

PROVISIONAL ANSWER KEY

NAME OF THE POST

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Note: Candidate must ensure the compliance to send all suggestion in the given format with reference to this paper with provisional answer key only.

101. Which pair is different from the others?
- (A) Be-Al (B) Li-Mg
(C) B-Si (D) Li-Na
102. The ions O^{2-} , F^- , Na^+ , Mg^{2+} and Al^{3+} are isoelectronic. Their ionic radii show:
- (A) A decrease from O^{2-} to F^- and then increase from Na^+ to Al^{3+}
(B) A significant increase from O^{2-} to Al^{3+}
(C) A significant decrease from O^{2-} to Al^{3+}
(D) An increase from O^{2-} to F^- and then decrease from Na^+ to Al^{3+}
103. Any two electrons present in an orbital can be distinguished by
- (A) azimuthal quantum number (B) magnetic quantum number
(C) spin quantum number (D) principle quantum number
104. Of the following pairs, the one containing examples of metalloid elements in the Periodic Table is
- (A) Na and K (B) Cu and Ag
(C) F and Cl (D) B and Si
105. The relative extent to which the various orbitals penetrate the electron clouds of other orbitals is
- (A) $s < p < d < f$ (B) $s > p > d > f$
(C) $s > p > f > d$ (D) $d < s < f < p$
106. Catenation properties of C, Si, Ge, Sn and Pb are in the order
- (A) $C > Si > Sn > Ge > Pb$ (B) $C < Si < Ge < Sn < Pb$
(C) $C > Si > Ge > Sn > Pb$ (D) None of above
107. Which of the following pairs have two lone pair of electrons on the central atom according to VSEPR theory
- (A) SF_4 and BF_4^- (B) BF_4^- and XeF_4
(C) XeF_4 and ICl_4^- (D) SF_4 and ICl_4^-
108. Coordination number and oxidation state of Cr in $K_3[Cr(C_2O_4)_3]$ are respectively:
- (A) 3 and 0 (B) 6 and 3+
(C) 4 and 2+ (D) 3 and 3+

109. Which of the following pair is isoelectronic and isostructural?
 (A) CO_2 and SO_2 (B) SO_3 and SeO_3
 (C) SiO_4^{4-} and PO_4^{3-} (D) NO_2^+ and TiO_2
110. The increasing order of dipole moment of molecules is
 (A) $\text{H}_2\text{O} < \text{NF}_3 < \text{NH}_3$ (B) $\text{H}_2\text{O} < \text{NH}_3 < \text{NF}_3$
 (C) $\text{NH}_3 < \text{NF}_3 < \text{H}_2\text{O}$ (D) $\text{NF}_3 < \text{NH}_3 < \text{H}_2\text{O}$
111. The hybridization state of the central atom of IF_5 is
 (A) sp^3d (B) dsp^3
 (C) d^2sp^3 (D) sp^3d^2
112. Change of boron trifluoride to tetra fluoroborate leads to
 (A) Increase in symmetry and bond contraction
 (B) Increase in symmetry and bond elongation
 (C) Decrease in symmetry and bond contraction
 (D) Decrease in symmetry and bond elongation
113. Which of the following is hard acid ?
 (A) Au^+ (B) Ag^+
 (C) Li^+ (D) Cu^+
114. According to Pearson theory, a hard base is one whose donor atom has
 (A) high electronegativity, high polarizability and easy to oxidize
 (B) high electronegativity, low polarizability and difficult to oxidize
 (C) low electronegativity, low polarizability and difficult to oxidize
 (D) low electronegativity, high polarizability and difficult to oxidize
115. Which one of these orders on acidity is false?
 (A) $\text{HI} > \text{HBr} > \text{HCl}$
 (B) $\text{HIO} > \text{HBrO} > \text{HClO}$
 (C) $\text{HClO}_4 > \text{HClO}_3 > \text{HClO}_2$
 (D) $\text{CCl}_3.\text{COOH} > \text{CHCl}_2.\text{COOH} > \text{CH}_2\text{Cl}.\text{COOH}$
116. Which of the following trend of covalent character is correct among the given set of hydrides
 (A) $\text{H}_2\text{O} > \text{H}_2\text{S} > \text{H}_2\text{Se} > \text{H}_2\text{Te}$ (B) $\text{H}_2\text{O} < \text{H}_2\text{S} < \text{H}_2\text{Se} < \text{H}_2\text{Te}$
 (C) $\text{H}_2\text{O} > \text{H}_2\text{Se} > \text{H}_2\text{S} > \text{H}_2\text{Te}$ (D) $\text{H}_2\text{O} < \text{H}_2\text{Se} < \text{H}_2\text{S} < \text{H}_2\text{Te}$

117. Which of the following complex ion is expected to show the highest magnetic moment at room temperature
- (A) $[\text{Co}(\text{CN})_6]^{3-}$ (B) $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$
 (C) $[\text{Fe}(\text{CN})_6]^{4-}$ (D) $[\text{Ni}(\text{CN})_4]^{2-}$
118. H_3PO_2 and $\text{H}_4\text{P}_2\text{O}_7$ are respectively
- (A) monobasic and dibasic acid (B) dibasic and tribasic acid
 (C) tribasic and tetrabasic acid (D) monobasic and tetrabasic acid
119. Mass defect of 2 g gives energy equal to
- (A) $9 \times 10^{13}\text{J}$ (B) $18 \times 10^{13}\text{J}$
 (C) $27 \times 10^{13}\text{J}$ (D) $81 \times 10^{13}\text{J}$
120. Thorium is found in
- (A) uranite (B) pitchblende
 (C) malachite green (D) monazite
121. The moderator used in nuclear reactor is
- (A) hard water (B) heavy water
 (C) liquid sodium (D) soft water
122. A process that produce a one-unit increase in atomic number is
- (A) α -emission (B) β -emission
 (C) γ -ray emission (D) electron capture
123. Which of the following types of radiation deflected in a magnetic field?
- (A) X-rays (B) β -rays
 (C) γ -ray (D) Neutrons
124. The ion CrO_4^{2-} is
- (A) Colourless due to absence of d-d transition
 (B) Coloured due to $\text{M} \rightarrow \text{L}$ charge transfer
 (C) Coloured due to $\text{L} \rightarrow \text{M}$ charge transfer
 (D) Coloured due to presence of d – d transition
125. The property measured in TGA is
- (A) the rate of change in weight (B) change in temperature
 (C) heat evolved or absorbed (D) change in weight

126. The most widely used flame in atomic absorption is
(A) air-coal gas (B) air-propane
(C) oxy-acetylene (D) air-acetylene
127. Out of the compounds shown below the one that shows linear geometry is
(A) H₂O (B) BeH₂
(C) CH₂ (D) SO₂
128. Synthetic ion exchange resins have widely been used for
(A) Catalysis (B) water deionisation
(C) ion separation (D) all of these
129. Commonly used chromatographic method for polymer sample analysis is
(A) HPLC (B) GLC
(C) Ion exchange (D) GPC
130. Which of the following statement is correct when silicon (Si) is doped with arsenic (As)
(A) acceptor levels are created close to the conduction band
(B) acceptor levels are created close to the valence band
(C) donor levels are created close to the conduction band
(D) donor levels are created close to the valence band
131. The commercial name of the compound Mg₃(OH)₄Si₂O₅ is
(A) water-glass (B) zeolite
(C) soda-glass (D) white asbestos
132. The overall charge (n) present on the cyclic silicate anion [Si₆O₁₈]ⁿ⁻ is
(A) 6 (B) 12
(C) 18 (D) 24
133. The number of hydroxyl groups present in pyrophosphorus acid is
(A) four (B) three
(C) two (D) one
134. Which of the following complex ions shows geometrical isomers?
(A) [Pt(NH₃)₃Cl] (B) [Co(NH₃)₆]³⁺
(C) [Co(CN)₅(NC)]³⁻ (D) [Cr(H₂O)₄Cl₂]⁺

