10046 **120 MINUTES**

1. Which element is the second most abundant on the earth's crust?
   A) Carbon B) Hydrogen
   C) Silicon D) Aluminium

2. Which statement is not true?
   A) Electro negativity tends to decrease down a representative family
   B) Metal fluorides and – oxides tend to be ionic
   C) Nitrogen cannot form pentavalent compounds
   D) Bonding between atoms becomes more effective with increasing atomic size

3. The first noble gas compound obtained was
   A) XeF_2 B) $XePtF_6$ C) XeF_4 D) $XeOF_4$

4. Which of the following is carborundum?
   A) SiC B) CaC_2 C) SiO_2 D) B_4C

5. Which of the following nuclides is the terminal member of the naturally occurring radioactive series which begins with $^{232}_{90}Th$?
   A) $^{209}_{83}Bi$ B) $^{208}_{82}Pb$ C) $^{206}_{82}Pb$ D) $^{210}_{83}Bi$

6. A typical neutron-initiated fission of ^{235}U yields $^{97}_{42}Mo$, two neutrons and an isotope
   A) $^{137}_{50}Sn$ B) $^{139}_{54}Xe$ C) $^{140}_{56}Ba$ D) $^{140}_{57}La$

7. A black solid (X), when heated with conc. HCl, gives a greenish yellow gas. When (X) is heated with sodium bismuthate in the presence of H_2SO_4, a purple solution is formed. (X) is likely to be
   A) PbO_2 B) BaO_2 C) MnO_2 D) Pb_3O_4

8. The tendency of 3-d metal ions to form stable complexes is due to
   A) Variable oxidation state
   B) Strong electronegative nature
   C) Very low ionization energies
   D) High charge to size ratio and vacant d-orbitals

9. Choose correct statement with respect to the magnetic properties of $K_3[Cr_2Cl_9]$ and $K_3[W_2Cl_9]$
   A) Both are paramagnetic
   B) Both are diamagnetic
   C) $K_3[Cr_2Cl_9]$ is paramagnetic and $K_3[W_2Cl_9]$ is diamagnetic
   D) $K_3[Cr_2Cl_9]$ is diamagnetic and $K_3[W_2Cl_9]$ is paramagnetic

10. An alloy of Cu, Fe, Ni, Al and Co used as permanent magnet is
    A) Stellite B) Alnico
    C) Nichrome D) Pewter

11. Separation of lanthanides by ion-exchange method is based on
A) Size of the hydrated ions B) Size of unhydrated ions
C) Basicity of the hydroxides D) The solubility of their nitrates

12. Choose the correct statement with respect to the complex forming ability of actinides
A) Actinides will not form complexes
B) Actinides are much less prone to complex formation than lanthanides
C) Actinides are much more prone to complex formation than lanthanides
D) Actinides and lanthanides have comparable complex formation abilities

13. Name of $[Pt(S_2O_3)(SCN)_2(H_2O)]$ is
A) Aquabis(thiocyanato)(thiosulphato)platinum(IV)
B) Bis(thiocyanato)(thiosulphato)platinum(IV) hydrate
C) Aquadi(thiocyanato)(thiosulphato)platinum(IV)
D) Aquabis(thiocyanato)(thiosulphato)platinum(II)

14. The correct order of stability of the following complexes, (I) $[Ni(NH_3)_6]^{2+}$, (II) $[Co(NH_3)_6]^{2+}$ and (III) $[Fe(NH_3)_6]^{2+}$ is
A) I < II < III B) III < II < I
C) I < III < II D) II < III < I

15. The crystal field splitting diagram for a complex in square planar field is
A) $dxz \approx dyz > dz^2 > dxy > dx^2\text{-}y^2$
B) $dxz \approx dyz > dz^2 > dx^2\text{-}y^2 > dxy$
C) $dx^2\text{-}y^2 > dz^2 > dxy > dxz \approx dyz$
D) $dx^2\text{-}y^2 > dxy > dz^2 > dxz \approx dyz$

16. The intense colour of $[Co(en)_2Cl_2]$ is due to
A) Cl^- to Co^{3+} charge-transfer transition
B) Co^{3+} to Cl^- charge-transfer transition
C) d-d transition
D) octahedral geometry of the complex

17. The ground state term symbol of Mn^{2+} is
A) ^3F B) ^2D C) ^2S D) ^6S

18. The spin-only formula of magnetic moment (μ) of a paramagnetic species in terms of Bohr Magneton (B.M.) and number of unpaired electrons (n) is
A) $\mu = \sqrt{n(n+1)}$ B.M. B) $\mu = n\sqrt{(n+2)}$ B.M.
C) $\mu = \sqrt{n(n+2)}$ B.M. D) $\mu = n$.B.M.

