

- Physics**

 - The ratio of areas within the electron orbits for the second excited state to the ground state for hydrogen atom is
A) 9: 1 B) 27: 1
C) 81: 1 D) 3: 1
 - The innermost orbit of the hydrogen atom has a diameter 1.06 Å . The diameter of the twentieth orbit is
A) 212 B) 848
C) 424 D) 106
 - Energy of the electron in nth orbit of a hydrogen-like atom is given by $E_n = \frac{-18}{n^2}$ eV. The amount of energy needed to transfer electron from first orbit to third orbit is
A) 2 eV B) 18 eV
C) 16 eV D) 8 eV
 - If the binding energy of the electron in a hydrogen atom is 16 eV, the energy required to remove the electron from the first excited state of Li^{++} is
A) 144 eV B) 9 eV
C) 4 eV D) 36 eV
 - The ratio of the wavelengths for $2 \rightarrow 1$ transition in Be^{+++} , Li^{++} and He^+ is
A) 9: 16: 36 B) 4: 9: 16
C) 36: 16: 9 D) 16: 9: 4
 - Energy E of a hydrogen-like atom with principal quantum number n is given by $E = \frac{-36}{n^2}$ eV. The energy of a photon ejected when the electron jumps from $n = 3$ state to $n = 2$ state of this atom is approximately
A) 13 eV B) 4 eV
C) 9 eV D) 5 eV
 - In the Bohr model of the hydrogen atom, let R , v and E represent the radius of the orbit, the speed of electron and the total energy of the electron respectively. Which of the following quantity is proportional to the cube of the quantum number n
A) Rv B) E/v
C) R/v D) RE
 - The energy of hydrogen atom in nth orbit is E_n , then the energy in nth orbit of doubly ionised lithium atom will be
A) $3E_n$ B) $E_n/3$
C) $9E_n$ D) $E_n/9$

- A)** $2\lambda_0$
- B)** $\lambda_0/4$
- C)** $4\lambda_0$
- D)** $8\lambda_0$

Planck's constant is $h = 6.28 \times 10^{-34}$ J-s

- A) 2×10^{-34} J-s**
- B) 3×10^{-34} J-s**
- C) 6×10^{-34} J-s**
- D) 1×10^{-34} J-s**

11. In hydrogen atom, if the difference in the energy of the electron in $n = 3$ and $n = 6$ orbits is E , the ionization energy of hydrogen atom is

- A) $6E$** **B) $36E$**
C) $12E$ **D) $3E$**

12. In Bohr model of hydrogen atom, the ratio of periods of revolution of an electron in $n = 3$ and $n = 1$ orbits is

- A) 9: 1**
- B) 3: 1**
- C) 81: 1**
- D) 27: 1**

13. A double charged lithium atom is equivalent to hydrogen whose atomic number is 3. The wavelength of required radiation for emitting electron from first to second Bohr orbit in Li^{++} will be. Ionisation energy of hydrogen atom is 13.6 eV (take $hc = 12400$ eV-)

- A) 270** **B) 135**
C) 540 **D) 45**

14. The absorption transitions between two energy states of hydrogen atom are 4. The emission transitions between these states will be

- A) 10**
- B) 6**
- C) 8**
- D) 4**

15. The energy levels of a certain atom for 1st, 2nd and 3rd levels are E , $\frac{5E}{4}$ and $2E$ respectively. A photon of wavelength λ is emitted for a transition $3 \rightarrow 1$. What will be the wavelength of emissions for transition $2 \rightarrow 1$

- A) 2λ** **B) 8λ**
C) 4λ **D) $\lambda/2$**

16. Hydrogen atom emits violet light when it changes from $n = 6$ energy level to $n = 2$ level. Which colour of light would the atom emit when it changes from $n = 3$ level to $n = 2$ level

- A) Violet**
- B) Blue**
- C) Red**
- D) Green**

17. A single electron orbits a stationary nucleus of charge $+Ze$, where Z is a constant. It requires 108.8 eV to excite the electron from first Bohr orbit to third Bohr orbit. Find the value of Z .

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

18. The first member of the Balmer series in hydrogen spectrum is of wavelength 6561 . The short wavelength limit of Balmer series is

- A) 6561**
- B) 2430**
- C) 1215**
- D) 3645**

19. Ratio of the wavelengths of first line of Balmer series and first line of Paschen series is

- A) 20: 7**
- B) 7: 20**
- C) 5: 27**
- D) 27: 5**

20. The third line of Balmer series of an ion equivalent to hydrogen atom has wavelength 48.2 nm. The ground state energy of an electron of this ion (in units of 13.6 eV) will be

- A) 9
C) 16
- B) 4
D) 2

21. Hydrogen, deuterium, doubly ionized lithium and triply ionized beryllium all have one electron around the nucleus. Consider the transition $n = 3$ to $n = 2$. The wavelengths of emitted radiations are $\lambda_1, \lambda_2, \lambda_3$ and λ_4 respectively. Then approximately

- A) $\lambda_1 = \lambda_2 = 3\lambda_3 = 4\lambda_4$
C) $\lambda_1 = \lambda_2 = 9\lambda_3 = 16\lambda_4$
- B) $\lambda_1 = \lambda_2 = 16\lambda_3 = 9\lambda_4$
D) $\lambda_1 = 2\lambda_2 = 9\lambda_3 = 16\lambda_4$

22. Hydrogen atom in its ground state is excited by radiation of wavelength 950 . How many lines will be there in the emission spectrum

- A) 6
C) 4
- B) 10
D) 15

23. A photon of energy 12.09 eV is completely absorbed by a hydrogen atom initially in the ground state so that it is excited. The quantum number of the excited state is

- A) $n = 3$
C) $n = 4$
- B) $n = 2$
D) $n = 5$

24. The wave number of the energy emitted when an electron comes from third orbit to first orbit in hydrogen is 82259 cm^{-1} . The wave number of the energy for the same transition in Li^{++} is

- A) 246777 cm^{-1}
C) 82259 cm^{-1}
- B) 164518 cm^{-1}
D) 740331 cm^{-1}

25. In an atom, two electrons move round the nucleus in circular orbits of radii R and $9R$. The ratio of the time taken by them to complete one revolution is

- A) 1/9
C) 1/27
- B) 27/1
D) 9/1

26. Ionisation energy for hydrogen atom in the ground state is E . What is the ionisation energy of Be^{+++} atom in the first excited state

- A) $2E$
C) $16E$
- B) $4E$
D) $8E$

27. An electron jumps from $n = 2$ to $n = 1$ state in a hydrogen atom. The recoil momentum of the hydrogen atom in eV/c is

- A) 10.2 eV/c
C) 3.4 eV/c
- B) 5.1 eV/c
D) 13.6 eV/c

28. If elements with principal quantum number $n > 3$ were not allowed in nature, the number of possible elements would be

- A) 10
C) 18
- B) 28
D) 36

29. An energy of 25.6 eV is required to remove one of the electrons from a neutral helium atom. The energy (in eV) required to remove both the electrons from a neutral helium atom is (ionisation energy of hydrogen = 13.6 eV)

- A) 54
C) 26
- B) 80
D) 108

30. An energy of 81.0 eV is required to remove the first two electrons from a neutral lithium atom. The energy (in eV) required to remove all three electrons from a neutral lithium atom is

- A) 122
C) 163
- B) 81
D) 203

31. Find the ratio of de-Broglie wavelengths for a deuteron and an alpha particle, if both have same speed.

- A) 2: 1 B) 1: 2
C) 4: 1 D) 1: 4

32. Calculate de-Broglie wavelength of an electron revolving in second excited state in hydrogen atom (take Bohr radius as 0.53).

- A) 5 B) 10
C) 15 D) 20

33. In fifth orbit of hydrogen atom wavelength of revolving electron is λ . Calculate the circumference of fifth Bohr orbit.

- A) 2λ B) λ
C) 5λ D) 10λ

34. Find the ratio of de Broglie wavelength of molecules of hydrogen and helium which are at temperatures 27°C and 327°C respectively.

- A) 4: 1 B) 2: 1
C) 1: 2 D) 1: 4

35. A stationary nucleus of mass M splits into two fragments of masses m and $3m$ having non zero velocities. Find out the ratio of the de-Broglie wavelengths of the two fragments.

- A) 3: 1 B) 1: 3
C) $\sqrt{3} : 1$ D) 1: 1

36. Find out velocity of an electron so that its momentum is equal to that of photon with a wavelength of $\lambda = 2600$.

- A) 1400 m/s B) 5600 m/s
C) 2800 m/s D) 700 m/s

37. What is the effective mass of a photon having frequency ν ?

- A) $\frac{h\nu}{c}$ B) $\frac{hc}{\nu}$
C) $\frac{c^2}{h\nu}$ D) $\frac{h\nu}{c^2}$

38. The de Broglie wavelength of particles of mass m with average momentum p at a temperature T in two dimensions is given by

- A) $\lambda = \frac{h}{\sqrt{2mk_B T}}$ B) $\lambda = \frac{h}{\sqrt{3mk_B T}}$
C) $\lambda = \frac{h}{\sqrt{mk_B T}}$ D) $\lambda = \frac{h}{\sqrt{k_B T/m}}$

39. An electron is moving in Bohr's third orbit. The circumference of the orbit is C . What is its de Broglie wavelength?