135. Which of the following gas is named as laughing gas
 (A) NO (B) N₂O
 (C) NO₂ (D) CO
136. The ligand system present in vitamin B₁₂ is
 (A) Corrin (B) Porphyrin
 (C) Crown ether (D) Phthalocyanine
137. Magnesium (Mg) is an important component of which biomolecules occurring extensively in living world
 (A) hemoglobin (B) chlorophyll
 (C) florigen (D) Ferredoxins
138. Which of the following compound display John-Teller distortion?
 (A) [Mn(H₂O)₆]²⁺ (B) [Cr(H₂O)₆]³⁺
 (C) [Mn(H₂O)₆]³⁺ (D) [Fe(CN)₆]⁴⁻
139. The number of unpaired electron(s) present in [Fe(H₂O)₅(NO)]²⁺ which is formed during brown ring test is
 (A) 5 (B) 4
 (C) 3 (D) 2
140. Complex [Ti(H₂O)₆]³⁺ has an absorption maximum at 492 nm. The crystal field stabilization energy for this complex is
 (A) 8,130 cm⁻¹ (B) 10,162 cm⁻¹
 (C) 12,195 cm⁻¹ (D) 20,325 cm⁻¹
141. The complexes [Co(NH₃)₄(H₂O)Cl]Br₂ and [Co(NH₃)₄(H₂O)Br₂]Cl.H₂O are examples of
 (A) Linkage isomerism (B) Ionization isomerism
 (C) Geometrical isomerism (D) Optical isomerism
142. The number of metal-metal bonds in Fe₃(CO)₁₂ and Co₄(CO)₁₂ is
 (A) 3 and 4 (B) zero and 4
 (C) 4 and 5 (D) 3 and 6
143. The product of the reaction between CH₃Mn(CO)₅ and ¹³CO is
 (A) CH₃Mn(CO)₄ (B) (¹³CH₃CO)Mn(CO)₅
 (C) (CH₃CO)Mn(CO)₄(¹³CO) (D) (CH₃¹³CO)Mn(CO)₅

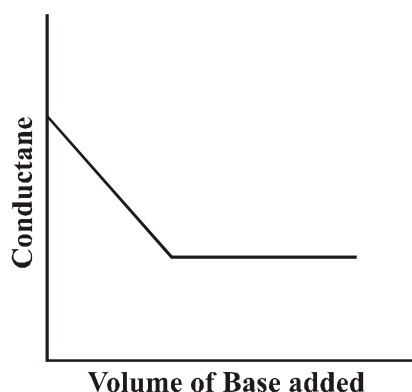
144. The dissociation constant of ammonia is 1.8×10^{-5} . Then, the pH of 0.15 M solution of ammonium chloride will be
- (A) 5.03 (B) 6.03
(C) 4.03 (D) 3.03
145. Bordeaux which is a mixture used to prevent fungus attack on the leaves of potatoes is
- (A) CaSO_4 and $\text{Cu}(\text{OH})_2$ (B) CuO and CaO
(C) CuSO_4 and $\text{Ca}(\text{OH})_2$ (D) CuCO_4 and $\text{Cu}(\text{OH})_2$
146. The experimental magnetic moment value of 2.3 BM for $\text{K}_3[\text{Fe}_3(\text{CN})_6]$ suggests
- (A) high-spin Fe with orbital contribution
(B) low-spin Fe with orbital contribution
(C) spin-only value of high-spin Fe
(D) spin-only value of low-spin Fe
147. The ground state term symbol for $[\text{Mn}(\text{CN})_6]^{4-}$ is
- (A) ${}^6\text{A}_{1g}$ (B) ${}^5\text{E}_g$
(C) ${}^1\text{A}_{1g}$ (D) ${}^2\text{T}_{2g}$
148. The iron-sulphur clusters in biological system are involved in
- (A) electron transfer (B) group transfer
(C) atom transfer (D) proton transfer
149. Which of the following statement is correct as a result of back bonding in metal carbonyls:
- (A) CO bond order reduced (B) M – C bond length shorten
(C) CO stretching frequency decreases (D) All of these
150. Which of the following species does not have metal-metal bond
- (A) $\text{Fe}_2(\text{CO})_9$ (B) $\text{Mn}_2(\text{CO})_{10}$
(C) $\text{Al}_2(\text{CH}_3)_6$ (D) $\text{Co}_2(\text{CO})_8$
151. The transition metal which forms an unusual triple-decker sandwich complex:
- (A) Co (B) Fe
(C) Ni (D) Mn
152. The values of atomic and structural parachors are: C = 8.6, H = 15.7, double bond = 19.9 and six membered ring = 1.4. Based on this, the parachor of benzene is likely to be :
- (A) 218.9 (B) 78.9
(C) 178.9 (D) 206.9

153. Which of the following can behaves as tri-hapto ligand
 (A) alkyl (B) carbyne
 (C) allyl (D) carbine
154. An intermediate formed during hydroformylation of olefins using $\text{Co}_2(\text{CO})_8$ as catalyst is
 (A) $\text{HCo}(\text{CO})_4$ (B) $\text{H}_2\text{Co}(\text{CO})_4$
 (C) $\text{H}_4\text{Co}(\text{CO})_3$ (D) $\text{HCo}(\text{CO})_6$
155. A well known naturally occurring organometallic compound is
 (A) myoglobin (B) cytochrome P-450
 (C) chlorophyll (D) vitamin B_{12} coenzyme
156. The extent of increase in metal \rightarrow olefin π -back donation during metal-olefin interaction results into
 (A) increase with the presence of electron donating substituent on the olefin
 (B) change the hybridization of the olefin carbon from sp^2 to sp^3
 (C) change the formal oxidation state of the metal
 (D) decrease in $\text{C}=\text{C}$ bond length
157. Which of the following statement is correct
 (A) CH_2 is isolobal to $\text{Mn}(\text{CO})_4$ (B) CH_2 is isolobal to $\text{Ni}(\text{CO})_2$
 (C) CH is isolobal to $\text{Co}(\text{CO})_3$ (D) CH is isolobal to $\text{Fe}(\text{CO})_4$
158. The general formula of double chain silicates is
 (A) $\text{Si}_2\text{O}_7^{6-}$ (B) SiO_4^{4-}
 (C) $(\text{Si}_4\text{O}_{11})_n^{6n-}$ (D) $(\text{Si}_2\text{O}_5)_n^{2n-}$
159. The correct set of biologically essential elements is
 (A) Mg, Fe, Zn, Ru (B) Mn, Cu, Ag, Zn
 (C) Fe, Co, Cu, Ru (D) Fe, Cu, Zn, Mo
160. During transformation of oxyhemoglobin to deoxyhemoglobin
 (A) high spin Fe^{2+} changes to high spin Fe^{3+}
 (B) high spin Fe^{2+} changes to low spin Fe^{2+}
 (C) low spin Fe^{3+} changes to low spin Fe^{2+}
 (D) low spin Fe^{3+} changes to high spin Fe^{2+}

161. Impurities associated with the ore after mining are collectively called
- (A) flux (B) slag
(C) mineral (D) Gangue
162. Which of the following spectroscopic technique will be useful to distinguish between M – NCS and M – SCN ?
- (A) Mass (B) EPR
(C) IR (D) NMR
163. Which of the following statement is true for Raman spectrum
- (A) it is the result of absorption of light by vibrating molecules
(B) it is the result of scattering of light by vibrating molecules
(C) water cannot be used as a solvent
(D) presence of permanent dipole moment in the molecule is pre-requisite of Raman spectrum
164. Chemically Plaster of Paris is
- (A) $\text{CaSO}_4 \cdot \text{H}_2\text{O}$ (B) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
(C) $\text{CaSO}_4 \cdot 1/2 \text{H}_2\text{O}$ (D) Anhydrous CaSO_4
165. Positron has mass equal to that of
- (A) proton (B) neutron
(C) electron (D) Meson
166. A metal crystallizes with a *fcc* lattice. The edge of its unit cell is found to be 408 pm. Then the diameter of the metal atom will be ...
- (A) 408 pm (B) 288 pm
(C) 204 pm (D) 144 pm
167. Which of the following function is acceptable wave function in Quantum Chemistry?
- (A) $\psi = x$ (B) $\psi = x^2$
(C) $\psi = e^x$ (D) $\psi = e^{-x}$
168. The value of molecular partition function can never be
- (A) More than zero (B) Less than zero
(C) equal to zero (D) equal to 1