19. The compound $[Ti(C_5H_5)_2(C_5H_5)_2]$ obeys the 18-electron rule. Then the hapticities of C_5H_5 ligands are
A) 1 and 5 B) 5
C) 2 and 3 D) 3

20. CO is weak Lewis base but acts as a strong ligand
   A) It is a strong σ donor
   B) It is a strong π donor
   C) It is a strong σ donor and weak π acceptor
   D) It is a strong π acceptor

21. The correct trend in the M–C stretching frequencies of (i) $[V(CO)_6]^-$ (ii) $[Cr(CO)_6]$ and (iii) $[Mn(CO)_6]^+$ is
   A) (ii) > (iii) > (i) B) (i) > (ii) > (iii)
   C) (iii) > (ii) > (i) D) (ii) > (i) > (iii)

22. Haemerythrine is a
   A) Fe-haem protein B) Cu-non-haem protein
   C) Fe-sulphur protein D) Diiron-non-haem protein

23. The most important role of manganese in biological system is
   A) Water oxidation and dioxygen evolution
   B) Dioxygen binding and transport
   C) Dioxygen storage
   D) Nitrogen fixation

24. Which of the following statement is true?
   A) Extractive metallurgy is concerned with the first step in obtaining a metal from its ore
   B) Surfaces of many mineral materials are hydrophobic
   C) Gauge is a type of desired mineral
   D) Flotation is a most important pyrometallurgical process

25. In zone refining method the molten zone
   A) Consists of impurity only
   B) Consists of purified metal only
   C) Consists of more impurity than the original metal.
   D) Moves to either side

26. Predict the influence of an increase in CO partial pressure above a certain threshold on the rate of cobalt-catalysed hydroformylation of 1-pentene
   A) Rate is decreased B) Rate is increased
   C) No effect on rate D) The catalyst is poisoned

27. The Zeigler-Nalta catalyst is
   A) $TiCl_4$ B) $(C_2H_5)_3Al$
   C) $(Ph_3P)_3RhCl$ D) Formed from $TiCl_4$ and $Al(C_2H_5)_3$

28. If a plane makes an intercept 'a' an OX any goes parallel to OY and OZ. Its Miller indices are
   A) 1 0 0 B) 0 1 1
   C) 1 1 1 D) 0 0 1

29. A solid has a structure in which 'W' atoms are located at the cube corners of the unit cell. 'O' atoms are located at the cube edges and 'Na' atoms at the cube centres. What type of lattice is represented by the compound? What is the formula of the compound?

A) Simple cubic, Na_2WO_3 B) Boly-centred cubic, $NaWO_3$
C) Face-centred cubic, NaWO D) Simple cubic, $NaWO_3$

30. Which one of the following is an example for a covalent crystal?

A) NaCl B) SiC
C) Ice D) Iodine

31. Based on the principles of Green Chemistry, which of the following is a good solvent for the production of high value chemicals?

A) Ethanol B) Methanol
C) Cyclohexane D) Supercritical carbon dioxide

32. F-centres are

A) Cation vacancies in crystal lattice
B) Anion vacancies in crystal lattice
C) Lattice sites in which the cation is trapped
D) Lattice sites in which electron is trapped

33. ZnS does not crystallize in NaCl structure, as

A) The r^+ / r^- ratio is very low
B) The r^+ / r^- ratio is very large
C) Anion is divalent (S^{2-})
D) Cation is divalent (Zn^{2+})

34. The law of multiple proportion is illustrated by the pair of compounds

A) Potassium chloride and potassium bromide
B) H_2O and D_2O
C) Sulphur dioxide and sulphur trioxide
D) Magnesium hydroxide and magnesium oxide

35. The total number of orbitals possible in an atomic shell with Principal quantum number, n = 4 is

A) 4 B) 9 C) 24 D) 16

36. How many significant figures are there in 0.067?

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

37. Choose the correct statement with respect to indeterminate errors

A) They affect the accuracy of the results
B) They affect the measurement precision
C) They are due to non-ideal instrument behaviour
D) They are due to personal limitations of the experimenter

38. The essential requirement for the visual use of metal ion indicator in EDTA titration is

A) The metal-indicator complex should be stable
B) The metal-indicator complex should be less stable
C) The metal-indicator complex should be more stable than the metal-EDTA complex
D) The metal-indicator complex should be less stable than the metal-EDTA complex

