the following occurs at the anode as the reaction proceeds?  
A) Cd loses  $2e^-$  and forms  $\text{Cd}(\text{OH})_2(\text{s})$   
B) Cd gains  $2e^-$  and forms  $\text{Cd}(\text{OH})_2(\text{s})$   
C)  $\text{NiO}_2$  loses  $2e^-$  and forms  $\text{Ni}(\text{OH})_2(\text{s})$   
D)  $\text{NiO}_2$  gains  $2e^-$  and forms  $\text{Ni}(\text{OH})_2(\text{s})$
29. What is the potential of an electrode consisting of Zinc metal in a solution in which the zinc ion concentration is 0.0100 M ?  
A)  $-0.822\text{V}$       B)  $-1.2\text{V}$       C)  $-1.51\text{V}$       D)  $+1.45\text{V}$
30. Which one of the following statements is not correct?  
A) Since voltage depends on concentrations, using standard conditions makes it easier to compare different electrochemical reactions.  
B) We have to measure the cell potential to obtain the difference in potential because the potential of half-reactions cannot be measured directly.  
C) The direction of a redox reaction can only be determined experimentally.  
D) Half-cell potentials for half-reactions are determined by combining the relevant half-cell with a standardised half-cell

31. At very high pressure the Langmuir adsorption isotherm is represented as ( 'x' is the mass of the gas adsorbed on 'm' g of the adsorbent, 'a' and 'b' are constants, 'p' is the pressure)
- A)  $x/m = b/a$     B)  $x/m = 1/ap$     C)  $x/m = ap$     D)  $x/m = a/b$
32. Which of the following is correct for lyophilic sol?
- A) Irreversible sol  
 B) Readily coagulated by addition of electrolyte  
 C) Formed from inorganic substances  
 D) Self stabilized
33. Colloidal sulphur may be produced by reaction between solutions of :
- A)  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{I}_2$                       B)  $\text{H}_2\text{S}$  and  $\text{FeCl}_3$   
 C)  $\text{Na}_2\text{S}$  and  $\text{FeCl}_2$                       D)  $\text{Na}_2\text{S}_2\text{O}_3$  and  $\text{HI}$
34. A surfactant with a very large Hydrophile-Lipophile Balance (HLB) value (e.g. 40) is expected to function as a:
- A) Anti-foaming agent                      B) Solubility enhancer emulsifier  
 C) Oil in water (o/w) emulsifier    D) Water in oil(w/o)
35. If B is denoted as the rotational constant, then the energy difference between adjacent rotational energy levels
- A) is equal to  $2B$   
 B) increases with increase in J value  
 C) decreases with increase in J value  
 D) is equal to B
36. ----- errors does not fall under the category of constant errors.
- A) Operational    B) Reagent    C) Erratic    D) Proportional
37. What is meant by the term 'data quality'?
- A) The lineage of the data  
 B) The generalization present in the source data  
 C) The resolution of the data  
 D) The inherent quality of the data as characterized by its accuracy, precision, bias and level of error
38. The solubility product ,  $K_{sp}$  of  $\text{CaSO}_4$  is  $6.4 \times 10^{-5}$ , The solubility of  $\text{CaSO}_4$  in mol/liter is:
- A)  $8 \times 10^{-5}$                       B)  $8 \times 10^{-3}$                       C)  $8 \times 10^{-10}$                       D)  $1.6 \times 10^{-3}$
39. In which of the following precipitates  $\text{K}^+$  form its solution?
- A) Sodium ferrocyanide                      B) Sodium bicarbonate  
 C) Sodium cobaltinitrite                      D) Sodium argentocyanide
40. An isocratic elution in HPLC is one in which the composition of the solvent
- A) remains constant                      B) changes continuously  
 C) changes in a series of steps    D) none of these