- A) $3C$ B) $C/3$
C) C D) $9C$

40. The velocities of two particles A & B are 0.08 m/s & 0.01 m/s respectively. The mass of B is two times of mass of A. The ratio of their de-Broglie wavelength is

- A) 4: 1 B) 2: 1
C) 1: 2 D) 1: 4

41. The de Broglie wavelength of a proton of energy E_p is four times the de Broglie wavelength of an alpha particle of energy E_α . The ratio of $\frac{E_p}{E_\alpha}$ is

- A) 4 B) 1/4
C) 1 D) 16

42. The de-Broglie wavelength of a charged particle accelerated through a potential difference V is proportional to

- A) $1/V$ B) $V^{1/2}$
C) $1/V^{1/2}$ D) V^2

43. The de-Broglie wavelength of an electron with a kinetic energy of 12270 eV is nearly

- A) 100 pm** **B) 1000 pm**
- C) 10 pm** **D) 1 pm**

44. A particle of mass M at rest decays into two particles of masses m_1 and m_2 having nonzero velocities. The ratio of their kinetic energies (K_1/K_2) is

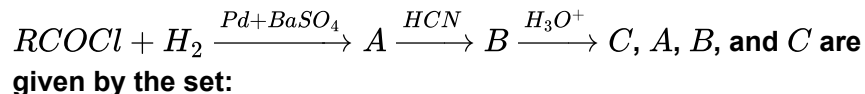
- A)** m_1/m_2
- B)** m_2/m_1
- C)** 1
- D)** $\sqrt{m_2/m_1}$

45. The de Broglie wavelength λ for an electron of energy 1.5 eV is

- A)** 10^{-10} m **B)** 10^{-11} m
C) 10^{-12} m **D)** 10^{-9} m

Chemistry

46. In the reaction sequence:



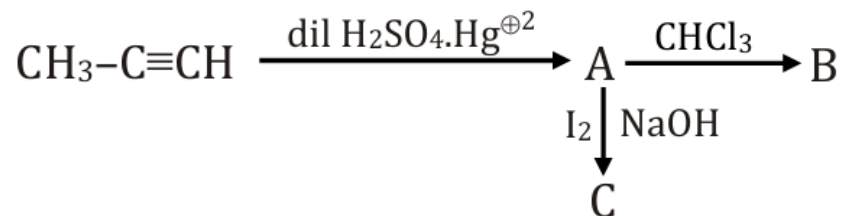
- A)** $RCHO, RCH(OH)CN, RCH(OH)CH_2NH_2$

B) $RCHO, RCH(OH)CN, RCH(OH)COOH$

C) $RCHO, R-\overset{\overset{O}{\parallel}}{C}-\underset{\underset{CN}{|}}{CH_2}, R-\overset{\overset{O}{\parallel}}{C}-CH_2-\overset{\overset{O}{\parallel}}{C}-OH$

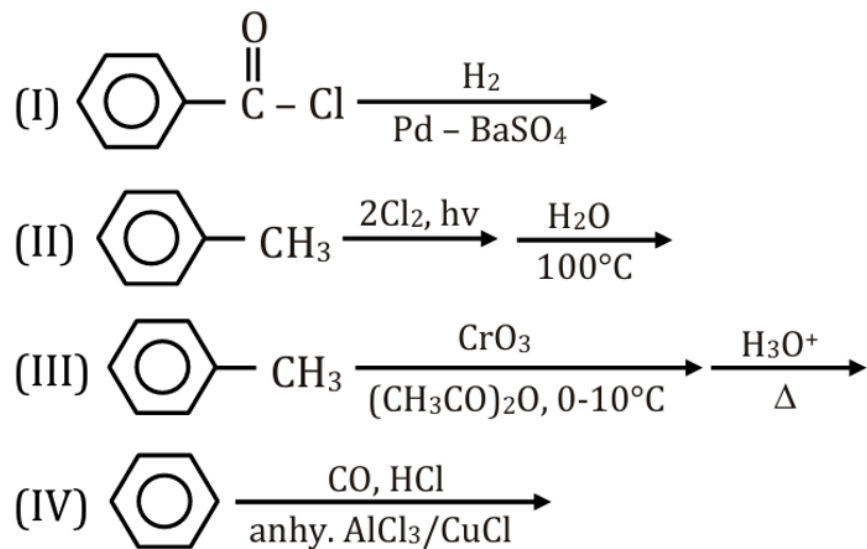
D) $RCHO, R-CH_2-CN, R-CH_2-COOH$

47. In the reaction sequence: , the products A , B , and C are:



- A)** CH_3CH_2CHO ,
 $CH_3CH_2CH_2Cl$, CHI_3
- B)** CH_3COCH_3 , $CCl_3-C(=O)-CH_3$, CHI_3
- C)** CH_3COCH_3 , $CCl_3-C(OH)(CH_3)_2$, CHI_3
- D)** CH_3CH_2CHO , $CCl_3-C(=O)-CH_2-CH_3$, CHI_3

48. Which of the following reactions can be used to prepare benzaldehyde?

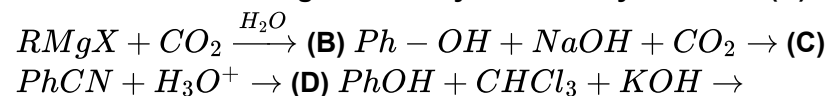


- A)** I, II
B) II, III, IV
C) I, III, IV
D) I, II, III, IV

49. Which of the following substrates gives the same product on reduction with DIBAL-H?

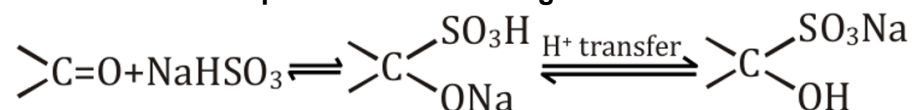
- A) $CH_3 - (CH_2)_4 - CN$ and $CH_3 - (CH_2)_5 - COOH$
 B) $CH_3 - (CH_2)_4 - CN$ and $CH_3 - (CH_2)_4 - COOC_2H_5$
 C) $CH_3 - (CH_2)_4 - COOH$ and $CH_3 - (CH_2)_4 - COCH_3$
 D) $CH_3 - (CH_2)_5 - COOH$ and $CH_3 - (CH_2)_4 - COOC_2H_5$

50. Which of the following reactions yield carboxylic acids? (A)



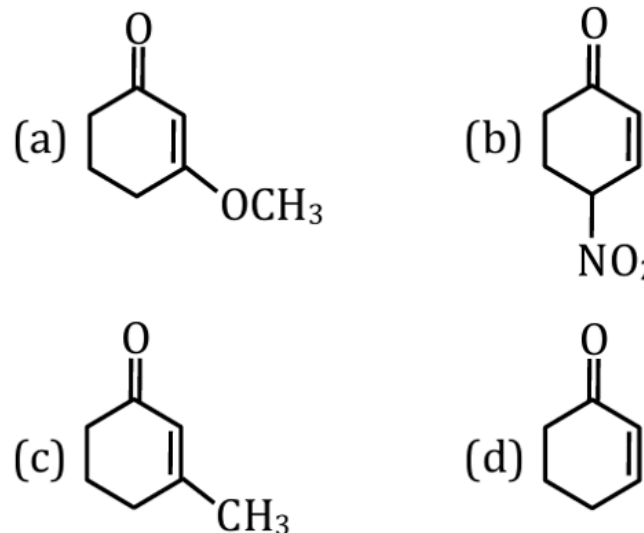
- A) A, B and C are correct
 B) A & B are correct
 C) B & D are correct
 D) A & C are correct

51. Select the correct option for the following reaction



- A) The position of equilibrium is on RHS for most ketones
 B) The position of equilibrium is on LHS for most aldehydes
 C) The hydrogen sulphite addition compound is water insoluble
 D) Sulphite addition compounds are useful for separation and purification of aldehydes

52. Correct reactivity order towards nucleophilic addition is:



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

53. Choose the correct alternative from the following.

- A) Ketones are more reactive than aldehydes towards NAR.
 B) Aldehydes are more reactive than ketones towards NAR.
 C) Formaldehyde is the least reactive carbonyl compound towards NAR.
 D) Steric hindrance does not play a role to effect the reactivity of carbonyl compounds towards NAR.