169. According to Statistical thermodynamics, Helmholtz work function(A) is related with molecular partition function (f) by relationship (where k = Boltzmann's constant)
- (A) $A = -nkT \ln f$ (B) $A = n \ln f / kT$
 (C) $A = nkT/f$ (D) $A = n kT + \ln f$
170. The scientist who got Nobel prize for discovery of Photoelectric effect is
- (A) Einstein (B) Rutherford
 (C) Pauli (D) Thomson
171. The general expression for Langmuir Adsorption isotherm is (where θ = fraction of surface covered, P = pressure, K = equilibrium constant)
- (A) $\theta = KP$
 (B) $\theta = 1 / KP$
 (C) $\theta = KP / 1 + KP$
 (D) $\theta = K + P$
172. The three way catalyst is used for
- (A) pollution control (B) industrial process
 (C) polymer synthesis (D) asymmetric synthesis
173. Which of the following is not true regarding LCAO method?
- (A) the energies of atomic orbitals should be comparable
 (B) the atomic orbitals should overlap to a considerable extent
 (C) the symmetry of the combining orbitals should be the same
 (D) the energy of resulting antibonding orbital is less than that of bonding orbital
174. The species with the highest bond order among NO, CO, CN and O₂ is
- (A) NO (B) CO
 (C) CN (D) O₂
175. A system absorbs 100 kJ heat and performs 50 kJ work on the surroundings. The increase in internal energy of the system is equal to:
- (A) 50 kJ (B) 100 kJ
 (C) 150 kJ (D) 5000 kJ
176. The relationship between the variation of internal energy change with temperature is/ are known as
- (A) Hess's law (B) Maxwell's relationship
 (C) Kirchoff's equations (D) Clausius-Clapeyron equation

177. The area enclosed within the Temperature- Entropy diagram denotes
 (A) Work done (B) Enthalpy
 (C) Internal energy (D) Heat exchange
178. The number of atoms in a unit cell of a face centered cube is
 (A) 2 (B) 4
 (C) 6 (D) 8
179. For a orthorhombic crystal system, which is correct? (a, b, c are Relative axial lengths)
 (A) $a \neq b \neq c$ (B) $a = b \neq c$
 (C) $a = b = c$ (D) $a \neq b = c$
180. A Botanist who is credited with the discovery of Chromatography is
 (A) Tiselius (B) Brown
 (C) Willstatter (D) Tswett
181. What is the standard EMF of the cell given below?
 $\text{Zn, Zn}^{2+}(\text{aq}) \parallel \text{Cu}^{2+}(\text{aq}), \text{Cu}$
 [Standard Electrode Potential at 25°C for $\text{Cu}^{2+}(\text{aq}), \text{Cu} = +0.34 \text{ V}$ and $\text{Zn}^{2+}(\text{aq}), \text{Zn} = -0.76 \text{ V}$]
 (A) -1.10 V (B) + 1.10 V
 (C) -0.42 V (D) + 0.42 V
182. A conductometric titration curve represents titration between



- (A) A strong acid and a strong base (B) A weak acid and a weak base
 (C) A strong acid and a weak base (D) A weak acid and a strong base

183. For any synthetic polydisperse polymer sample, the mass average molar mass $\langle M \rangle_m$
- (A) is less than number average molar mass $\langle M \rangle_n$
(B) is greater than number average molar mass $\langle M \rangle_n$
 (C) is equal to number average molar mass $\langle M \rangle_n$
 (D) is equal to viscosity average molar mass. $\langle M \rangle_v$
184. In the following set of values indicate which is the median value?
 21, 23, 23, 54, 67, 21, 25, 21, 54, 72, 75
- (A) 21 (B) 23
(C) 25 (D) 54
185. The point symmetry of trans-azobenzene is
- (A) C_{3h} (B) D_{3h}
 (C) C_3 **(D) C_{2h}**
186. According to Lindemann's theory of Unimolecular gaseous reaction, the order of reaction under low pressure limit is
- (A) First **(B) Second**
 (C) Third (D) Zero
187. The number of components in the thermal decomposition of calcium carbonate (CaCO_3) in a closed tube is
- (A) 1 **(B) 2**
 (C) 3 (D) 4
188. The average kinetic energy of the gas molecules is
- (A) inversely proportional to its absolute temperature
(B) directly proportional to its absolute temperature
 (C) equal to the square of its absolute temperature
 (D) directly proportional to the square root of its absolute temperature
189. The partial derivative $(\partial H / \partial S)_p$ is equal to
- (A) Pressure **(B) Temperature**
 (C) Volume (V) (D) Internal energy (U)
190. The precipitating power of Al^{3+} , Na^+ , Ba^{2+} for Arsenious Sulphide (As_2S_3) sol is in the order
- (A) $\text{Na}^+ > \text{Ba}^{2+} > \text{Al}^{3+}$ (B) $\text{Ba}^{2+} > \text{Na}^+ > \text{Al}^{3+}$
 (C) $\text{Al}^{3+} > \text{Na}^+ > \text{Ba}^{2+}$ **(D) $\text{Al}^{3+} > \text{Ba}^{2+} > \text{Na}^+$**

191. A light source that is commonly used in a Visible spectrometer is
 (A) Tungsten lamp (B) Hydrogen lamp
 (C) Sodium vapour lamp (D) Klystron
192. Which of the following acids has the lowest pK_a value ?
 (A) Chloroacetic acid (B) Bromoacetic acid
 (C) Nitroacetic acid (D) Cyano acetic acid
193. The rotational transitions for a rigid diatomic molecules are governed by the selection rule (where J is rotational quantum number)
 (A) $\Delta J = 0$ (B) $\Delta J = \pm 1$
 (C) $\Delta J = \pm 2$ (D) $\Delta J = \pm 3$
194. What would happen to the following reaction, when pressure is increased

$$A(g) + 2B(g) \rightleftharpoons C(g) + D(g)$$
 (A) Equilibrium shifts towards left
 (B) Equilibrium shifts towards right
 (C) No change in equilibrium position
 (D) Plausible change cannot be predicted
195. If λ_{∞} is the equivalent conductance at infinite dilution and λ_v the equivalent conductance of the electrolyte at the dilution v, the degree of dissociation (α) is given by
 (A) $\lambda_{\infty} / \lambda_v$ (B) $\lambda_v / \lambda_{\infty}$
 (C) $\lambda_{\infty} + \lambda_v$ (D) $\lambda_{\infty} - \lambda_v$
196. The nature of solution containing salt of weak acid and strong base is
 (A) acidic (B) basic
 (C) neutral (D) cannot be predicted
197. The relationship between the entropy and thermodynamic probability (W) is :
 (where k is Boltzmann's constant)
 (A) $S = k + W$ (B) $S = k - W$
 (C) $S = k + \ln W$ (D) $S = k \ln W$