41. The use of insulin hormone to purify its receptor is an example of:
- Affinity chromatography
  - Ion exchange chromatography
  - Gel filtration chromatography
  - Ligand mediated chromatography
42. Which of the following separation method is suited for a protein sample with large differences in molecular mass?
- Dialysis
  - Rate zonal centrifugation
  - Density gradient centrifugation
  - Salting out process
43. Which type of compounds in water are most suitable for trapping at low concentrations using solid phase extraction (SPE) with large water volumes if using non-polar stationary phase.
- ionic compounds
  - highly polar compounds
  - moderately polar compounds
  - weakly polar compounds
44. Which of the following additives can be used to extract an anion such as perchlorate from an aqueous phase to an organic phase?
- no additive is needed
  - use of an ion pair reagent
  - use of an anionic ligand
  - use of a crown ether
45. Fluorescence occurs within-----.
- $10^{-5}$  s.
  - $10^{-5}$  ms.
  - $10^{-5}$   $\mu$ s.
  - $10^{-5}$  ns.
46. Optical fiber operates on the principle of
- Total internal reflectance
  - Photo-conduction
  - Photo-electric effect
  - Laser technology
47. Which sentence is false about Turbidimetry ?
- Concerned with the measure of the intensity of the transmitted light as a function of concentration of the suspended particle in a suspension.
  - Greater concentration of particle more the intensity of light
  - Concentration is more transmission is less.
  - The intensity of transmitted light is measured in a line i.e.,  $180^\circ$  to the incident light
48. Limiting current in polarography depends on:
- Residual current
  - Diffusion current
  - Kinetic current
  - All the above

49. What problem might you foresee in labelling a drug as shown?

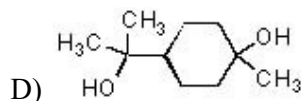
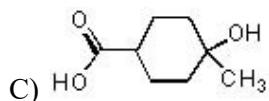
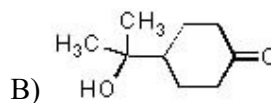
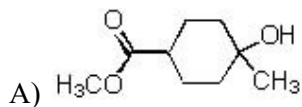
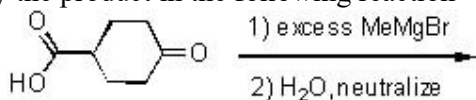


- A) The isotope could be easily lost since it is exchangeable with water  
B) The isotope could be lost as a result of a metabolic oxidation  
C) The isotope could be lost since it is acidic  
D) The isotope could be lost as a result of hydrolysis
50. Which pair of isotopes are likely to result in the greatest isotope effect?  
A) Carbon-12 and carbon-14    B) Carbon-12 and carbon-13  
C) Hydrogen and deuterium    D) Nitrogen-14 and nitrogen-15
51. Which of the following statements given below is false?  
A) TGA, DTA and DSC are measured using same instrument  
B) TGA and DTA can be carried out simultaneously.  
C) TGA, DTA and DSC are measured using different instruments.  
D) TMA is a recent name of Dilatometry
52.  $C_2H_4 + 1/2 O_2 \rightarrow C_2H_4O$  (Ethylene oxide). This reaction will takes place under presence of catalyst. Find out the % atom economy.  
A) 25.7%    B) 51.4%    C) 77.0%    D) 100.0%
53. Which of the following will give a pair of enantiomorphs?  
A)  $[Cr(NH_3)_6] [Co(NC)_6]$     B)  $[CoCl_2(en)_2]Cl$   
C)  $[Pt(NH_3)_4] [PtCl_6]$     D)  $[Co(NH_3)_6Cl_2] NO_2$
54. In which of the following molecules/ions,  $BF_3$ ,  $NO_2^-$ ,  $NH_2^-$  and  $H_2O$ , the central atom is  $sp^3$  hybridized?  
A)  $NO_2^-$  and  $NH_2^-$     B)  $BF_3$ , and  $NH_2^-$   
C)  $NH_2^-$  and  $H_2O$     D)  $BF_3$  and  $H_2O$
55. The reaction of  $S_4N_4$  with metallic potassium leads to the formation of...  
A)  $S_2N_2^-$     B)  $S_3N_3^-$     C)  $S_4N_4^{2-}$     D)  $S_2N_2$
56. For which of the following molecules would VSEPR theory predict a trigonal pyramidal structure?  
A)  $BrF_3$     B)  $BF_3$     C)  $PF_3$     D)  $ClF_3$
57. Reaction of  $B_2H_6$  with Na/Hg leads to the formation of .....  
A)  $Na[BH_4]$  and  $Na[B_3H_8]$     B)  $BH_3$  and  $B_3H_9$   
C)  $B_4H_{10}$     D)  $NaBH_4$ ,  $NaB_3H_8$  and  $B_4H_{10}$
58. Carborane  $C_2B_7H_{13}$  is named as:  
A) Dicarba-nido-heptaborane(13)  
B) Dicarba-closo- heptaborane(13)  
C) Dicarba-closo- nonaborane  
D) Dicarba-nido-nonaborane(13)