54. Cyanohydrin of which of the following compounds on hydrolysis gives a compound that can show optical isomerism?

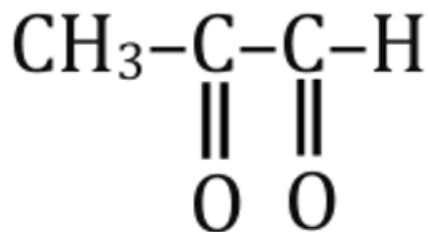
- A) $HCHO$
 B) CH_3CHO
 C) CH_3COCH_3
 D) All the above

55. When acetone reacts with Grignard reagent followed by hydrolysis, it gives:

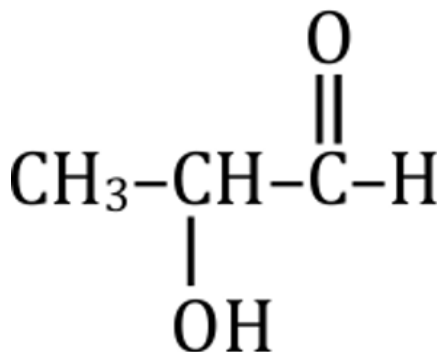
- A) 1°-alcohol
 B) 2°-alcohol
 C) 3°-alcohol
 D) Methyl alcohol

56. Which of the following aldehydes does not form iodoform on heating with iodine and alkali?

- A) ICH_2CHO B) ICH_2CHO



- C) $CH_3 - CH_2 - CHO$ D)



57. A carbonyl compound gives a positive iodoform test but does not reduce Tollen's reagent or Fehling's solution. It forms a cyanohydrin with HCN, which on hydrolysis gives a hydroxy acid with a methyl side chain. The compound is:

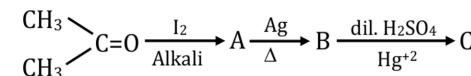
- A) Acetaldehyde B) Propionaldehyde
C) Acetone D) Crotonaldehyde

58. Which of the following statements is wrong?

- A) All methyl ketones give a positive iodoform test
B) Acetaldehyde is the only aldehyde that gives iodoform test
C) All secondary alcohols give positive iodoform test
D) Any alcohol that can be oxidised to an acetyl group gives a positive iodoform test

59. The compounds A, B, and C in the reaction sequence are given by the set:

- A) CHI_3 , $H_2C = CH_2$, CH_3CH_2OH
B) CHI_3 , $HC \equiv CH$, CH_3CHO
C) CHI_3 , $CH_3 - C \equiv CH$, CH_3COCH_3
D)



60. CH_3CHO and CH_3COCH_3 cannot be distinguished by:

- A) Fehling solution B) Grignard reagent
C) Schiff's reagent D) Tollen's reagent

61. Select the correct option about Fehling's test:

- A) Fehling test is given by all aldehydes but not by ketones
B) A red brown ppt. of CuO confirms the test
C) Fehling solution 'A' is aq. $CuSO_4$
D) Fehling solution 'B' is alkaline sodium potassium citrate

62. Which of the following reagents is/are used in the given reaction?
 $RCHO \rightarrow RCOOH$

- A) $KMnO_4/H^+$ B) Potassium dichromate
C) Tollen's reagent D) All of the above

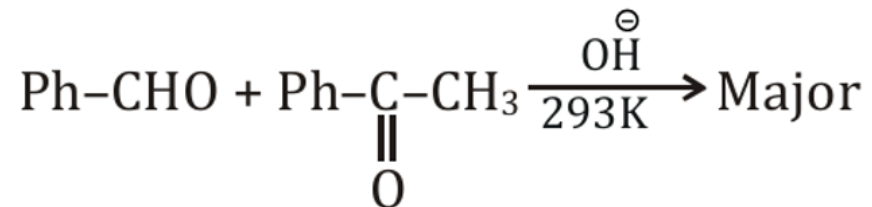
63. Which of the following statements is/are correct regarding oxidation of ketones?

- A) Aldehydes are generally oxidised under vigorous conditions
B) Ketones are easily oxidised to carboxylic acids even under mild oxidising agents
C) Oxidation of ketones involves carbon-carbon bond cleavage to give a mixture of carboxylic acids having lesser number of carbon atoms than the parent ketone
D) All of the above

64. Regarding acetone, choose the correct statements: (A) It restores the pink colour of Schiff's reagent (B) It gives a positive 2,4-DNP test (C) It is very easily oxidised to acetic acid (D) It forms 2,3-dimethylbutan-2,3-diol on treatment with magnesium amalgam and water

- A) A, B and C are correct
 B) A & B are correct
 C) B & D are correct
 D) A & C are correct

65. For the reaction the major product is:



- A) $\text{Ph}-\overset{\overset{\text{CH}_3}{|}}{\underset{\underset{\text{OH}}{|}}{\text{C}}}-\text{CH}_2-\overset{\overset{\text{O}}{\parallel}}{\text{C}}-\text{Ph}$
- B) $\text{Ph}-\overset{\overset{\text{O}^\ominus}{\parallel}}{\text{C}} + \text{Ph}-\text{CH}_2-\text{OH}$
- C) $\text{Ph}-\underset{\underset{\text{OH}}{|}}{\text{CH}}-\overset{\overset{\text{O}}{\parallel}}{\text{C}}-\text{Ph}$
- D) $\text{Ph}-\text{CH}=\text{CH}-\overset{\overset{\text{O}}{\parallel}}{\text{C}}-\text{Ph}$

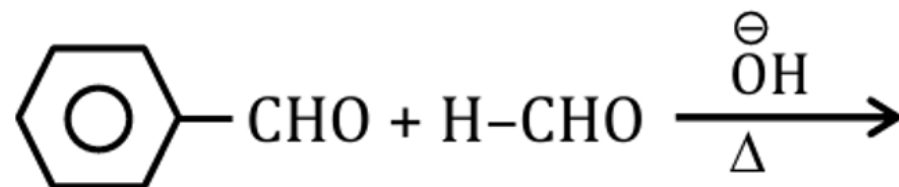
66. What is incorrect about acetaldehyde? (A) It is very easily oxidised (B) It forms 1-hydroxypropanenitrile with HCN (C) It can be obtained by hydration of acetylene (D) It gives Cannizzaro reaction

- A) A, B and C
 B) A & B
 C) B & D
 D) A & C

67. Which type of reaction(s) is/are involved in the Cannizzaro reaction?

- A) Reduction
 B) Oxidation
 C) Both (A) and (B)
 D) None of these

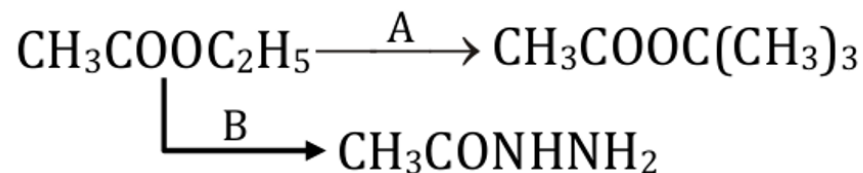
68. . The products will be:



- (A) $\text{C}_6\text{H}_5\text{-CH}_2\text{-OH}$ (B) $\text{C}_6\text{H}_5\text{-COO}^\ominus$
- (C) $\text{HCOO}^\ominus$ (D) $\text{CH}_3\text{-OH}$

- A) A, B and C are correct
 B) A & B are correct
 C) C & D are correct
 D) A & C are correct

69. The reagents A and B in the reaction sequence



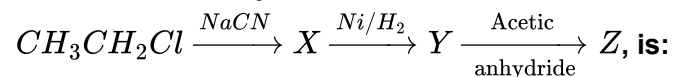
are given by the set:

- A) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{OH}$, $\text{H}_2\text{N}-\text{NH}_2$ B) $\text{CH}_3-\underset{\text{CH}_3}{\text{CH}}-\text{OH}$, $\text{H}_2\text{N}-\text{OH}$
- C) $\text{CH}_3-\underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}}-\text{OH}$, $\text{H}_2\text{N}-\text{NH}_2$ D) $\text{CH}_3-\underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}}-\text{OH}$, $\text{H}_2\text{N}-\text{OH}$

70. Methyl amine reacts with acetyl chloride and forms:

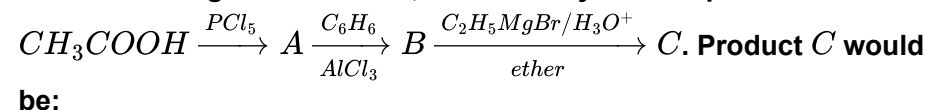
- A) CH_3NH_2 B) CH_3NHNa
 C) $\text{CH}_3\text{NHCOCH}_3$ D) $(\text{CH}_3)_2\text{NCOCH}_3$

71. In the reaction sequence

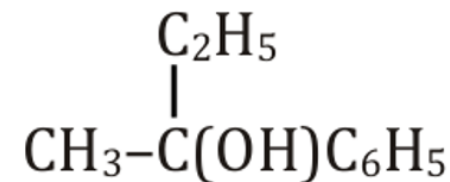


- A) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NHCOCH}_3$ B) $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
 C) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CONHCH}_3$ D) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CONHCOCH}_3$

72. In a set of the given reactions, acetic acid yielded a product C:



- A) $\text{CH}_3\text{CH}(\text{OH})\text{C}_2\text{H}_5$ B) $\text{CH}_3\text{COC}_6\text{H}_5$
 C) $\text{CH}_3\text{CH}(\text{OH})\text{C}_6\text{H}_5$ D)



73. $\text{CH}_3\text{CH}_2\text{CH}_2-\text{CN} \xrightarrow{\text{H}_3\text{O}^+} \text{A} \xrightarrow[\Delta]{\text{NH}_3} \text{B. Product B is:}$

- A) $\text{CH}_3-\text{CH}_2\text{CH}_2-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{OH}$ B) $\text{CH}_3\text{CH}_2\text{CH}_2-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{H}$
- C) $\text{CH}_3\text{CH}_2\text{CH}_2-\text{NC}$ D) $\text{CH}_3\text{CH}_2\text{CH}_2-\underset{\text{O}}{\underset{\parallel}{\text{C}}}-\text{NH}_2$

74. Sodium ethoxide has reacted with ethanoyl chloride. The compound that is produced in the above reaction is:

- A) Ethyl chloride B) Ethyl ethanoate
 C) Diethyl ether D) 2-Butanone

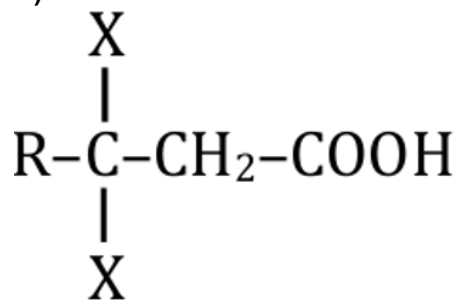
75. The product formed during Hell-Volhard-Zelinsky (HVZ) reaction is:

A)

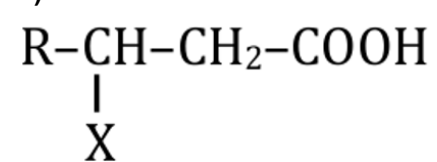


B) $\text{R}-\text{CH}_2-\text{COX}$

C)

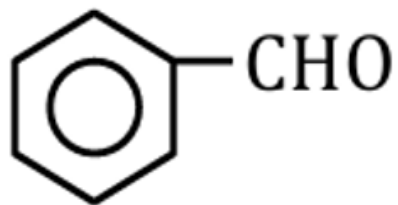


D)

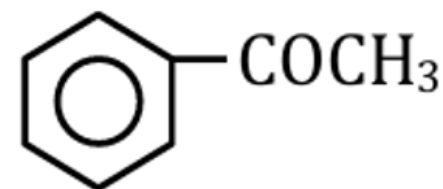


76. Which one is most reactive towards Nucleophilic addition reaction?

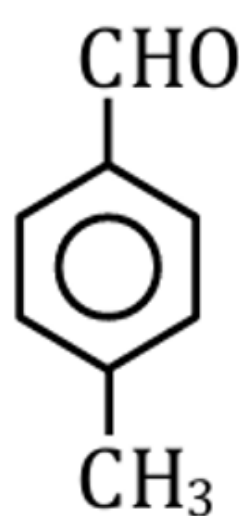
A)



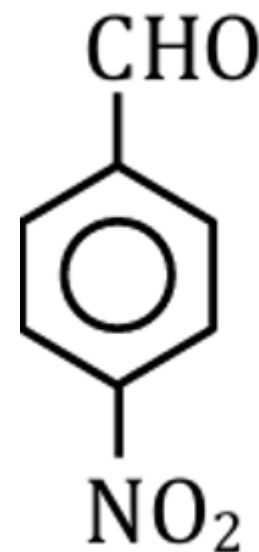
B)



C)

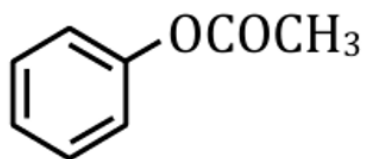


D)

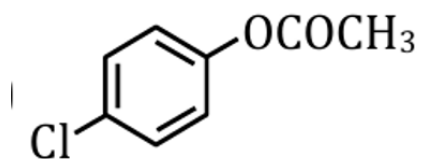


77. Which one of the following esters gets hydrolysed most easily under alkaline conditions?

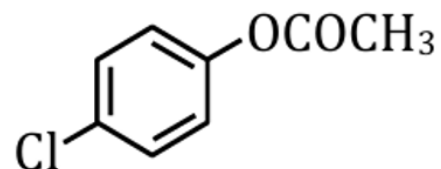
A)



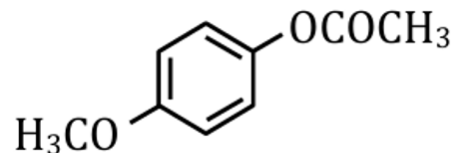
B)



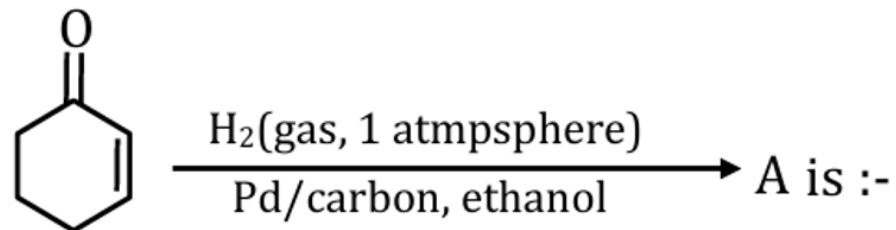
C)



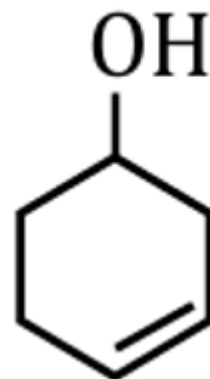
D)



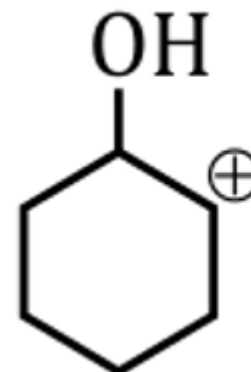
78. The correct structure of the product *A* formed in the reaction



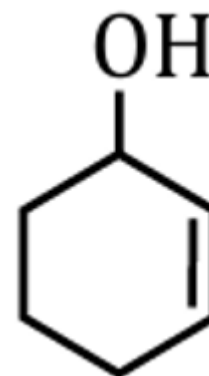
A)



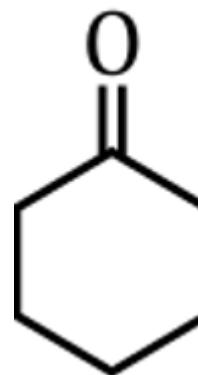
B)



C)

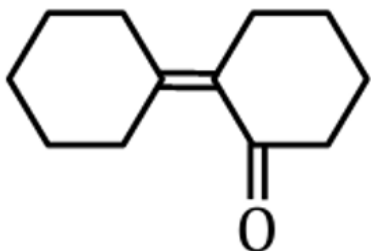


D)

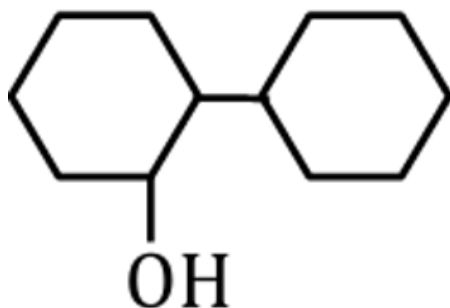


79. Of the following, which is the product formed when cyclohexanone undergoes aldol condensation followed by heating?

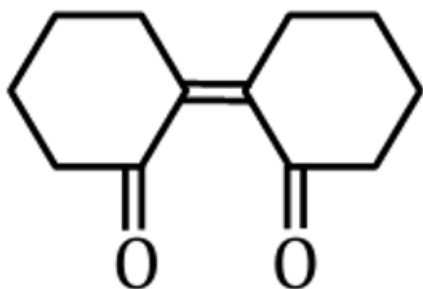
A)



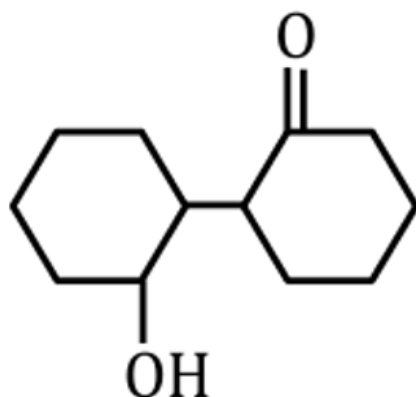
B)



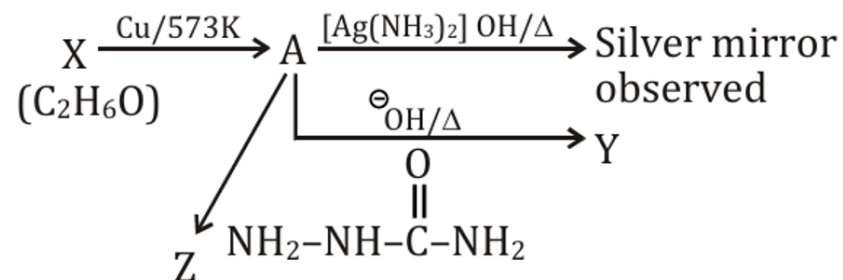
C)



D)



80. Consider the reactions:

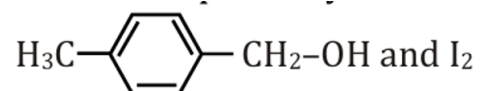


Identify A, X, Y, and Z:

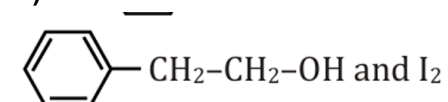
- A) A-Methoxymethane, X-Ethanol, Y-Ethanoic acid, Z-Semicarbazide
 B) A-Ethanol, X-Ethanal, Y-Ethanoate ion, Z-Semicarbazide
 C) A-Ethanol, X-Acetaldehyde, Y-Butanone, Z-Hydrazone
 D) A-Methoxymethane, X-Ethanoic acid, Y-Acetate ion, Z-Hydrazine

81. Compound A, $\text{C}_8\text{H}_{10}\text{O}$, is found to react with NaOI (produced by reacting Y with NaOH) and yields a yellow precipitate with characteristic smell. A and Y are respectively:

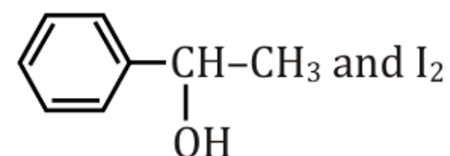
A)