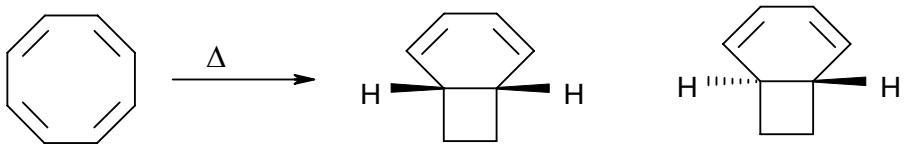
39. In the titration of iron(II) with potassium dichromate using diphenylamine, addition of phosphoric acid is desirable, because

A) It acts as a masking agent
B) It lowers the pH of the system
C) It lowers the formal potential of the Fe(III)-Fe(II) system
D) It stabilizes the metal-indicator complex

40. Upon repeated washing of the precipitate with solvent, a part of the adsorbed electrolyte is removed and this may result in

A) Coagulation B) Flocculation
C) Digestion D) Peptisation

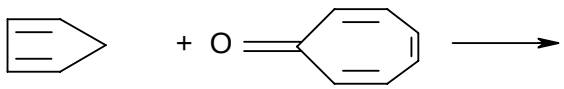
41. Cycloctatetraene (I) undergoes thermal ring closure to form



I II III

A) Mixture of II and III in which II is excess
B) Mixture of II and III in which III is excess
C) II alone
D) III alone

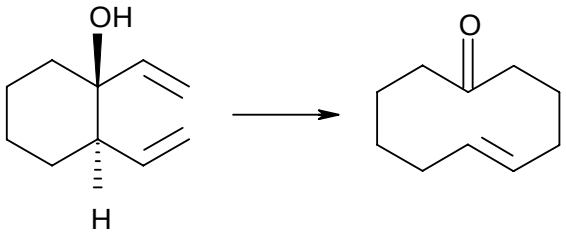
42. Cyclopentadiene(IV) undergoes thermal reaction with cycloheptatrienone(V). The cycloaddition adduct will be



IV V

A) $\pi^4s + \pi^6s$ Endo
B) $\pi^4s + \pi^6s$ Exo
C) $\pi^4s + \pi^6a$ Endo
D) $\pi^4a + \pi^6s$ Exo

43. The following reaction is best example of



A) Claisen rearrangement B) Di-Pi-Methane
C) Oxy-Cope rearrangement D) Fries rearrangement

44. The 'chasing-arrows' with number 

is used to represent plastic containers made of

A) PETE B) HDPE C) LDPE D) PP

45. How many stereocenters are present in the tripeptide, Methionylalanylhistidine

A) Three B) Four C) Five D) Zero

46. Select the most suitable solvent for the extraction of diethylamine from ether solution

A) Benzene
B) 10% aqueous HCl
C) 10% aqueous $NaHCO_3$
D) Methanol

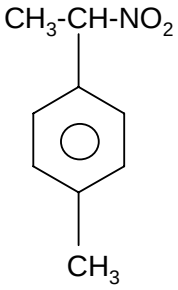
47. During the esterification of acetic acid with ethyl alcohol in presence of conc. H_2SO_4, the reaction mixture was subjected to TLC analysis. The compounds were separated according to the polarity and the least polar compound moved faster. What will be the order of the distances traveled by the three compounds?

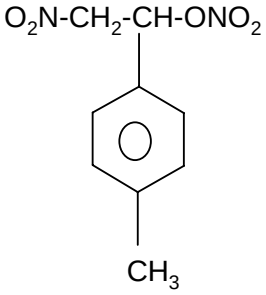
A) Ester < Carboxylic acid < Alcohol
B) Ester < Alcohol < Carboxylic acid
C) Carboxylic acid < Alcohol < Ester
D) Alcohol < Carboxylic acid < Ester

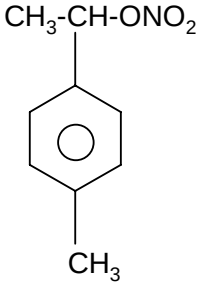
48. When 2-iodohexane was treated with sodium methoxide in methanol, the main product obtained was Zaitzeff elimination product. In addition to this, a byproduct was also formed. What will be the most likely byproduct?