59. Arrange the following ions according to their magnetic moment
- (i)  $\text{Ni}^{2+}$       (ii)  $\text{Fe}^{3+}$       (iii)  $\text{Mn}^{4+}$       (iv)  $\text{V}^{4+}$
- At.No.s Ni = 28    (ii) Fe = 26    (iii) Mn = 25    (iv) V = 23
- A) (ii) > (iii) > (iv) > (i)      B) (ii) > (iii) > (i) > (iv)  
 C) (i) > (ii) > (iv) > (iii)      D) (iii) > (ii) > (iv) > (i)
60. The most important mineral of lanthanide is \_\_\_\_\_.  
 A) Monazite sand    B) Magnetite    C) Carnotites    D) Xenotime
61. Which of the following is most basic in nature?  
 A)  $\text{La}(\text{OH})_3$       B)  $\text{Nd}(\text{OH})_3$       C)  $\text{Lu}(\text{OH})_3$       D)  $\text{Gd}(\text{OH})_3$
62. Which of the following combinations can be regarded as hard acids?  
 A)  $\text{NCS}^-$  and  $\text{Hg}^{2+}$       B)  $\text{CN}^-$  and  $\text{Au}^+$   
 C)  $\text{Cu}^+$  and  $\text{CN}^-$       D)  $\text{SCN}^-$  and  $\text{Mn}^{2+}$
63. Among the following, the pair in which the two species are not isostructural is:  
 A)  $\text{PF}_6^-$  and  $\text{SF}_6$       B)  $\text{SF}_4$  and  $\text{SiF}_4$   
 C)  $\text{BH}_4^-$  and  $\text{NH}_4^+$       D)  $\text{IO}_3^-$  and  $\text{XeO}_3$
64. Ferromagnetic substances are a simple paramagnetics:  
 A) Below Neel temperature      B) Above Neel temperature  
 C) Below curie temperature      D) Above curie temperature
65. Identify the complex showing magnetic moment with 4 unpaired electrons  
 A)  $[\text{CoF}_3(\text{H}_2\text{O})_3]$     B)  $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$     C)  $[\text{Ti}(\text{H}_2\text{O})]^{3+}$     D)  $[\text{V}(\text{H}_2\text{O})_6]^+$
66. Which of the following organometallic compounds is the strong base?  
 A)  $\text{CH}_3\text{MgBr}$     B)  $\text{CH}_3\text{ZnBr}$     C)  $(\text{CH}_3)_2\text{CuLi}$     D)  $\text{CH}_3\text{Li}$
67. Which of the following statements about organometallic compounds is false?  
 A) An alkyllithium reagent is a very strong base  
 B) A Grignard reagent reacts as if it were a negatively charged carbanion  
 C) An organosodium compound is not very reactive compared to a Grignard reagent  
 D) Grignard reagents are decomposed by water and alcohol



68. Identify the product in the following reaction



69. What is oxidation number of Fe in Rubredoxin, Fe-S protein?

- A) +2                      B) +3                      C) +6                      D) +2 & +3

70. Reduction of nitrogen to ammonia, carried out by the enzyme nitrogenase, needs:

- A) 2 electrons    B) 4 electrons    C) 6 electrons    D) 8 electrons

71. Deoxy-hemocyanin is:

- A) Colourless and paramagnetic  
B) Ble and paramagnetic  
C) Colourless and diamagnetic  
D) Heme protein and paramagnetic

72. Calmoduline protein contains ----- calcium ions and -----amino acid residues, respectively:

- A) 4 and 148    B) 4 and 74    C) 6 and 148    D) 3 and 74

73. Self thermo regulated systems are called as-----.

- A) Green methodologies                      B) Green synthesis  
C) Green principles                              D) Green concepts

74. In petrochemical industry, both in conventional method and green synthesis what is the first product obtained?

- A) 2-ethyl benzene                              B) 2-methyl propyl benzene  
C) Methyl methacrylate                        D) Ethanol