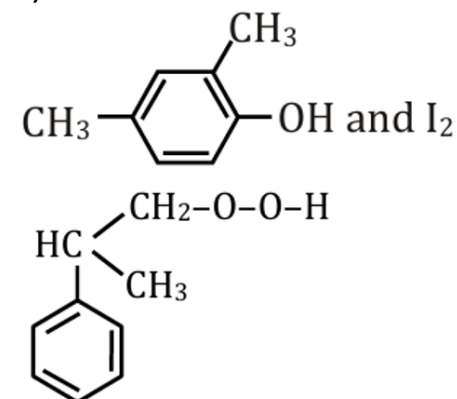
B)



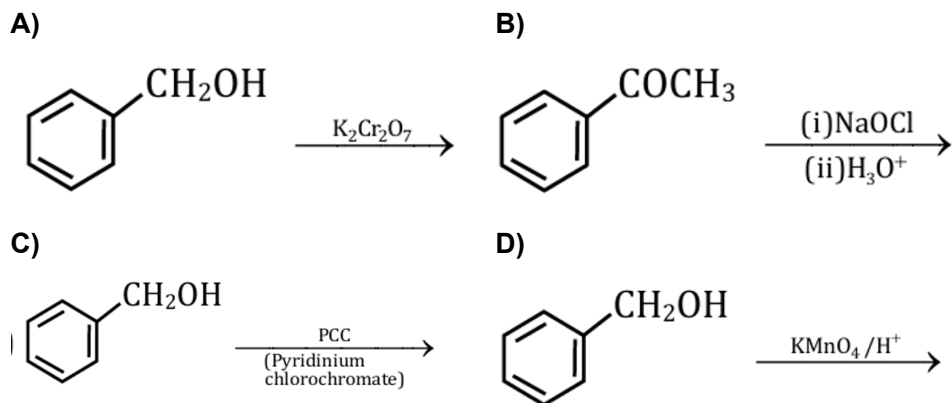
C)



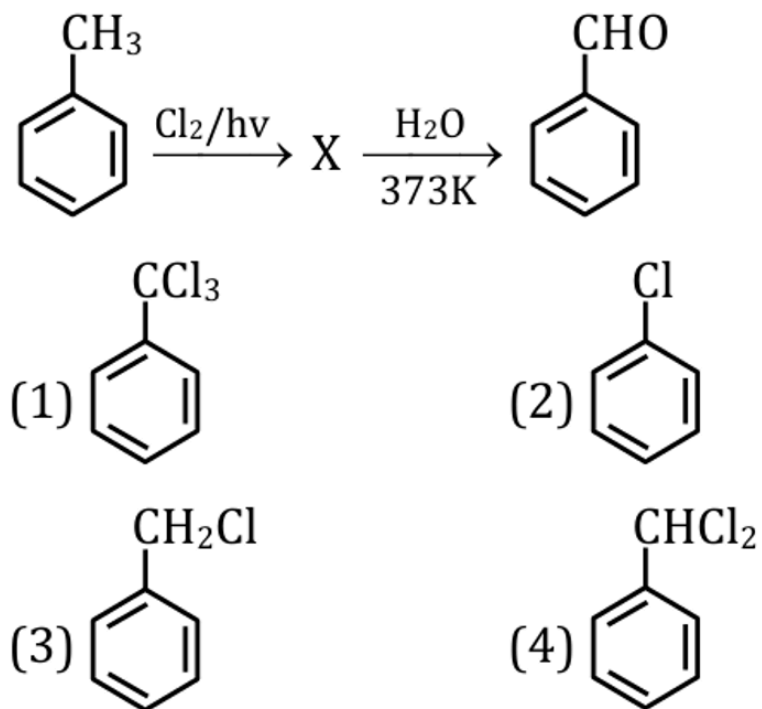
D)



82. The reaction that does not give benzoic acid as the major product is:



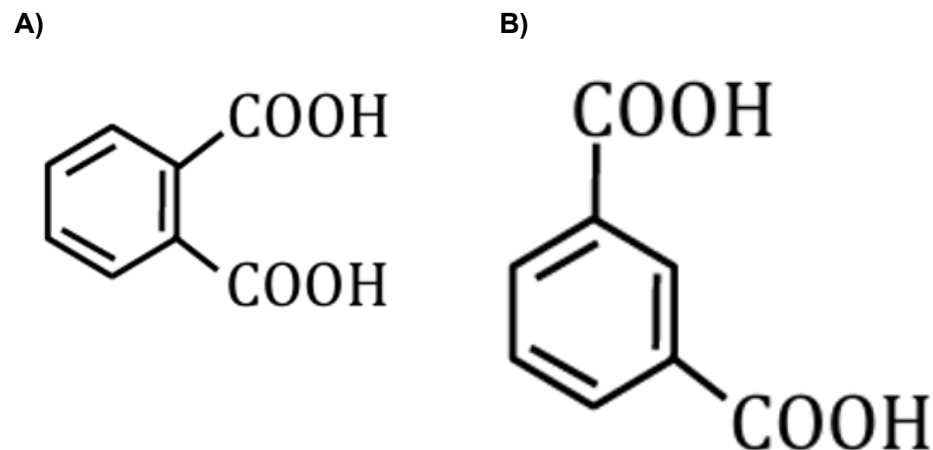
83. Identify compound X in the following sequence of reactions:



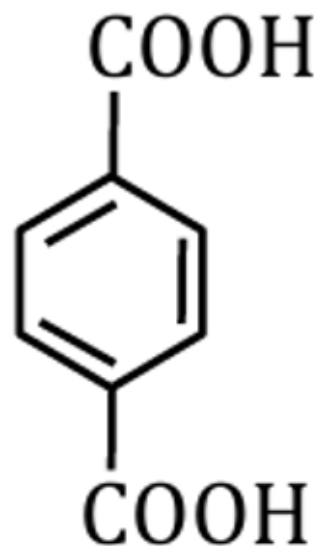
A) 1
C) 3

B) 2
D) 4

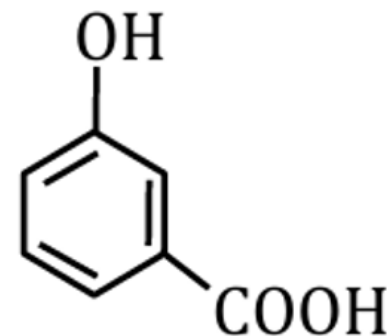
84. Which of the following acid will form an (a) Anhydride on heating and (b) Acid imide on strong heating with ammonia?



c)



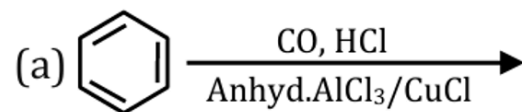
D)



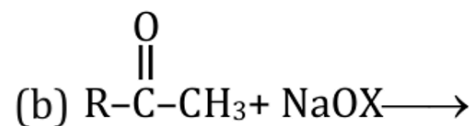
85. Match List-I with List-II.

List-I

List-II



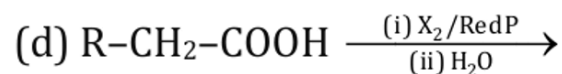
(i) Hell-Volhard-Zelinsky reaction



(ii) Gattermann-Koch Reaction



(iii) Haloform reaction



(iv) Esterification

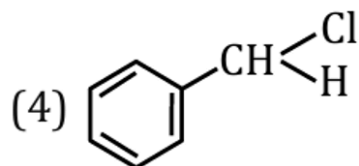
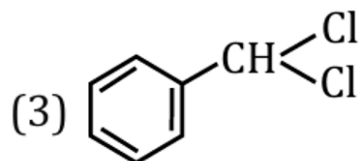
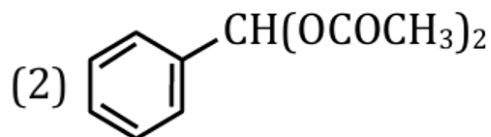
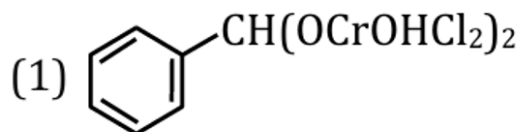
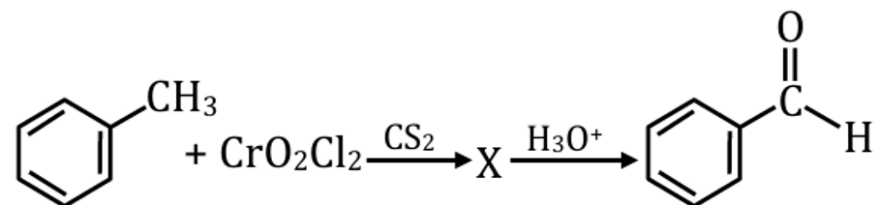
A) (a)-(iv), (b)-(i), (c)-(ii), (d)-(iii)

B) (a)-(iii), (b)-(ii), (c)-(i), (d)-(iv)

C) (a)-(i), (b)-(iv), (c)-(iii), (d)-(ii)

D) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

86. The intermediate compound 'X' in the following chemical reaction is:



A) 1

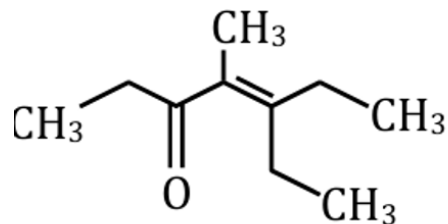
B) 2

C) 3

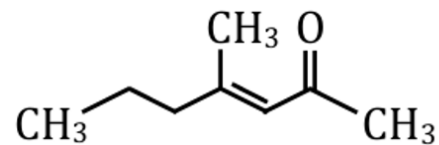
D) 4

87. Which one of the following is not formed when acetone reacts with 2-pentanone in the presence of dilute NaOH followed by heating?