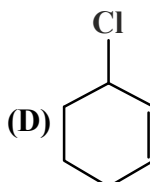
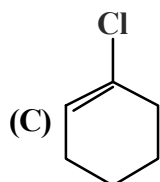
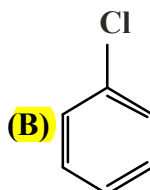
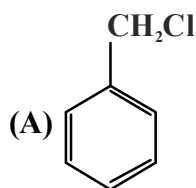
198. The movement of sol particles under an applied electric potential is called
 (A) electrophoresis (B) electro-osmosis
 (C) electrofiltration (D) Electrolysis
199. The Henderson-Hasselbalch equation for acidic buffer is represented mathematically as
 (A) $\text{pH} = \text{pK}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$ (B) $\text{pOH} = \text{pK}_a + \log \frac{[\text{salt}]}{[\text{acid}]}$
 (C) $\text{pH} = \text{pK}_w - \log \frac{[\text{salt}]}{[\text{acid}]}$ (D) $\text{pH} = \text{pK}_a + \log \frac{[\text{salt}]^2}{[\text{acid}]}$
200. Which of the following materials is not transparent to infra-red radiations?
 (A) NaCl (B) CsI
 (C) AgCl (D) Glass
201. The salt bridge in the electrochemical cell serves to
 (A) increase the rate at which equilibrium is attained
 (B) increase the voltage of the cell
 (C) maintain electrical neutrality
 (D) increase the oxidation/reduction rate
202. According to Arrhenius equation, the effect of increase of temperature on any chemical reaction is
 (A) increase of activation energy of reaction
 (B) decrease of activation energy of reaction
 (C) no effect on activation energy of reaction
 (D) cannot be predicted
203. Which of the following is not an intensive property?
 (A) Internal energy (B) Pressure
 (C) Temperature (D) Density
204. At what angle (in radians) first order diffraction occurs if the spacing between two planes is $\lambda/2$
 (A) $\pi/4$ (B) $\pi/2$
 (C) π (D) 0

205. Symmetric stretching vibration of carbon dioxide molecule is
(A) Raman inactive and IR active (B) Both are Raman and IR active
(C) Raman active and IR inactive (D) Both are Raman and IR inactive
206. The ratio of two specific heats (C_p / C_v) of a diatomic gas is
(A) 1.66 (B) 1.33
(C) 1.40 (D) 1.52
207. According to Maxwell's law of distribution of velocities of molecules, the most probable velocity is
(A) Greater than the mean velocity
(B) Equal to the mean velocity
(C) Equal to root mean square velocity
(D) Less than the root mean square velocity
208. An increase in equivalent conductance of strong electrolyte with dilution is mainly due to
(A) Increase in both i.e. number of ions and ionic mobility of ions
(B) Increase in number of ions
(C) Increase in ionic mobility of ions
(D) 100% ionization of electrolyte at normal dilution
209. High quantum yields of photochemical reactions are due to
(A) Lowering of activation energy (B) High frequency of collision
(C) Accompanying side reactions (D) Formation of free radicals
210. In a chemical reaction, the following statement about the catalyst is not correct....
(A) A catalyst provides an alternative path for the reaction
(B) A catalyst takes part in the reaction
(C) A catalyst does not undergo any chemical change
(D) A catalyst shifts the position of equilibrium to the right
211. The physical adsorption of gases on the solid surface is due to
(A) Covalent bond (B) Hydrogen bond
(C) Ionic bond (D) van der Waals forces

212. The total energy operator can be written as
- (A) $-i \frac{\hbar}{2\pi} \frac{\partial}{\partial t}$ (B) $i \hbar \frac{\partial}{\partial t}$
- (C) $-\frac{\hbar}{4\pi} \frac{\partial}{\partial t}$ (D) $\frac{\hbar}{4\pi} \frac{\partial}{\partial t}$
213. Which statement about the electromagnetic radiation is not true?
- (A) They are unaffected by both electric and magnetic fields
- (B) Their intensity depends on frequency
- (C) Their velocity depends on the medium in which they travel
- (D) They do not need a medium for propagation in space
214. The paramagnetic molecule from the following is
- (A) O₂ (B) N₂
- (C) Cl₂ (D) H₂
215. The number of degrees of vibrational freedom possessed by methane (CH₄) is
- (A) 10 (B) 6
- (C) 4 (D) 9
216. “You can not prepare an omlette without breaking eggs”. This is as per the definition of
- (A) zeroth law of thermodynamics (B) first law of thermodynamics
- (C) second law of thermodynamics (D) third law of thermodynamics
217. For polymer characterization, Mark-Houwink equation is used for the determination of
- (A) Number average molar mass (B) weight average molar mass
- (C) viscosity average molar mass (D) viscosity average molar mass
218. Which one of the following statements is true?
- (A) Fermions are distinguishable whereas boson are not
- (B) Bosons are distinguishable whereas fermions are not
- (C) Both fermions and bosons are distinguishable
- (D) Both fermions and bosons are indistinguishable but classical particles are distinguishable

227. Which of the following decreases with increase in dilution?
 (A) Measured conductance (B) Specific conductance
 (C) Equivalent conductance (D) Molar conductance
228. The value of the nuclear magneton is
 (A) $50.50 \times 10^{-25} \text{ JT}^{-1}$ (B) $50.50 \times 10^{-26} \text{ JT}^{-1}$
 (C) $50.50 \times 10^{-28} \text{ JT}^{-1}$ (D) $5.050 \times 10^{-28} \text{ JT}^{-1}$
229. Entropy remains constant in
 (A) Isothermal process (B) Adiabatic process
 (C) Isochoric process (D) Isobaric process
230. The Helmholtz work function 'A' is defined as (where H= enthalpy, T=temperature, S= entropy, U= Internal energy, P= pressure, V= volume)
 (A) $U - TS$ (B) $H - TS$
 (C) $U + TS$ (D) $U + PV$
231. The size of nanoparticles generally falls in the range
 (A) 1-100 nm (B) 10-1000 nm
 (C) > 1000 nm (D) 1- 10 Å
232. In the sulphur system, under stable equilibrium conditions, the equilibrium between following three phases is not observed, (where Rhombic S_R , Monoclinic S_M , Liquid S_L , and Vapour S_V)
 (A) S_R, S_M, S_L (B) S_R, S_M, S_V
 (C) S_R, S_L, S_V (D) S_M, S_L, S_V
233. Statistical thermodynamics is branch of Chemistry that acts as a bridge between
 (A) Classical thermodynamics and Chemical Kinetics
 (B) Classical thermodynamics and Electrochemistry
 (C) Classical thermodynamics and Quantum Chemistry
 (D) Quantum Chemistry and Electrochemistry
234. Which one of the following statements is not generally true about complex reactions?
 (A) Mostly show fractional order
 (B) Multi step reaction takes place.
 (C) Molecularity and order of a reaction are equal.
 (D) Parallel reaction is an example of complex reaction

235. An organic compound is boiled with HNO_3 , cooled and then treated with AgNO_3 , a white precipitate is obtained. The compound can be



236. Detection of the chlorine is possible without preparing sodium extract in for the compounds

i) 2, 4, 6-trinitro chlorobenzene

ii) Chloroform

iii) Benzyl chloride

iv) Allyl Chloride

(A) i and ii

(B) ii & iv

(C) i, ii & iii

(D) i, iii & iv

237. A mixture of o-nitrophenol and p-nitrophenol can be separated by

(A) sublimation

(B) steam distillation

(C) fractional distillation

(D) fractional crystallization

238. Which of the following statement is false?

i) All amino acid including glycine are ampholyte.

ii) An amino acid may be neutral, acid or basic.

iii) The main functional group in amino acid is $-\text{COOH}$.

iv) None of above statement is false.

(A) i & ii

(B) i & iii

(C) ii & iii

(D) iv

239. Which one of the following statement is false?

- i) Gly-Ala and Ala-Gly have same structure.
- ii) A dipeptide bond has two peptide bonds.
- iii) Glycine and Alanine form two dipeptides.
- iv) All the above three statement are correct.