75. Microwave dielectric heating works with-----and -----mechanism.

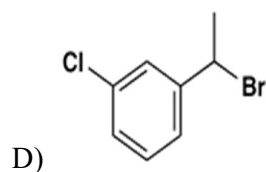
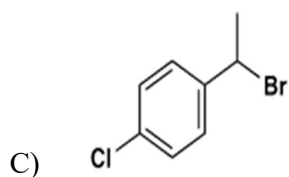
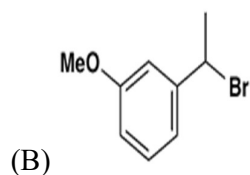
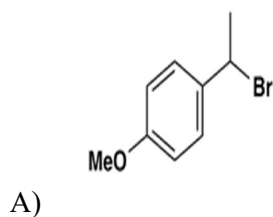
- A) Ionic conduction and electron polarization  
B) Electron polarization and dipolar polarization  
C) Dipolar polarization and ionic conduction  
D) Both A and C

76. Which of the following cyclodextrin is called cycloheptamylose.

- A)  $\alpha$ -Cyclodextrin                              B)  $\beta$ -Cyclodextrin  
C)  $\gamma$ - cyclodextrin                                D) None of these

77. The size of a quantum dot is ----- m.  
 A)  $5 \times 10^{(-7)}$     B)  $5 \times 10^{(-9)}$     C)  $5 \times 10^{(-10)}$     D)  $5 \times 10^{(-11)}$
78. Nano particles of which atom are used to control collateral damage due to explosion?  
 A) Copper    B) Carbon    C) Aluminium    D) Lead
79. The electrical conductivity of a nanotube is \_\_\_\_\_ times that of copper.  
 A) 10    B) 100    C) 1000    D) 1/100
80. The class of compounds that exhibit liquid crystalline behavior on variation of concentration are referred to as:  
 A) Lyotropic liquid crystals    B) Thermotropic liquid crystal  
 C) Isotropic liquids    D) None of these
81. The clean water should have BOD value  
 A) 40 mg/L    B) 20 mg/L  
 C) 10 mg/L    D) Less than 5 mg/L
82. The reason that temperature increases with altitude through most of the stratosphere is:  
 A) greenhouse gases warm the air  
 B) heat released by absorption of UV radiation by oxygen and ozone  
 C) water vapor levels are high and store heat  
 D) sunlight is more intense in the stratosphere
83. Which of the following statements about ozone is wrong?  
 A) Ozone can be used for the purification of drinking water  
 B) Ozone is one of the gases involved in the formation of photochemical smog  
 C) In the atmosphere concentration of ozone is maximum in the mesosphere  
 D) On the average ozone is more abundant at the poles than at the equator
84. Select the correct alternative from the following.  
 A) Hazard = exposure x risk    B) Exposure = hazard x risk  
 C) Risk = hazard x exposure    D) Risk = Hazard x toxicity
85. Which are natural sinks for ClO. radicals in other parts of stratosphere?  
 A) CH<sub>4</sub> and NO<sub>2</sub>    B) Cl<sub>2</sub> and O<sub>3</sub>    C) NO and NO<sub>2</sub>    D) SO<sub>2</sub> and NO
86. Which of the following polymer has weakest intermolecular forces of attraction ?  
 A) natural rubber    B) nylon  
 C) poly(vinyl chloride)    D) cellulose
87. Caprolactum needed for manufacture of nylon-6 is obtained by Beckman rearrangement of:  
 A) Benzophenone oxime    B) Cyclohexanone oxime.  
 C) Cyclopentanone oxime    D) Acetophenone oxime