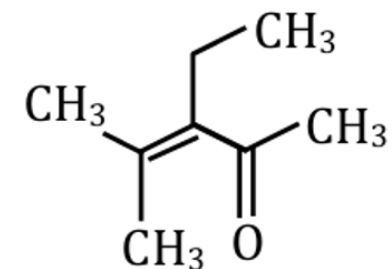
A)



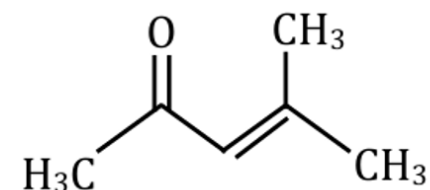
B)



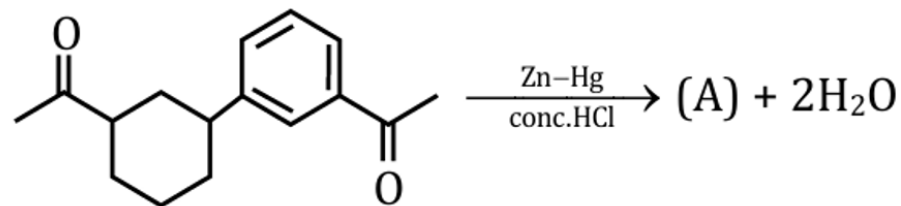
C)



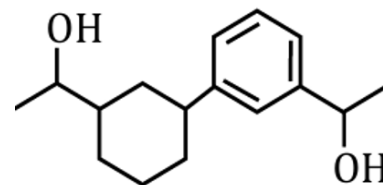
D)



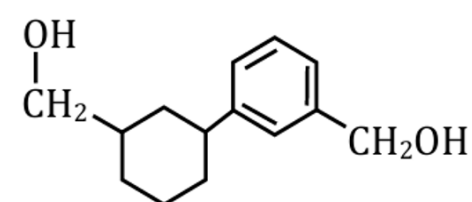
88. Identify product (A) in the following reaction:



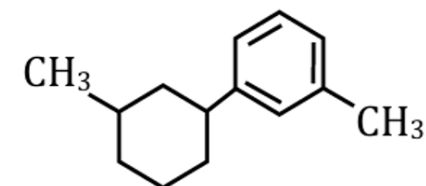
A)



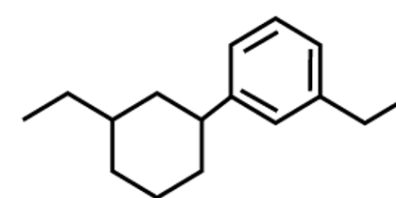
B)



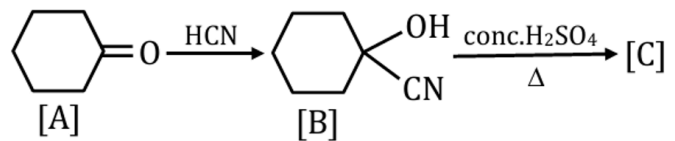
C)



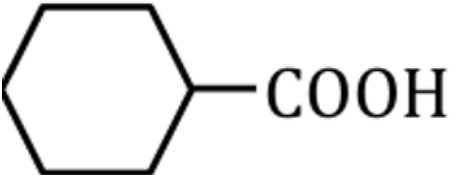
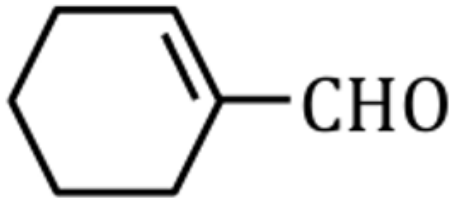
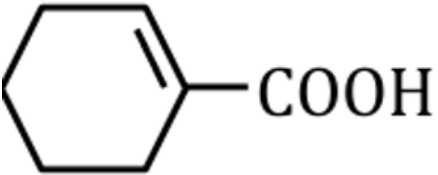
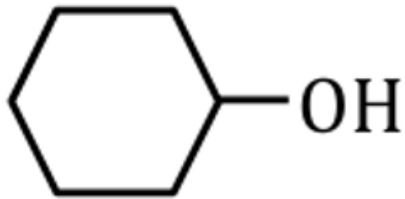
D)



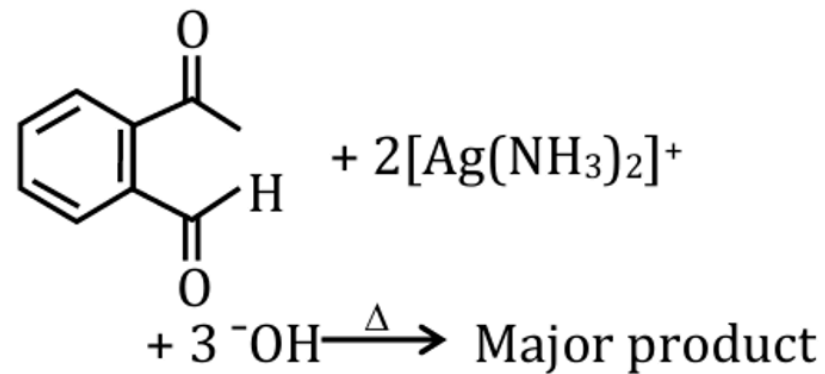
89. Complete the following reaction:

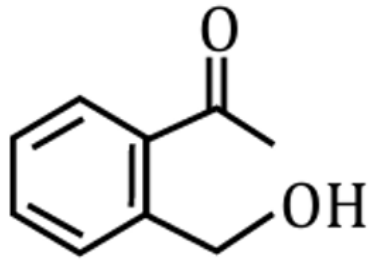
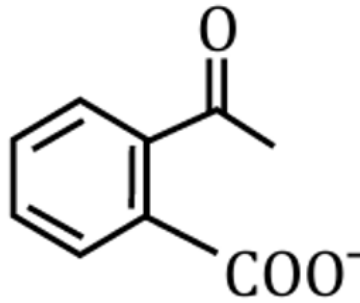
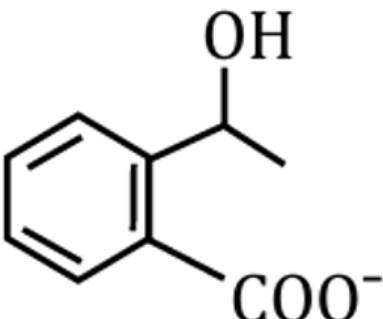
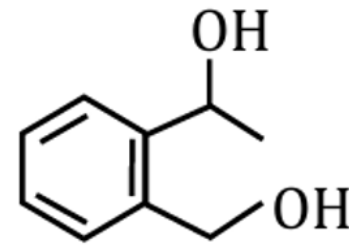


. [C] is:

- A)  B) 
- C)  D) 

90. Identify the major product obtained in the following reaction:



- A)  B) 
- C)  D) 

Botany

91. Select the mismatch.

- | | |
|-----------------------------------|------------------------------------|
| A) Cycas — Dioecious | B) Salvinia — Heterosporous |
| C) Equisetum — Homosporous | D) Pinus — Dioecious |

92. Zygotic meiosis is characteristic of:

- | | |
|-------------------------|----------------------|
| A) Fucus | B) Funaria |
| C) Chlamydomonas | D) Marchantia |

93. Conifers are adapted to tolerate extreme environmental conditions because of:

- | | |
|------------------------------|-------------------------------|
| A) broad hardy leaves | B) superficial stomata |
| C) thick cuticle | D) presence of vessels |

94. Which one of the following statements is wrong?

- | | |
|--|---|
| A) Algae increase the level of dissolved oxygen in the immediate environment. | B) Algin is obtained from red algae, and carrageenan from brown algae. |
| C) Agar-agar is obtained from Gelidium and Gracilaria. | D) Laminaria and Sargassum are used as food. |

95. Select the correct statement.

- | | |
|---|--|
| A) Sequoia is one of the tallest trees. | B) The leaves of gymnosperms are not well adapted to extremes of climate. |
| C) Gymnosperms are both homosporous and heterosporous. | D) Salvinia, Ginkgo and Pinus all are gymnosperms. |

96. In bryophytes and pteridophytes, transport of male gametes requires:

- | | |
|-----------------|-------------------|
| A) birds | B) water |
| C) wind | D) insects |

97. Which one of the following statements is wrong?

- | | |
|---|---|
| A) Chlorella and Spirulina are used as space food. | B) Mannitol is stored food in Rhodophyceae. |
| C) Algin and carrageenan are products of algae. | D) Agar-agar is obtained from Gelidium and Gracilaria. |

98. In which of the following, gametophyte is not independent free living?

- | | |
|-------------------|----------------------|
| A) Pteris | B) Pinus |
| C) Funaria | D) Marchantia |

99. Read the following five statements (A to E) and select the option with all correct statements: A. Mosses and lichens are the first organisms to colonise a bare rock. B. Selaginella is a homosporous pteridophyte. C. Coralloid roots in Cycas have VAM. D. Main plant body in bryophytes is gametophytic, whereas in pteridophytes it is sporophytic. E. In gymnosperms, male and female gametophytes are present within sporangia located on sporophyte.