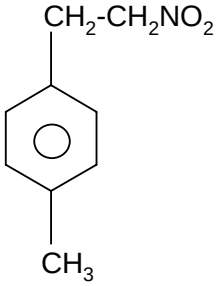
A) $CH_3CH_2CH_2CH_2CH(OH)CH_3$
B) $CH_3CH_2CH_2CH_2CH_2CH_2OH$
C) $CH_3CH_2CH_2CH_2CH_2OCH_3$
D) $CH_3CH_2CH_2CH_2CH(OCH_3)CH_3$

49. When 4-methylstyrene and anhydrous nitric acid in dichloromethane are reacted, the major product obtained is

A) 

(B) 

(C) 

(D) 

50. Using gas chromatography, the *erythro*- and *threo* isomers are distinguished by
A) Peak heights
B) Retention times
C) Peak areas
D) Injection times

51. The structure of the compound which exhibits the following ^{1}H NMR spectra δ = 0.93 (*t*, 3H), 1.20 (*t*, 3H), 1.60 (*sextet*, 2H), 3.37 (*t*, 2H), 3.47 (*q*, 2H) ppm is

A) $CH_3–O–C(CH_3)_2–CH_3$
B) $CH_3–CH_2–CH_2-CH_2–CH_2–OH$
C) $CH_3–O–CH_2-CH_2–CH_2-CH_3$
D) $CH_3–CH_2–O–CH_2–CH_2–CH_3$

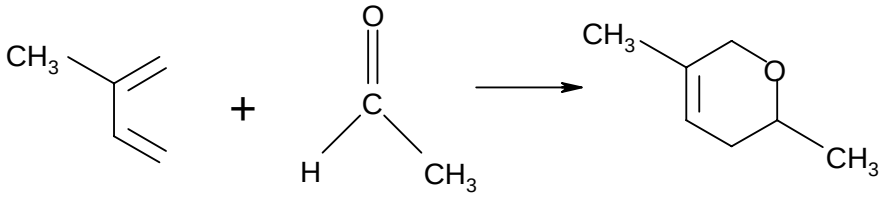
52. Which of the following absorbs in the longer wavelength region?
A) Azulene
B) 2-Methyl-1,3-butadiene
C) *trans*-1,3,5-hexatriene
D) *trans, trans*-1,3,5,7-octatetraene

53. Arrange the following compounds in the decreasing order of their S_{N^1} reactivity

a. $CH_3-CH_2–CH(Cl)–CH_3$ b. $CH_2=CH–CH(Cl)–CH_3$ c. $CH_3-CH_2-CH_2Cl$

A) a > b > c B) b > a > c C) c > b > a D) a > c > b

54. The progress of the following Diels-Alder reaction can be monitored by IR spectroscopy.



Which of the following spectroscopic features can be best utilized in determining the completion of the reaction?

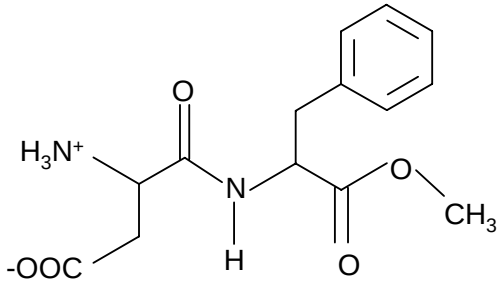
A) The disappearance of the dienophile C=O stretch
B) The disappearance of the diene C=C stretch
C) The appearance of the product C=C stretch
D) The appearance of the product alkene C–H stretch.

55. Select a pair of aromatic structure from the following
(a) cyclopropenyl cation (b) cyclononatetraenyl anion
(c) pentalene (d) cyclooctatetraene

A) (b) and (d)
B) (a) and (c)
C) (a) and (b)
D) (c) and (d)

56. In GPC (Gel Permeation Chromatography) the beads should have some important characteristics. The characteristics are
A) Charged and inert
B) Charged and reactive
C) Neutral and reactive
D) Neutral and inert

57. How many total stereoisomers exist for the following compound?



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

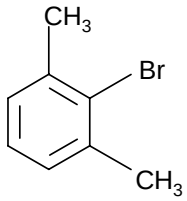
58. The relative rates of S_{N^2} reaction of hydroxide ions with

a. CH_3CH_2Br b. $CH_3CH_2CH_2Br$ c. $(CH_3)_2CHCH_2Br$ d. $(CH_3)_3CCH_2Br$ are in the order

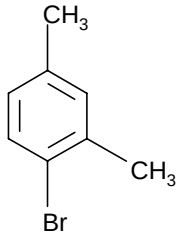
A) a > b > c > d
B) d > c > b > a
C) b > a > c > d
D) d > b > a > c

59. When *m*-dimethylbenzene is treated with Br_2 in the presence of $FeBr_3$, the major product obtained is

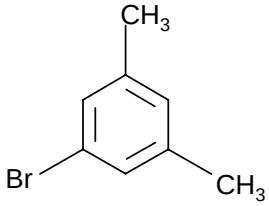
A)