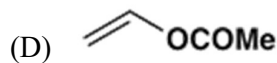
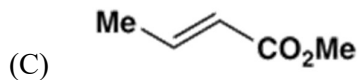
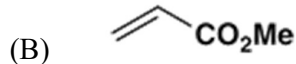
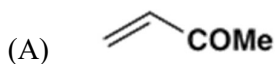
88. Arrange the following monomers in their decreasing ability to undergo anion polymerization  
 1.  $\text{CH}_2=\text{CHCN}$     2.  $\text{CH}_2=\text{CHCl}$     3.  $\text{CH}_2=\text{CHCH}_3$   
 A)  $\text{CH}_2=\text{CHCN} > \text{CH}_2=\text{CHCl} > \text{CH}_2=\text{CHCH}_3$   
 B)  $\text{CH}_2=\text{CHCl} > \text{CH}_2=\text{CHCN} > \text{CH}_2=\text{CHCH}_3$   
 C)  $\text{CH}_2=\text{CHCH}_3 > \text{CH}_2=\text{CHCN} > \text{CH}_2=\text{CHCl}$   
 D)  $\text{CH}_2=\text{CHCN} > \text{CH}_2=\text{CHCH}_3 > \text{CH}_2=\text{CHCl}$
89. Which of the following statements is true?  
 A) The most stable conformation of a drug is also the active conformation  
 B) The active conformation can be determined by conformational analysis  
 C) The active conformation is the most reactive conformation of a structure.  
 D) The active conformation is the conformation adopted by a drug when it binds to its target binding site
90. Which of the following software programmes is used for automated de novo drug design?  
 A) DOCK    B) # LUDI    C) CHEM3D    D) CoMFA
91. The unit of LD50 is -----.  
 A) gram/gram of animal body weight  
 B) milligrams/ kilogram of animal body weight  
 C) kilogram/gram of animal body weight  
 D) milligrams/gram of animal body weight
92. Which of the following is an example of a super enzyme?  
 A) Kinases    B) Non-ribosomal peptide synthases  
 C) Esterases    D) Proteases
93. The point group present in  $[\text{PdCl}_4]^{2-}$  is:  
 A)  $D_{4h}$     B)  $D_{5d}$     C)  $C_{\infty v}$     D)  $C_{4h}$
94. The potential site for chemical neurotoxicity is:  
 A) Neuron    B) Neuroglia    C) Axon    D) Synapse
95. Which is the least reactive compound by the  $\text{S}_{\text{N}}1$  mechanism?



96.  $S_N2$  mechanism proceeds through the formation of:
- A) Carbonium ion                      B) Transition state  
C) Free radical                        D) Carbanion
97. Which of the following statements is correct with respect to the carbanions?
- A) The carbon carrying the charge has even number of valence electrons  
B) They are formed through homolytic fission  
C) They have distorted octahedral structure  
D) The hybridisation of carbon in carbanion is  $sp^2$
98. Which combination of reagents is appropriate for the following transformation?

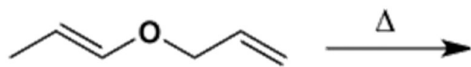


- A) 1)  $\text{HOCH}_2\text{CH}_2\text{OH}$ ,  $\text{H}^+$ ; 2).  $\text{LiAlH}_4$ ,  $\text{Et}_2\text{O}$ ; 3).  $\text{H}_3\text{O}^+$   
B) 1)  $\text{NaBH}_4$ ,  $\text{MeOH}$ ; 2).  $\text{LiAlH}_4$ ,  $\text{Et}_2\text{O}$ ; 3).  $\text{H}_3\text{O}^+$   
C) 1)  $\text{LiAlH}_4$ ,  $\text{Et}_2\text{O}$ ; 2).  $\text{H}_3\text{O}^+$   
D)  $\text{NaBH}_4$ ,  $\text{MeOH}$
99. Which of the following dienophiles is the least reactive in normal Diels-Alder reactions?



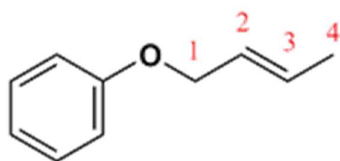
100. The reagent used in Dickmann condensation is:
- A) Anhy.  $\text{AlCl}_3$                       B)  $\text{Al}(\text{OCH Me})_3$   
C)  $\text{C}_2\text{H}_5\text{ONa}$                         D)  $\text{KNH}_2$  in Liquid  $\text{NH}_3$
101. Acetaldehyde ( $\text{CH}_3\text{CHO}$ ) undergoes a Wolf-Kishner reaction, which is the addition of hydrazine ( $\text{H}_2\text{NNH}_2$ ) with subsequent addition of a base and heat. In this reaction, the aldehyde is-----, resulting in a(n) ----- product.
- A) oxidized, .amide                      B) oxidized, carboxylic acid  
C) reduced, alkane                        D) reduced, alcohol
102. The conversion of pinacol to pinacolone using electrophilic reagents occurs via:
- A) a carbonium ion                      B) a carbene  
C) a free radical                        D) a carbanion

103. Which of unsaturated aldehydes (a)-(d) is the sigmatropic rearrangement product obtained by heating the following ether?