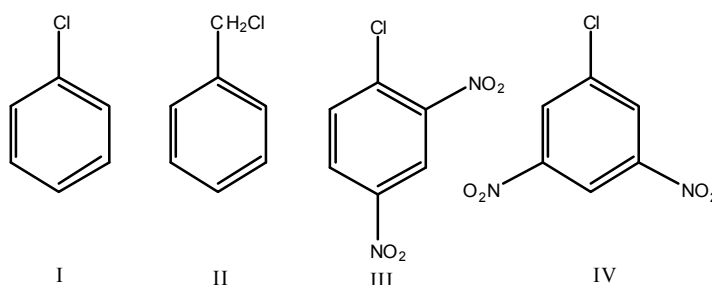
(A) i & ii

(B) ii & iii

(C) i & iii

(D) iv

240. Which of the following reagent can form a nitrile when treated with NaCN in DMSO?



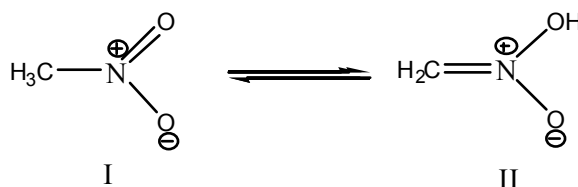
(A) Only II

(B) II & III

(C) II, III & IV

(D) All the four

241. Methyl nitrite shows following tautomerism. Their relative acidity is



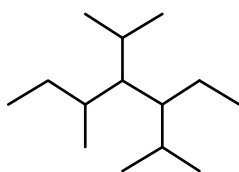
(A) Both are equal in acidic

(B) I is more acidic than II

(C) II is more acidic than I

(D) None of this is acidic

242. The correct IUPAC name of the following compound is



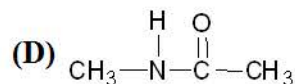
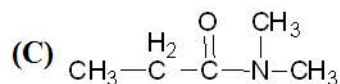
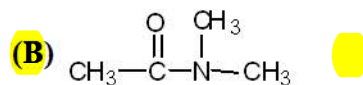
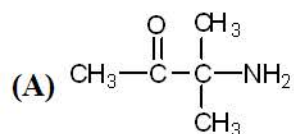
(A) 3-methyl-4, 5-diisopropylheptane

(B) 4, 5- diisopropyl-3- methylheptane

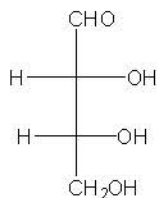
(C) 3-ethyl-4-isopropyl-2, 5-dimethylheptane

(D) 5-ethyl-4-isopropyl-3, 6-dimethylheptane

243. The correct structure of N,N-dimethylethanamide is



244. The absolute configuration of the following structure is



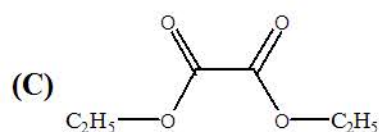
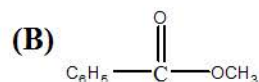
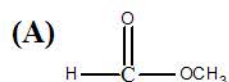
(A) 2R, 3S

(B) 2R, 3R

(C) 2S, 3R

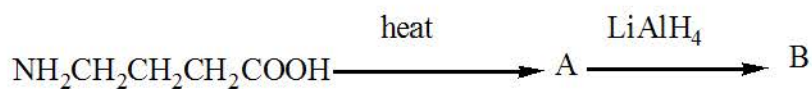
(D) 2S, 3S

245. Which of the following ester can be used as acylating agent in mixed Claisen condensation?



(D) All the above

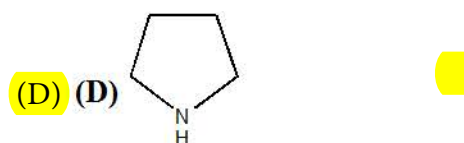
246. For the following reaction predict the structure of B



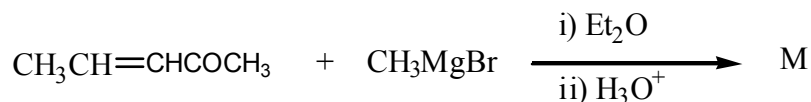
(A) $\text{NH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$

(B) $\text{H}_2\text{C}=\overset{\text{H}}{\text{C}}-\text{CH}_2\text{CH}_2\text{OH}$

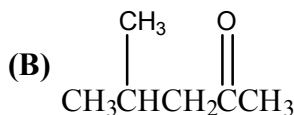
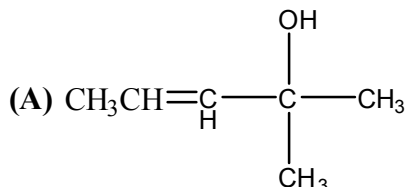
(C) $\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$



247. The following reaction gives the product M .



The correct option for M is



(C) Both A and B

(D) None

248. Racemic modification can be resolved by

(A) The use of enzyme

(B) Fractional crystallization

(C) Fractional distillation

(D) All of these

249. An S_{N}^2 reaction of an asymmetric carbon of a compound always gives

(A) A product with opposite optical rotation

(B) An enantiomer of the substrate

(C) A mixture of diastereomers

(D) A single stereoisomer

250. The heterocyclic ring present in amino acid histidine is

(A) Pyridine

(B) Tetrahydropyrrole

(C) Indole

(D) Imidazole

251. o-chlorotoluidine can undergo

(I) electrophilic aromatic substitution

(II) Nucleophilic aromatic substitution

(III) Nucleophilic aliphatic substitution

(IV) Free radical substitution

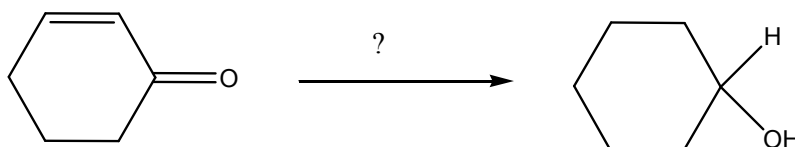
(A) Only I

(B) I and II

(C) I, II and IV

(D) all four

252. Predict the nature of reducing agent in the following reaction



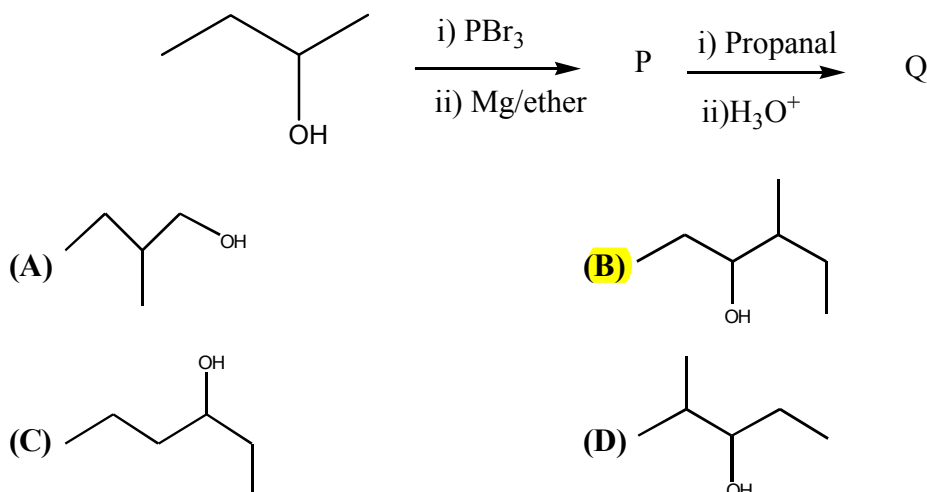
(A) LiAlH_4

(B) NaBH_4

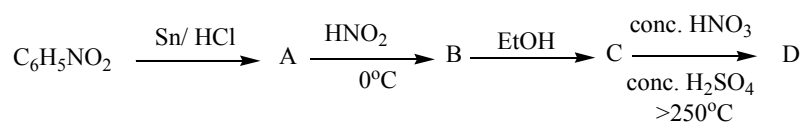
(C) H_2/Pt

(D) both A and B

253. The correct structure for the compound Q is

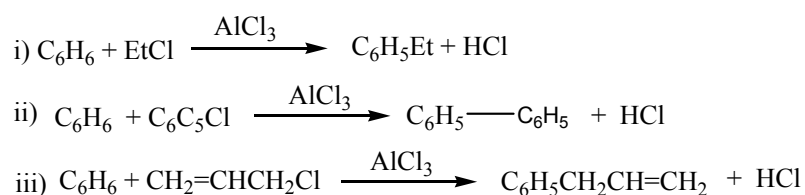


254. In the following reaction, the product D will show NMR signal



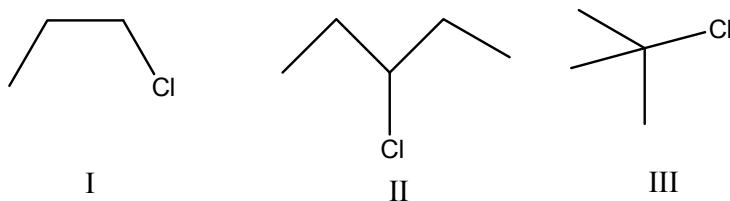
- (A) Four (B) three
 (C) two (D) one

255. Which of the following reaction is not possible?



- (A) i (B) ii
 (C) iii (D) All are possible

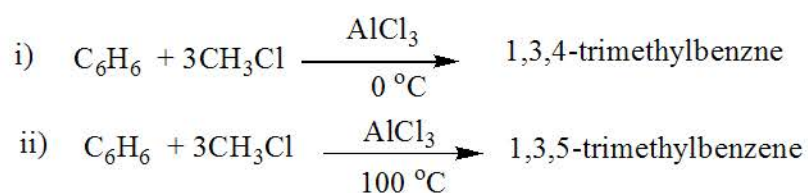
256.