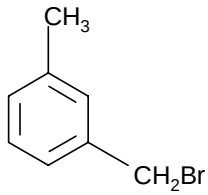
B)



C)



D)



60. Pick out the incorrect statement from the following

A) High density polyethylene is manufactured by the Zeigler Natta polymerisation method
B) Zeigler Natta polymerisastion gives highly stereo regular polymer
C) Low density polyethylene has less amorphous- and more crystalline regions
D) Gutta-Purcha is *trans*-polyisoprene

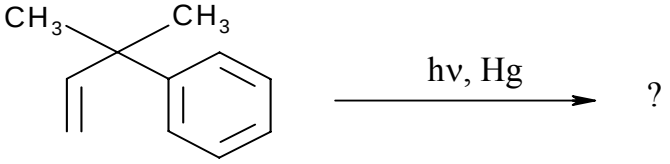
61. Silicone polymers contain ---------- bonds in the polymer backbone

A) Si – C B) Si – Si
C) Si – N D) Si – O

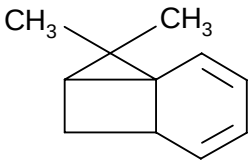
62. Chain growth polymerisation is the suitable method for the manufacture of

A) Polyethylene terephalate
B) Polymethylmethacrylate
C) Nylon 6, 6
D) Polycarbonate

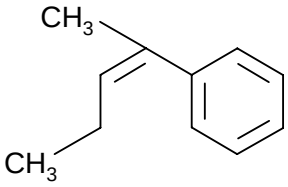
63. Predict the product in the following reaction



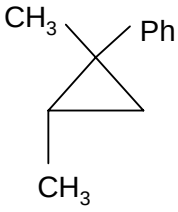
A)



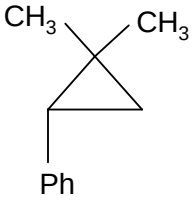
B)



C)

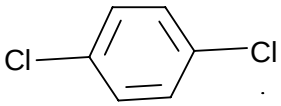


D)



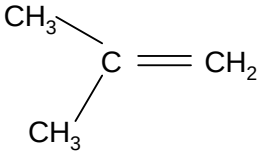
64. Among the following sets, select a set in which each compound exhibits a single peak in its PMR spectrum.

A) $CH_3–CCl_3$ and $ClCH_2–CHCl_2$

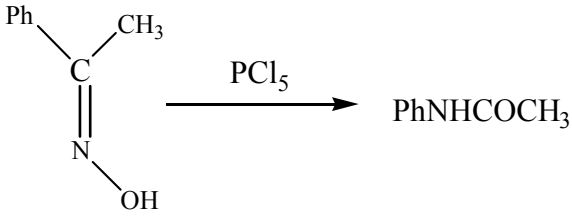
B) 

and $H_2C=C=CH_2$

C) $H_2C=C=CH_2$ and $ClCH_2–CHCl_2$

(D)  and 

65. The following reaction



is

A) Regioselective and stereospecific
B) Non regioselective and stereospecific
C) Neither regioselective and non stereospecific
D) Regioselective and non -stereospecific

66. The most stable conformation of *cis*-1, 4-di-*t*-butylcyclohexane is
   A) Chair conformation in which the *t*-butyl groups at positions 1- and 4- are equatorial
   B) Chair confirmation in which the *t*-butyl groups at positions 1- and 4- are axial
   C) Chair conformation in which *t*-butyl group at position 1 is equatorial and *t*-butyl group at position 4 is axial
   D) Twist-boat conformation with a quasi equatorial-equatorial *t*-butyl groups

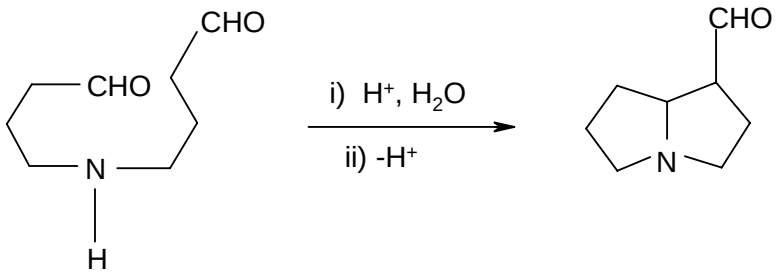
67. The following sugars on degradation with HIO_4 give formic acid and formaldehyde. Choose a sugar that gives two molecules of formaldehyde
   A) D-Arabinose
   B) D-Glucase
   C) D-Erythrose
   D) D-Erythrulose