- A) B) C) D)

104. Which side-chain carbon makes a new bond to the benzene ring upon Claisen rearrangement of the following allylic phenyl ether?



- A) C1      B) C2      C) C3      D) C4

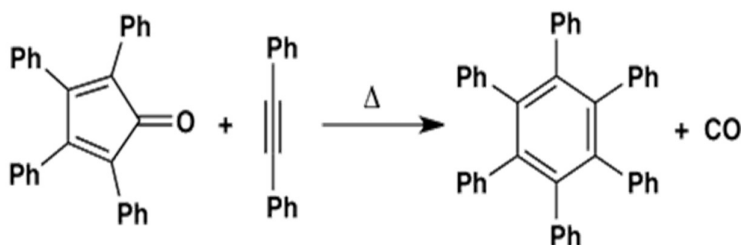
105. (2R,4S)-2,4-Dichloropentane and (2S,4R)-2,4-dichloropentane are:

- A) enantiomers      B) diastereomers  
C) identical      D) conformational isomers

106. Which of the following compounds has a stereoisomer that is a mesocompound?

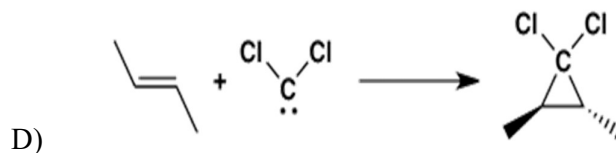
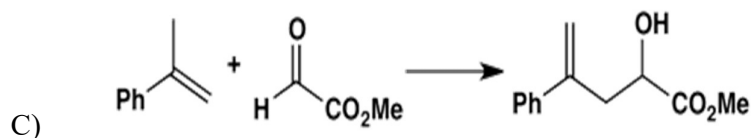
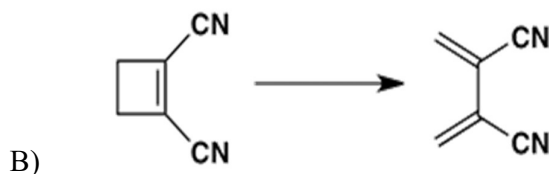
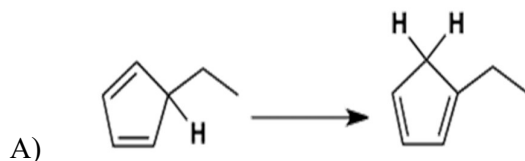
- A) 2,4-dibromohexane      B) 2,4-dibromopentane  
C) 1,4 dichlorocyclohexane      D) 2,4 dimethyl pentane

107. The following involves two pericyclic reactions. Which combination indicates correctly the types of reaction involved?



- A) [4+2] cycloaddition + [2+2] cycloreversion  
B) cheletropic reaction + [4+2] cycloaddition  
C) [4+2] cycloaddition + [4+1] cycloreversion  
D) [4+2] cycloaddition + cheletropic

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



109. How many ester linkages are present in a typical phospholipid?

- A) 2                      B) 3                      C) 4                      D) 5

110. Atropine is prepared by heating the mixture of reactants A and B in the presence of hydrogen chloride. The reactant A is tropine and the reactant B is

- A) Tropic acid    B) Tropinic acid    C) Tropinone    D) Pimelic acid

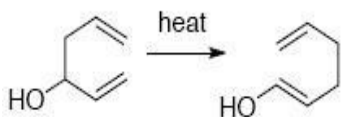
111. Many natural products contain a tertiary amine with a methyl substituent. What reagent is used to remove the methyl substituent in the following reaction sequence?

- A) Lithium aluminium hydride    B) Sodium hydroxide  
C) Hydrogen chloride              D) Vinyloxycarbonyl chloride

112. Which of the following base sequences would most likely be recognized by a restriction endonuclease?

- A) ACATCGT    B) ACGGGT    C) ACGGCA    D) ACGCGT

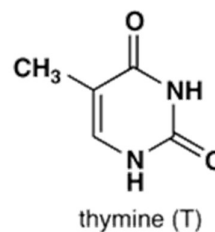
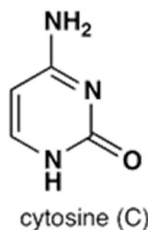
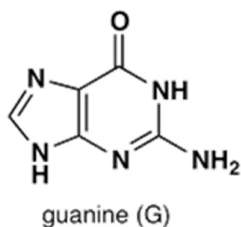
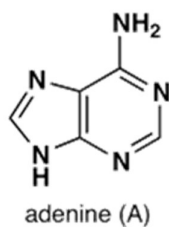
113. If you were to perform an oxy-Cope reaction shown below, you would not isolate the product drawn on the right side of the arrow. Why not?