- | | |
|----------------------|----------------------|
| A) A, D and E | B) B, C and E |
| C) A, C and D | D) B, C and D |

100.

Male gametes are flagellated in:

- | | |
|------------------------|---------------------|
| A) Ectocarpus | B) Spirogyra |
| C) Polysiphonia | D) Anabaena |

101.

Isogamous condition with non-flagellated gametes is found in:

- | | |
|-------------------------|---------------------|
| A) Volvox | B) Fucus |
| C) Chlamydomonas | D) Spirogyra |

102.

Read the following statements (A - E) and answer the question which follows them: (A) In liverworts, mosses and ferns gametophytes are free-living. (B) Gymnosperms and some ferns are heterosporous. (C) Sexual reproduction in Fucus, Volvox is oogamous. (D) The sporophyte in liverworts is more elaborate than that in mosses. (E) Both, Pinus and Marchantia are dioecious. How many of the above statements are correct?

- | | |
|----------|---------|
| A) Three | B) Four |
| C) One | D) Two |

103.

What is common in all the three, Funaria, Dryopteris and Ginkgo?

- | | |
|----------------------------|------------------------------------|
| A) Presence of archegonia | B) Well developed vascular tissues |
| C) Independent gametophyte | D) Independent sporophyte |

104.

Which one of the following is wrongly matched?

- | | |
|-------------------------------|----------------------------|
| A) Spirogyra — Motile gametes | B) Sargassum — Chlorophyll |
| C) Basidiomycetes — Puffballs | D) Nostoc — Water blooms |

105.

The plant body is thalloid in:

- | | |
|---------------|-------------|
| A) Sphagnum | B) Salvinia |
| C) Marchantia | D) Funaria |

106.

Which one of the following is a correct statement?

- | | |
|--|---|
| A) Pteridophyte gametophyte has a protonemal and leafy stage. | B) In gymnosperms, female gametophyte is free-living. |
| C) Antheridiophores and archegoniophores are present in pteridophytes. | D) Origin of seed habit can be traced in pteridophytes. |

107.

Cycas and Adiantum resemble each other in having:

- | | |
|------------|------------------|
| A) seeds | B) motile sperms |
| C) cambium | D) vessels |

108.

Read the following five statements (A - E) and answer as asked next to them: (A) In Equisetum, the female gametophyte is retained on the parent sporophyte. (B) In Ginkgo, male gametophyte is not independent. (C) The sporophyte in Riccia is more developed than that in Polytrichum. (D) Sexual reproduction in Volvox is isogamous. (E) The spores of slime moulds lack cell walls. How many of the above statements are correct?

- | | |
|---------|----------|
| A) Two | B) Three |
| C) Four | D) One |

109.

The gametophyte is not an independent, free-living generation in:

- | | |
|----------------|-------------|
| A) Polytrichum | B) Adiantum |
| C) Marchantia | D) Pinus |

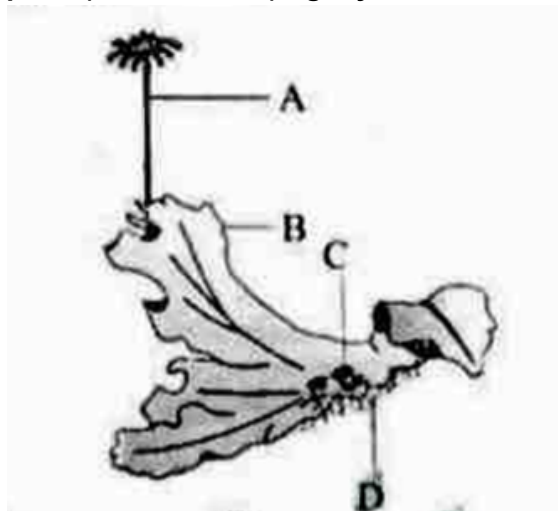
110.

Archegoniophore is present in:

- | | |
|---------------|------------|
| A) Marchantia | B) Chara |
| C) Adiantum | D) Funaria |

111.

Examine the figure given below (*Marchantia* thallus with archegoniophore) and select the correct option giving all the four parts (A, B, C and D) rightly identified:



A) A: Archegoniophore, B: Female thallus, C: Gemma cup, D: Rhizoids
C) A: Seta, B: Sporophyte, C: Protonema, D: Rhizoids

B) A: Archegoniophore, B: Female thallus, C: Bud, D: Foot
D) A: Antheridiophore, B: Male thallus, C: Globule, D: Roots

112.

Selaginella and *Salvinia* are considered to represent a significant step toward evolution of seed habit because:

A) female gametophyte is free and gets dispersed like seeds.
C) megaspores possess endosperm and embryo surrounded by seed coat.

B) female gametophyte lacks archegonia.
D) embryo develops in female gametophyte which is retained on parent sporophyte.

113.

Consider the following four statements whether they are correct or wrong: A. The sporophyte in liverworts is more elaborate than that in mosses. B. *Salvinia* is heterosporous. C. In gymnosperm and angiosperm male gametophyte is pollen grain D. In *Pinus* male and female cones are borne on different trees. The two wrong statements together are:

A) A and C
C) B and C

B) A and D
D) A and B

114.

Algae have cells made up of:

A) cellulose, galactans and mannans
C) pectins, cellulose and proteins

B) hemicellulose, pectins and proteins
D) cellulose, hemicellulose and pectins

115.

Male and female gametophytes are independent and free-living in:

A) mustard
C) *Pinus*

B) castor
D) *Sphagnum*

116.

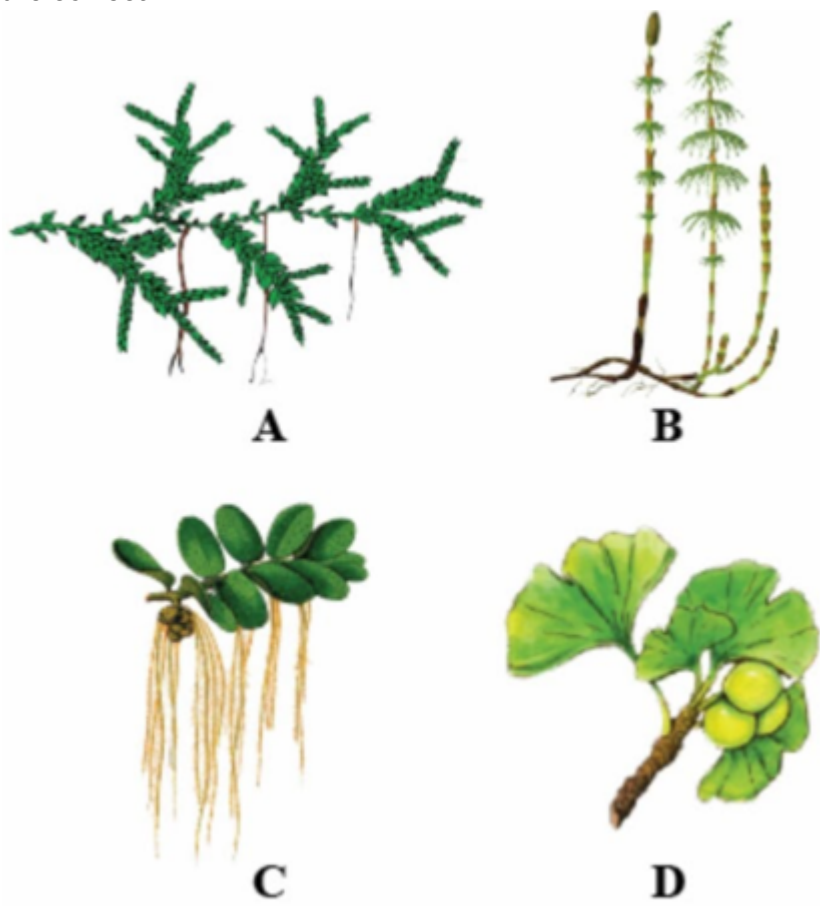
Which one of the following is monoecious?

A) *Marchantia*
C) *Pinus*

B) *Cycas*
D) Date palm

117.

Examine the figures A, B, C and D (Selaginella, Equisetum, Salvinia, Ginkgo). In which one of the four options all the items A, B, C and D are correct?



A) A: Chara, B: Marchantia, C: Fucus, D: Pinus

C) A: Selaginella, B: Equisetum, C: Salvinia, D: Ginkgo

B) A: Equisetum, B: Ginkgo, C: Selaginella, D: Lycopodium

D) A: Funaria, B: Adiantum, C: Salvinia, D: Riccia

118.

Which one of the following is a vascular cryptogam?

A) Ginkgo

C) Cedrus

B) Marchantia

D) Equisetum

119.

Mannitol is the stored food in:

A) Porphyra

C) Gracilaria

B) Fucus

D) Chara

120.

In which one of the following male and female gametophytes do not have free living independent existence?

A) Polytrichum

C) Pteris

B) Cedrus

D) Funaria

121.

Flagellated male gametes are present in all the three of which one of the following sets?

A) Pinus, Hydrilla, Porphyra

C) Riccia, Dryopteris and Cycas

B) Fucus, Marsilea and Calotropis

D) Anthoceros, Funaria and Spirogyra

122.