For the above molecules which of the below statements is/are correct?

- (i) reactivity for S_N^1 reaction is $\text{I} < \text{II} < \text{III}$
 (ii) reactivity for S_N^2 reaction $\text{I} < \text{II} < \text{III}$
 (iii) reactivity for S_N^1 reaction $\text{I} > \text{II} > \text{III}$
 (iv) reactivity for S_N^2 reaction $\text{I} > \text{II} > \text{III}$
- (A) i and ii (B) i and iv
 (C) i and iii (D) all are incorrect

257. Which of the following reaction is true?



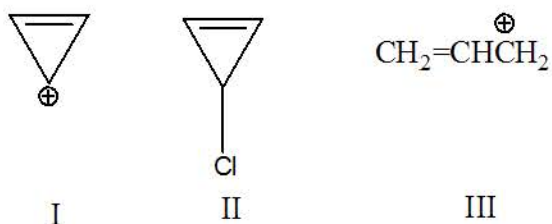
(A) Only i

(B) Only ii

(C) both i and ii

(D) Neither of two

258. The order of stability of the following three compound is



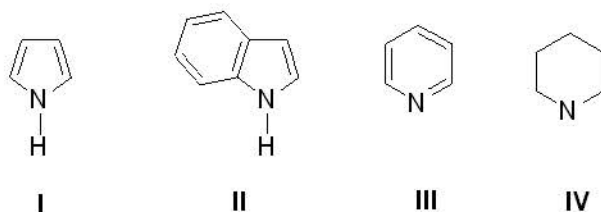
(A) III > I > II

(B) III > II > I

(C) I > III > II

(D) I > II > III

259. The correct order of basicity of the following compounds is



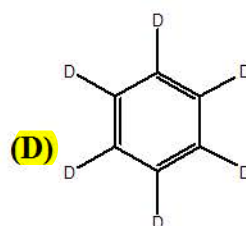
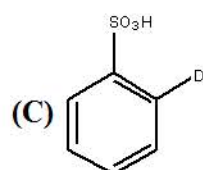
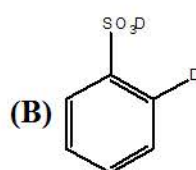
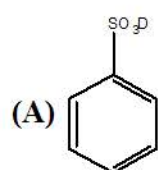
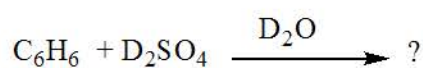
(A) I > II > III > IV

(B) IV > III > II > I

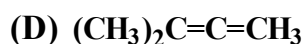
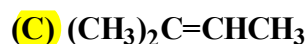
(C) III > IV > II > I

(D) III > IV > I > II

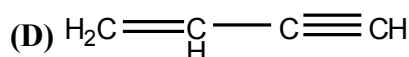
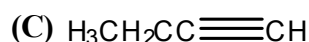
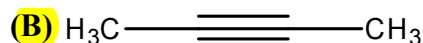
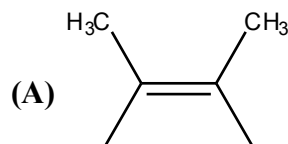
260. The product obtained in the reaction



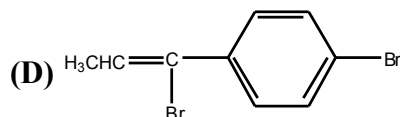
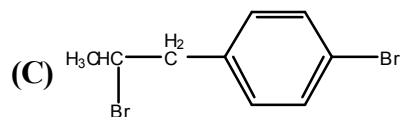
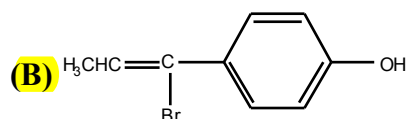
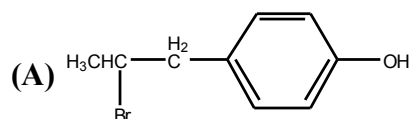
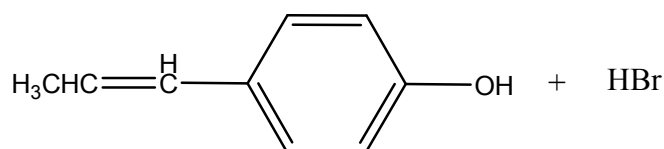
261. Three isomeric alkenes A, B and C [C_5H_{10}] are hydrogenated to give 2-methylbutane. A and B give same 3° alcohol on oxymercuration-demercuration, while B and C give different 1° alcohols on hydroboration oxidation. The alkene (A) is



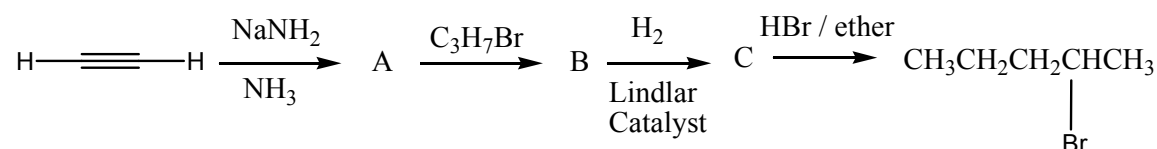
262. Which of the following has the lowest dipole moment?



263. The product of the reaction



264. In the following reaction Compound A is



(A) Ethene

(B) 1,3-Butadiene

(C) Ethyne

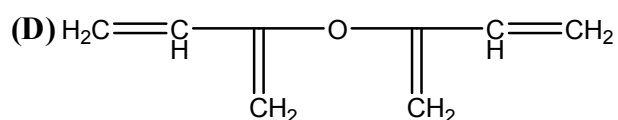
(D) acetylide ion

265. Number of ^{13}C NMR signal for $C_8H_{10}O$ is eight and the compound gives sooty flame on heating with Copper foil. The compound C_7H_8 is

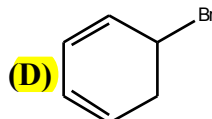
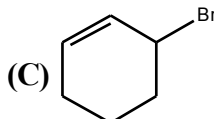
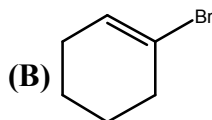
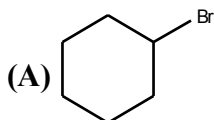
(A) o-methyl anisole