68. Among the following amino acid carboxylates, only one gives –NH stretching frequency at ≈ 3400 cm^{-1}. Identify it.
   A) (S)-Alanine
   B) (S)-Proline
   C) (S)-Phenylalanine
   D) (R)-Phenylalanine

69. The three base code AUG used in protein synthesis stands for
   A) Methionine B) Alanine
   C) Glycine D) Proline

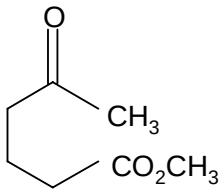
70. A vitamin having pyridine nucleus in its structure is
   A) Vitamin B_{12} B) Vitamin B_5
   C) Vitamin B_6 D) Vitamin B_2

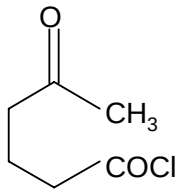
71. The following conversion is an example of

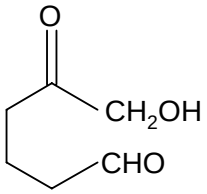


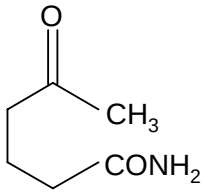
   A) Aldol condensation
   B) Claisen condensation
   C) Cannizzaro reaction
   D) Mannich reaction

72. 1, 3-Cyclohexanedione can be prepared very easily by an intramolecular mixed Claisen condensation. What may be the structure of the substrate molecule?

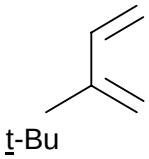
A. 

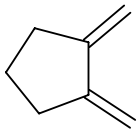
B. 

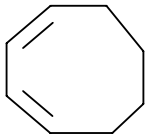
C. 

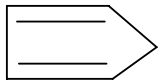
D. 

73. The Diels-Alder reaction is unlikely in

A. 

B. 

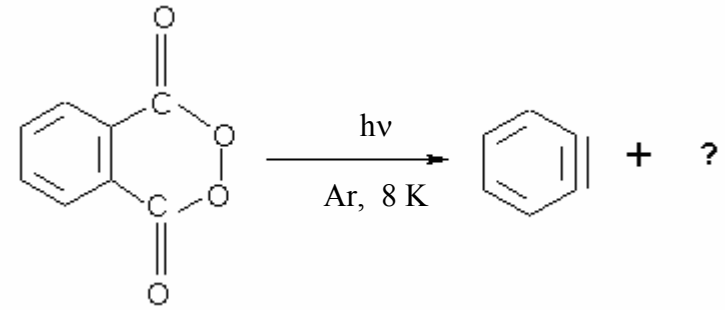
C. 

D. 

74. Acetophenone when reacted with Zn (Hg) and HCl in ethyl alcohol easily gives ethyl benzene. This is an example of

A) Clemensen reduction B) Birch reduction
C) Wolf-Kishner reduction D) MPV reaction

75. Predict the product, other than benzene, formed in the following reaction



A) $4O_2$ B) 2CO C) $2CO_2$ D) H_2CO_3

76. If an ester-, ether- and acid functional groups are present in the same molecule, in which order will they react with aqueous base?
A) The ester, the acid and then the ether
B) The acid, the ester and then the ether
C) The ether, the acid and then the ester
D) The acid, the ether and then the ester

77. The correct statement in the case of camphor is
A) Camphor has two dissimilar chiral centres and two pairs of enantiomers are known
B) Camphor has two dissimilar chiral centres but only one pair of enantiomers is known
C) Camphor has one chiral centre and one pair of enantiomers is known
D) Camphor has no chiral centre and exists in only as one form

78. Wegner-Meerwein rearrangement follows through the intermediate formation of
A) Carbon radical
B) Carbanion
C) Carbocation
D) Carbene

79. A carbonyl (C=O) group is present in both
A) Papaveraldine and papaverinic acid
B) Papaverine and papaverinol
C) Papaverine and papaveraldine
D) Papaverine and papaverinic acid

80. The most appropriate statement for the structure of quinine is
A) A ditertiary base with a methoxy group, a primary alcoholic group containing ethylinic double bond
B) A tertiary base with a dimethoxy group, a secondary alcoholic group containing ethylinic double bond
C) A ditertiary base with a methoxy group and a secondary alcoholic group
D) A ditertiary base with a methoxy group and a secondary alcoholic group containing ethylinic double bond

81. The energy of a particle in a box is proportional to
A) Square of the mass of the particle
B) Square of the length of the box
C) Square of the quantum number
D) Square of the velocity of the particle

82. If an electron travels with a velocity of X ms^{-1}, what will be the approximate velocity of a photon having the same de-Broglie wave length?
A) X B) X/1840 C) 1840/X D) 1840 X