- A) Equilibrium favors the starting material because it is lower in energy.  
 B) The reaction cannot form the product drawn because of orbital symmetry rules.  
 C) The product will aromatize to form a phenol  
 D) The product will undergo a tautomerization reaction to form an aldehyde
114. In the following thermal reaction, which side of the equilibrium is favored and why?

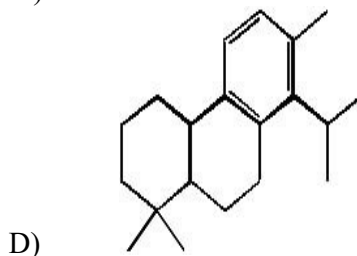
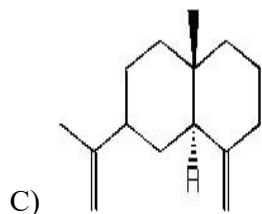
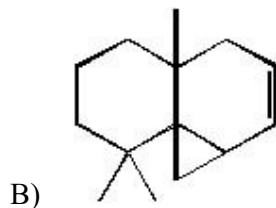
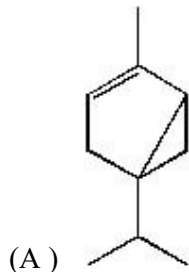


- A) The product is favored because it is aromatic  
 B) The starting material is favored because ring strain is relieved  
 C) The product is favored because there are more C-C single bonds  
 D) The starting material is favored due to orbital symmetry rules
115. The following are the four heteroaromatic bases found in DNA. Which base pair can form three hydrogen bonds?

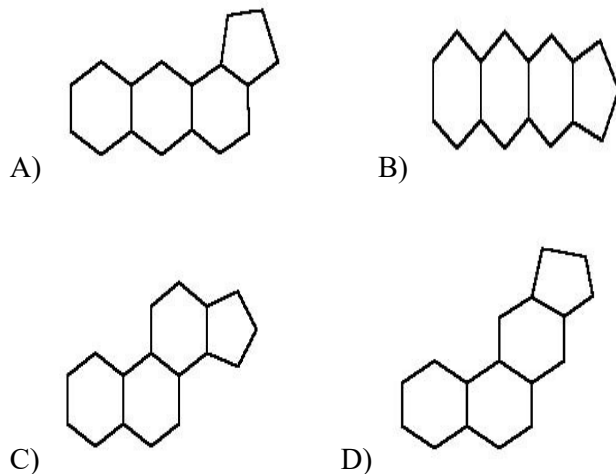


- A) A-T      B) A-C      C) G-T      D) G-C

116. Which of the following structures is a sesquiterpene?



117. Which of the following tetracyclic compounds corresponds to the typical 17-carbon steroid nucleus?



118. Which of the following X-ray diffraction methods can be used to determine the symmetry and orientation of crystals, mainly those with imperfect morphology?

- A) Bragg's spectrometer  
 B) Laue's photographic method  
 C) Weissenberg rotating crystal method  
 D) Debye and Scherer powder method

119. The van der Waals constant  $b$  for  $O_2$  is  $0.0319 \text{ L/mol}$ . The volume of one molecule is

- A)  $1.32 \times 10^{-29} \text{ m}^3$       B)  $1.32 \times 10^{-26} \text{ m}^3$   
 C)  $7.94 \times 10^{-6} \text{ m}^3$       D)  $3.72 \times 10^{-23} \text{ m}^3$

120. Pick out the pair of conjugate elements for the  $C_{3v}$  point group

- A)  $C_3^1$  and  $C_3^2$     B)  $C_3^2$  and  $\sigma_{V2}$     C)  $C_3^1$  and  $\sigma_{V1}$     D)  $C_3^1$  and  $\sigma_{V2}$
-