(B) p-methyl anisole

(C) phenitole



266. Which of the following compound is fast debrominated?



267. The correct order of aromaticity of furan, thiophene and pyrrole is as

(A) furan > thiophene > pyrrole

(B) furan > pyrrole > thiophene

(C) pyrrole > thiophene > furan

(D) thiophene > pyrrole > furan

268. The decreasing order of nucleophilicity of HS^- , RCOO^- , RCOOH and R-OH is

(A) $\text{RCOO}^- > \text{HS}^- > \text{RCOOH} > \text{ROH}$

(B) $\text{HS}^- > \text{RCOO}^- > \text{RCOOH} > \text{ROH}$

(C) $\text{HS}^- > \text{RCOO}^- > \text{ROH} > \text{RCOOH}$

(D) $\text{RCOO}^- > \text{HS}^- > \text{ROH} > \text{RCOOH}$

269. Meso stereoisomers is possible in which of the following compound

i) 2, 4- Dibromopentane

ii) 2, 3-Dibromopentane

iii) 3-Bromo-2-pentanol

iv) cis-1, 3-Dimethyl cyclohexane

(A) Only i

(B) ii and iii

(C) i and iv

(D) none of these

270. The ratio of relative intensities of the carbon signals in the first order ^{13}C NMR spectrum of CD_3Cl is

(A) 1:4:6:4:1

(B) 1:3:3: 1

(C) 1:6:15:20:15:6:1

(D) 1:3:6:7:6:3:1

271. Hyperconjugation is not possible in

(A) $\text{CH}_3\text{C}\equiv\text{CH}$

(B) CH_3CHO

(C) CH_3CN

(D) $(\text{CH}_3)_3\text{CCH}=\text{CH}_2$

272. The absorption at λ_{max} 279 nm ($\epsilon = 15$) in the UV spectrum of acetone is due to

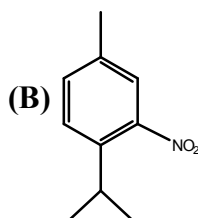
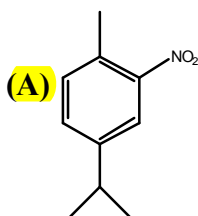
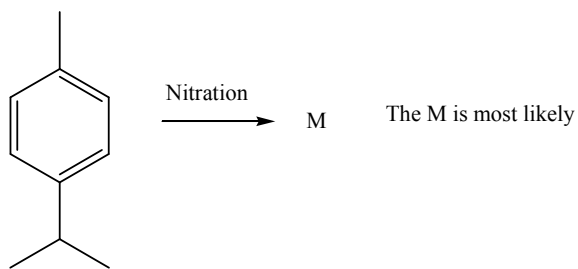
(A) $\pi \rightarrow \pi^*$ transition

(B) $n \rightarrow \pi^*$ transition

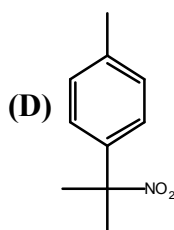
(C) $\sigma \rightarrow \sigma^*$ transition

(D) $\pi \rightarrow \sigma^*$ transition

273.



(C) A and B equal amount



274. 1-Buten-3-yne has

(A) six σ and four π bonds

(B) seven σ and three π bonds

(C) eight σ and two π bonds

(D) nine σ and one π bonds

275. Which of the following compounds will be optically active?

(A) Succinic acid

(B) meso-tartaric acid

(C) lactic acid

(D) Chloroacetic acid

276. Which of the following compounds reduces Tollen's reagent?

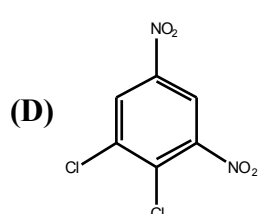
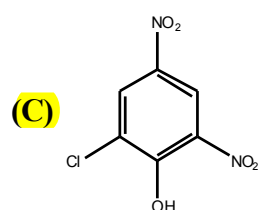
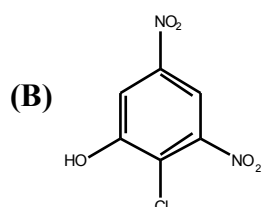
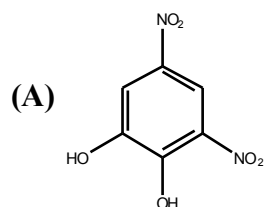
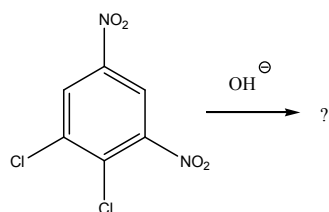
(A) Glucose

(B) Sucrose

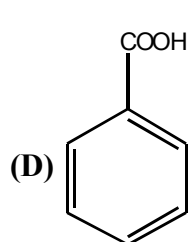
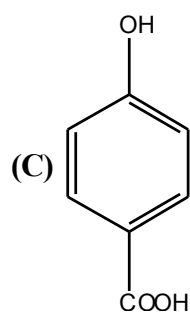
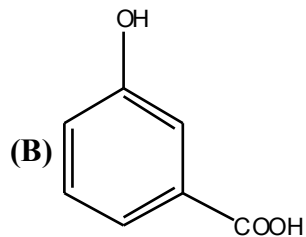
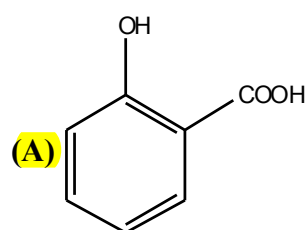
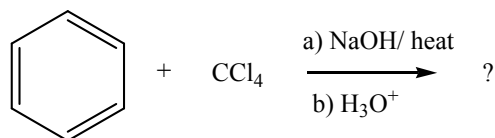
(C) Methanol

(D) Acetic acid

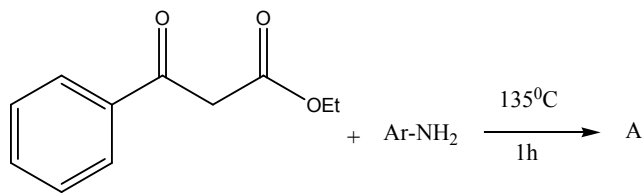
277. Name the product for the following reaction.



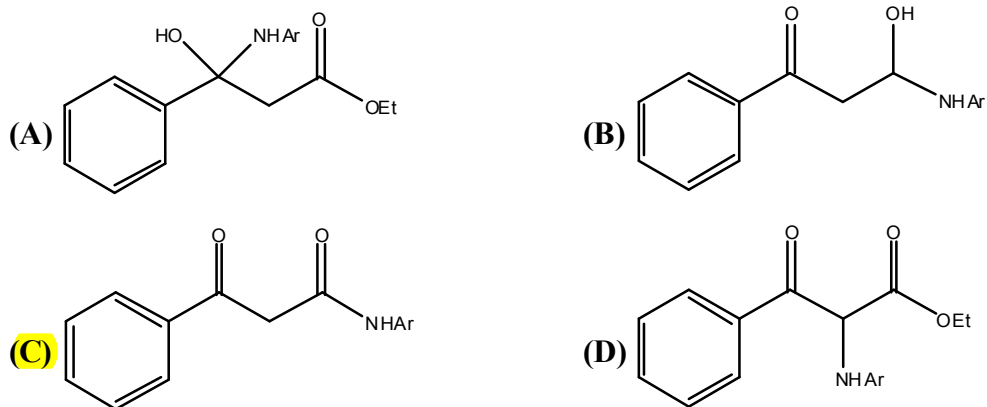
278. Give the end product



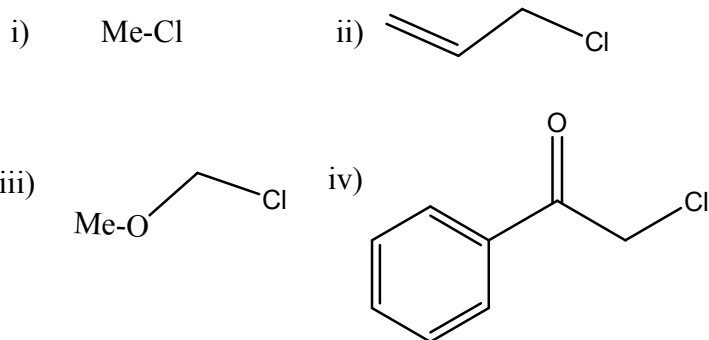
279. For a reaction



What will be structure of A?