83. If λ_{max} for a black body radiation is 500 nm, what will be the temperature of the black body?
A) 6000 K B) 5000 K C) 5800 K D) 6800 K

84. Which one of the following diatomic molecules would be stabilized by the removal of an electron?
A) CN B) O_2 C) N_2 D) C_2

85. Which one among the following is not an operator?
A) d/dx B) dy/dx C) √ D) ∫

86. The lowest energy term symbol for silicon atom is
A) ^3P B) ^3S C) ^1P D) ^3D

87. The bond angle in PF_3, PCl_3, PBr_3 and PI_3 is in the order

A) $PCl_3 > PBr_3 > PI_3 > PF_3$ B) $PF_3 < PCl_3 < PBr_3 < PI_3$
C) $PCl_3 < PF_3 < PBr_3 < PI_3$ D) $PF > PCl_3 > PBr_3 > PI_3$

88. NH_3 molecule has the symmetry point group of
A) C_{3v} B) T_d C) C_{3h} D) D_{4v}

89. What are the values of L, S and J for the term symbol, $^3F_2$
A) L = 3, S = 2, J = 3, 2, 1 B) L = 1, S = 3, J = 4, 3, 2
C) L = 3, S = 1, J = 4, 3, 2 D) L = 2, S = 3, J = 5

90. The structure of cesium metal at 25^0 C and 1 atmospheric pressure is body centered cubic. At the same temperature but at high pressure, cesium undergoes a phase transition to yield a structure much more dense than body centered cubic. Which of the following is the likely structure at high pressure?
A) Cubic close packed B) Primitive cubic
C) Primitive tetragonal D) Amorphous

91. The absorption of ultraviolet radiations by molecules generally causes ---------- transitions.
A) Rotational B) Vibrational
C) Electronic D) Vibrational accompanied by rotational

92. Predict the number of translational, rotational and vibrational degrees of freedom in Neon atom.
A) 3, 0, 0 B) 3, 1, 0 C) 3, 0, 1 D) 3, 1, 1

93. The Franck-Condon principle allows estimating relative intensities of ---------- transitions.
A) Electronic B) Vibrational
C) Rotational D) Both vibrational and rotational

94. The motion of an electric charge, 'I' around a closed loop of area, 'A' produces a magnetic dipole, 'μ' whose magnitude is given by
A) $\mu = I A$ B) $\mu = I/A$
C) $\mu = A/I$ D) $\mu = 2 \pi A/I$

95. The mass spectrum of a compound shows m/e values at 156, 127 and 29. Find out which among the following is the corresponding compound.

A) C_2H_5Br B) CH_3I
C) CH_3Br D) C_2H_5I

96. When two ideal gases are mixed:

A) $\Delta S_{mix} > 0$ and $\Delta H_{mix} > 0$ B) $\Delta S_{mix} > 0$ and $\Delta H_{mix} = 0$
C) $\Delta S_{mix} < 0$ and $\Delta H_{mix} < 0$ D) $\Delta S_{mix} = 0$ and $\Delta H_{mix} > 0$

97. Which one among the following is a wrong statement about liquid crystals?

A) It has properties between those of a conventional liquid and those of a solid crystal
B) It may flow like a liquid, but its molecules may be oriented in a colloidal-like way
C) Within a liquid crystal domain the molecules are well ordered
D) These materials may not always be in a Liquid Crystal phase

98. v_p, $\bar{v}$ and $\left(\bar{v}^2\right)^{1/2}$ are the most probable velocity , the arithmetic mean velocity and the root mean square velocity respectively for H_2 at 0^oC. Then

A) $\left(\bar{v}^2\right)^{1/2} < \bar{v} < v_p$ B) $\bar{v} < \left(\bar{v}^2\right)^{1/2} < v_p$

C) $v_p < \bar{v} < \left(\bar{v}^2\right)^{1/2}$ D) $\bar{v} < v_p < \left(\bar{v}^2\right)^{1/2}$

99. Which of the following statements is not correct?

A) The number of collision is proportional to the square root of pressure
B) The number of collision is proportional to the square root of temperature
C) The number of collision is proportional to the square of no. of molecules
D) The number of collision increases with decrease in molecular weight

100. Which one among the following is a wrong statement about the viscosity of gases?

A) Spherical molecules have low viscosity compared with plate like molecules
B) Polar molecules have higher viscosities compared with to non polar molecules
C) Decreases with increase in temperature
D) Increase with increase in temperature

101. According to the second law of thermodynamics, which of the following quantities represent the change in a state function?