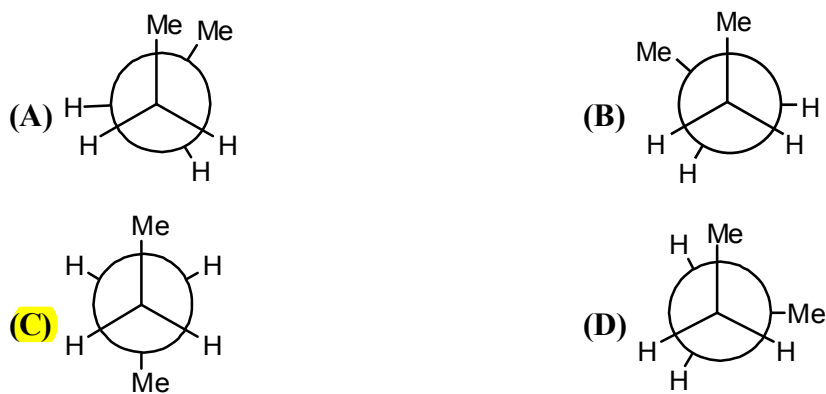


280. Arrange the following molecules into increasing order of their relative rate of reaction towards S_N^2 reaction

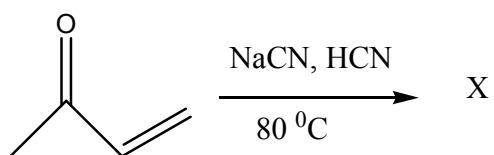


- (A) ii > i > iii > iv (B) iii > ii > iv > i
 (C) iv > iii > ii > i (D) i > ii > iii > iv

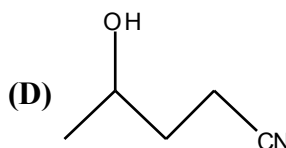
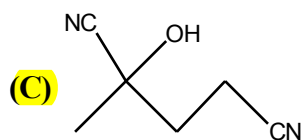
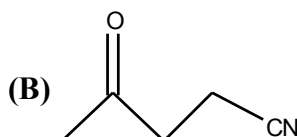
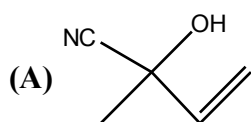
281. Which of the following conformation is most stable?



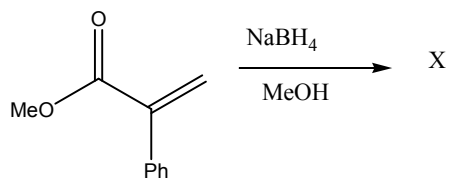
282. For a reaction



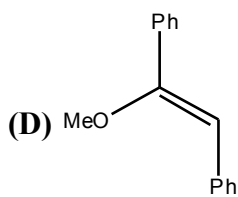
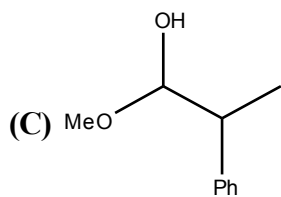
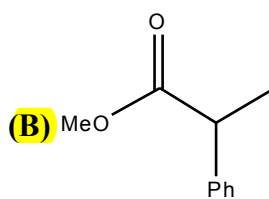
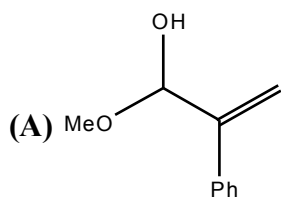
The structure of X will be



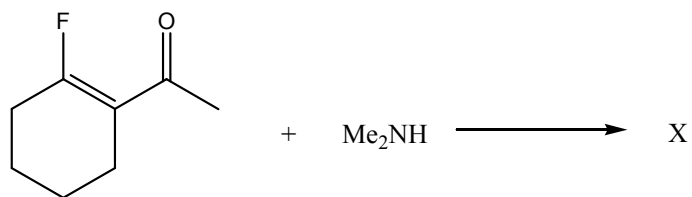
283. For a reaction



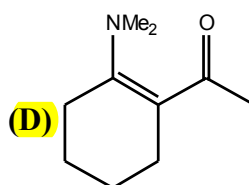
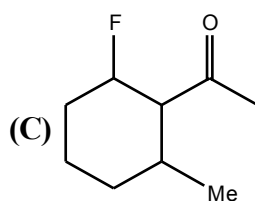
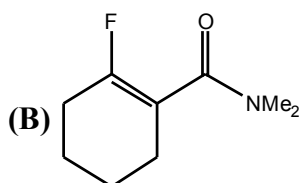
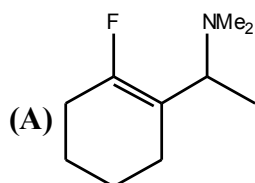
The structure of X will be



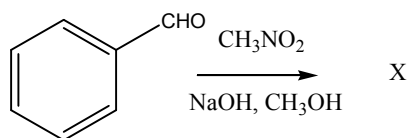
284.



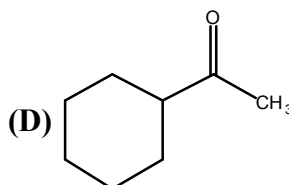
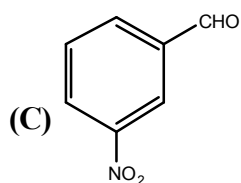
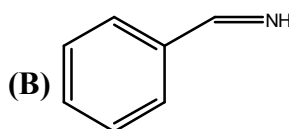
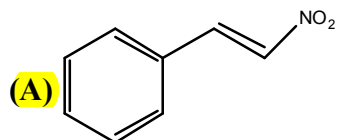
X will be



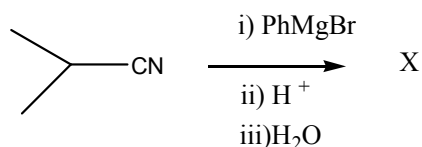
285. For a reaction



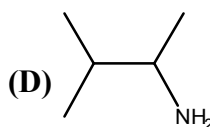
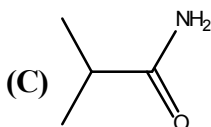
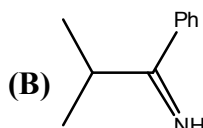
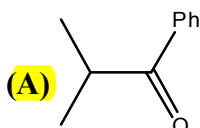
What will be the structure of X?



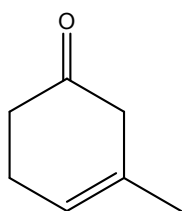
286. For a reaction



What is the structure of X?



287. IUPAC name of the following compound is



(A) 3-methyl-cyclohex-3-en-1-one

(B) 5-methyl-cyclohex-4-en-1-one

(C) 1-methyl-cyclohex-1-en-5-one

(D) 2-methyl-cyclohex-1-en-4-one

288. Nuclides having same number of neutrons are called

(A) Isomers

(B) isobars

(C) isotones

(D) isotopes

289. Which of the following statements is incorrect?

(A) H₂O₂ acts as an oxidizing agent

(B) H₂O₂ acts as a reducing agent

(C) H₂O₂ has acidic properties

(D) H₂O₂ acts has basic properties

290. When ammoniacal common salt solution is saturated with carbon dioxide we obtain
- (A) ammonium bicarbonate (B) ammonium carbonate
(C) sodium bicarbonate (D) Sodium carbonate
291. Arsenic is detected by
- (A) Ring test (B) Lucas test
(C) Lake test (D) Marsh test
292. Zirconium and Hafnium have almost equal atomic and ionic radii because
- (A) Of diagonal relationship (B) Of lanthanoid contraction
(C) Actinoid contraction (D) Both belong to same transition series
293. The equivalent mass of MnSO_4 is half of its molecular mass when it is converted to
- (A) Mn_2O_3 (B) MnO_2
(C) MnO_4^- (D) MnO_4^{2-}
294. The electrolytic reduction technique is used in the extraction of
- (A) Transition metals (B) Highly electropositive elements
(C) Metalloids (D) Highly electronegative elements
295. On moving down the group from F to I, which of the following properties decrease?
- (A) Ionic radius (B) ionization enthalpy
(C) oxidizing nature (D) electronegativity
296. Electrolyte A gives four ions and B is a non electrolyte. If 0.1 M solution of solute B produces an osmotic pressure 'p' then 0.02 M solution of A will produce osmotic pressure equal to
- (A) 0.02 p (B) 0.8 p
(C) 0.08 p (D) 0.4 p
297. 75% of a first order reaction was completed in 32 min, then half life of the reaction is
- (A) 24 min (B) 8 min
(C) 16 min (D) 4 min