A) q_{rev} B) $T\,q_{rev}$ C) q_{rev}/T D) w_{rev}

102. One mole of an ideal gas expands isothermally until its volume is doubled. What is the change in Gibbs energy, ΔG, for the process?

A) RT ln ½ B) RT ln 2 C) R ln ½ D) R ln 2

103. What is the change in enthalpy (ΔH) for the reaction, $H_2O_{(l)} \rightarrow H_2O_{(s)}$

A) Negative B) Positive C) Near Zero D) Zero

104. The thermodynamic property that may be utilized for specifying the direction of time is
A) E B) H C) S D) G

105. Which one among the following is correct in Joule-Thomson Expansion?
A) $\Delta E = 0$ B) $\Delta H = 0$ C) $\Delta S = 0$ D) $\Delta G = 0$

106. Which process is accompanied by a decrease in entropy?
A) Boiling of water
B) Condensing of water vapor
C) Subliming of iodine
D) Melting of ice

107. What is the effect of concentration of the reactants on a zero order reaction?
A) Varies inversely with initial concentration
B) Varies as square root of initial concentration
C) Varies linearly with initial concentration
D) Unaffected by the initial concentration

108. What is the relationship between the Arrhenius activation energy E_a and the pre-exponential factor, A for a chemical reaction.
A) $k = A\, e^{Ea/RT}$ B) $\ln A = E_a/RT + \ln k$
C) $\ln A = \ln k - E_a/RT$ D) $k = -A\, e^{Ea/RT}$

109. The theory that links thermodynamics with chemical kinetics is
A) Simple collision theory B) Modified collision theory
C) Arrhenius theory D) Absolute reaction rate theory

110. For a reaction the rate constant is doubled when the temperature is increased from 17^0 C to 37^0 C. What is the activation energy for the reaction?
A) 3.1 k Cal B) 6.2 k Cal
C) 12.4 k Cal D) 24.8 k Cal

111. Which one among the following is an incorrect statement about a catalyst?
A) Chemically unchanged at the end of the reaction
B) A small quantity is often sufficient to bring about a considerable extent of reaction
C) Does not affect the equilibrium in a reversible reaction
D) Physically unchanged at the end of the reaction

112. Which one among the following is an incorrect statement about the intermediate compound formation theory of homogeneous catalysis?
A) This theory explains the mechanism of homogeneous catalysis
B) This theory explains the action of catalytic poisons and activators
C) This theory gives an adequate explanation of the change brought about in the physical state of the catalyst in the course of a reaction
D) This theory explains the specification of the catalyst

113. Which one among the following is an incorrect statement about Van der Waals adsorption?
A) Characterized by low heat of adsorption
B) Reversible
C) Decreases with increase in temperature
D) Activation energy of desorption is very high

114. Which among the following is an incorrect statement about Tyndall Effect?
A) Strong for Lyophobic sols
B) Proves heterogeneous character of the colloidal system
C) Depends on volume of the colloidal solution
D) Shown by colloidal particles

115. Which one of the following is not an assumption for deriving Langmuir Adsorption Isotherm?
A) The process of adsorption and desorption is irreversible
B) Adsorbed molecules do not interact with one another
C) Enthalpy of adsorption was independent of surface coverge
D) There are a finite number of surface sites where a molecule can adsorb

116. The potential of a half cell consisting of Zn electrode in 0.01 M $ZnSO_4$ solution at 25^0 C ($E^0 = 0.763$ V) is
A) 0.604 V B) 0.822 V
C) -0.822 V D) -0.604 V

117. The solubility (S) of a sparingly soluble salt is related to specific conductance (K) and equivalent conductance (Λ_0) as
A) $S = 1000\ \Lambda_0/K$ B) $S = K\ \Lambda_0$
C) $S = K/1000\ \Lambda_0$ D) $S = 1000\ K/\ \Lambda_0$

118. The reaction occurring during the charging of lead storage battery is
A) $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$
B) $Pb^{2+} + 2\ e \rightarrow Pb$
C) $Pb \rightarrow Pb^{2+} + 2\ e$
D) $2H^+ + 2\ e \rightarrow H_2$

119. Which of the following is incorrect about transport number?
A) Never zero
B) Decrease with increase in concentration
C) May increase or decrease with increase in temperature
D) Different for different solutions

120. Which one among the following is an incorrect statement regarding quinhydrone electrode?
A) In alkaline solution hydroquinone ionizes appreciably as an acid
B) Used for solutions of pH > 8
C) In alkaline solution hydroquinone gets oxidized by atmospheric O_2
D) The potential of quinhydrone electrode is determined by connecting it with a calomel electrode