Peat moss is used as a packing material for sending flowers and live plants to distant places because:

A) it serves as a disinfectant

C) it is hygroscopic

B) it is easily available

D) it reduces transpiration

123.

In a moss, the sporophyte:

A) manufactures food for itself, as well as for the gametophyte

C) produces gametes that give rise to the gametophyte

B) is partially parasitic on the gametophyte

D) arises from a spore produced from the gametophyte

124.

Which one of the following pairs of plants are not seed producers?

A) Fern and Funaria

C) Ficus and Chlamydomonas

B) Funaria and Ficus

D) Funaria and Pinus

125.

Sexual reproduction in Spirogyra is an advanced feature because it shows:

- | | |
|--|---|
| A) different sizes of motile sex organs | B) same size of motile sex organs |
| C) morphologically different sex organs | D) physiologically differentiated sex organs |

126.

Plants reproducing by spores such as mosses and ferns are grouped under the general term:

- | | |
|-----------------------|------------------------|
| A) cryptogams | B) bryophytes |
| C) sporophytes | D) thallophytes |

127.

In ferns, meiosis takes place at the time of:

- | | |
|----------------------------|---|
| A) spore formation | B) spore germination |
| C) gamete formation | D) antheridia and archegonia formation |

128.

The antherozoids of Funaria are:

- | | |
|-------------------------|------------------------|
| A) multiciliated | B) monociliated |
| C) aciliated | D) biciliated |

129.

Which one of the following statements about Cycas is incorrect?

- | | |
|--|--|
| A) It has circinate vernation. | B) Its xylem is mainly composed of xylem vessel. |
| C) Its roots contain some blue-green algae. | D) It does not have a well organized female flower. |

130.

Ulothrix can be described as a:

- | | |
|--|--|
| A) filamentous alga lacking flagellated reproductive stages | B) membranous alga producing zoospores |
| C) filamentous alga with flagellated reproductive stages | D) non-motile colonial alga lacking zoospores |

131.

Transfusion tissue is present in the leaves of:

- | | |
|-----------------|----------------------------|
| A) Pinus | B) Dryopteris |
| C) Cycas | D) both (a) and (c) |

132.

A gymnospermic leaf carries 16 chromosomes. The number of chromosomes in its endosperm will be:

- | | |
|--------------|--------------|
| A) 12 | B) 8 |
| C) 16 | D) 24 |

133.

In bryophytes:

- | | |
|---|---|
| A) both generations are independent | B) gametophytes are dependent upon sporophytes |
| C) sporophytes complete their life cycle | D) sporophytes are dependent upon gametophytes |

134.

A plant in which sporophytic generation is represented by zygote is:

- | | |
|-------------------------|-----------------------|
| A) Pinus | B) Selaginella |
| C) Chlamydomonas | D) Dryopteris |

135.

In Pinus/gymnosperms, the haploid structures are:

- | | |
|---|---|
| A) megaspore, endosperm and embryo | B) megaspore, pollen grain and endosperm |
| C) megaspore, integument and root | D) pollen grain, leaf and root |

Zoology

136.

Which of the following statements (i – v) are incorrect? (i) Parapodia are lateral appendages in arthropods used for swimming. (ii) Radula in molluscs are structures involved in excretion. (iii) Aschelminthes are dioecious. (iv) Echinoderm adults show radial symmetry. (v) Ctenophorans are diploblastic.

- | | |
|-----------------------------|-------------------------|
| A) (i) and (ii) | B) (i) and (iii) |
| C) (i), (iv) and (v) | D) (iii) and (v) |

137.

Which of the following statements (i – v) are incorrect? (i) Circulatory system in arthropods is of closed type. (ii) Parapodia in annelids helps in swimming. (iii) Phylum mollusca is the second largest animal phylum. (iv) Aschelminthes are dioecious.

- | | |
|-------------------------|--------------------------|
| A) (i) only | B) (iii) only |
| C) (i) and (iii) | D) (iii) and (iv) |

138.

Which of the following phylum is being described by the given statements? (i) These are primitive multicellular animals and have cellular level of organization. (ii) Digestion is intracellular. (iii) They have a water transport or canal system. (iv) They reproduce asexually by fragmentation and sexually by formation of gametes.

- | | |
|------------------------|---------------------------|
| A) Porifera | B) Ctenophora |
| C) Coelenterata | D) Platyhelminthes |

139.

Which one of the following statement regarding coelom of given animals is correct?

- | | |
|---|---|
| A) Round worms (aschelminthes) are pseudocoelomates. | B) Molluscs are acoelomates. |
| C) Insects are pseudocoelomates. | D) Flatworms (Platyhelminthes) are coelomates. |

140.

Read the following statements and answer the question. (i) They are exclusively marine, radially symmetrical, diploblastic organisms with tissue level of organisation. (ii) Body bears eight external rows of ciliated comb plates, which help in locomotion. (iii) Digestion is both extracellular and intracellular. (iv) Reproduction takes place only by sexual means. Which of the following phylum is being described by above statements?

- | | |
|---------------------------|----------------------|
| A) Platyhelminthes | B) Arthropoda |
| C) Mollusca | D) Ctenophora |

141.

Which of the following phylum is being described by the given statements? (i) They are bilaterally symmetrical, triploblastic, segmented and coelomate animals. (ii) The body consists of head, thorax, abdomen and have jointed appendages. (iii) Circulatory system is of open type. (iv) Excretion takes place through Malpighian tubules.

- | | |
|----------------------|-------------------------|
| A) Arthropoda | B) Annelida |
| C) Mollusca | D) Echinodermata |

142.

Which of the following statements is incorrect?

- | | |
|--|---|
| A) Prawn has two pairs of antennae. | B) Nematocysts are characteristic feature of the phylum cnidarian. |
| C) Millipedes have two pairs of appendages in each segment of the body. | D) Animals that belong to phylum porifera are exclusively marine. |

143.

Which of the following is an incorrect statement regarding flatworms?

- | | |
|--|---|
| A) They are acoelomates. | B) They are bilaterally symmetrical |
| C) They lack a digestive system | D) They have Flame cells for excretion |

144.

Which of the following is not a characteristic of phylum Echinodermata?

- A)** They have a water vascular system.
- B)** They have an internal skeleton.
- C)** They are protostomes.
- D)** They have bilateral symmetry at larval stage.

145.

Which of the following statement(s) is/are correct? (i) Organ systems in different group of animals show various patterns of complexities. (ii) The digestive system in Platyhelminthes has only a single opening to the outside of the body that serve as both mouth and anus, and is hence called complete. (iii) In open type of circulatory system, the blood is pumped out of the heart and the cells and tissues are directly bathed in it. (iv) In closed type, the blood is circulated through a series of vessels of varying diameters (arteries, veins and capillaries)

- A)** Only (i)
- B)** Both (ii) and (iii)
- C)** (i), (iii) and (iv)
- D)** All of these

146.

Which of the following statement(s) is/are correct? (i) Animals in which the cells are arranged in two embryonic layers, an external ectoderm and an internal endoderm, are called diploblastic animals. (ii) Notochord is an ectodermally derived rod like structure formed on the ventral side during embryonic development in some animals. (iii) In some animals, the body cavity is not lined by mesoderm, instead, the mesoderm is present as scattering pouches in between the ectoderm and endoderm and such a body cavity is called pseudocoelom.

- A)** Only (i)
- B)** Both (i) and (ii)
- C)** Both (i) and (iii)
- D)** All of these

147.

Which of the following statement(s) is/are correct regarding phylum coelenterata? (i) They are aquatic, mostly marine, sessile or free-swimming, radially symmetrical animals (ii) They have a central gastro-vascular cavity with a single opening called hypostome. (iii) Digestion is extracellular and intracellular. (iv) Examples are Sycon, Spongilla and Euspongia.

- A)** Both (i) and (iii)
- B)** Both (i) and (iv)
- C)** (i), (ii) and (iii)
- D)** All of these

148.

Which of the following statement(s) is/are correct regarding phylum aschelminthes? (i) The body is circular in cross-section hence the name roundworms. (ii) Alimentary canal is complete with a well-developed muscular pharynx. (iii) Sexes are separate (dioecious), i.e., males and females are distinct. (iv) Nephridia help in osmoregulation and excretion.

- A)** (i) and (ii)
- B)** (iii) and (iv)
- C)** (i), (ii) and (iii)
- D)** All of these

149.

Which of the following statement(s) is/are correct regarding phylum mollusca?

- A)** They are bilaterally symmetrical, triploblastic and coelomate animals.
- B)** Body is covered by a calcareous shell and is unsegmented with a distinct head, muscular foot and visceral hump.
- C)** The mouth contains a file-like rasping organ for feeding, called radula.
- D)** All of the above

150.

Which of the following statement is incorrect?

- A) Platyhelminthes has incomplete digestive system.
- B) In coelenterates, the arrangement of cells is more complex.
- C) Nereis is monoecious but earthworms and leeches are dioecious.
- D) Simple and compound eyes are present in the animals of those phylum whose over two-thirds of all named species on earth are arthropods.

151.

Refer the following statement and answer the question. 'Name of "X" is derived from stinging capsules. It exhibits metagenesis containing two body forms in which sessile and cylindrical form is called "Y" and umbrella shaped and free swimming is called "Z". Identify X, Y and Z.

- A) X – Coelenterate, Y – Polyp, Z – Medusa
- B) X – Cnidarian, Y – Medusa, Z – Polyp
- C) X – Ctenophora, Y – Radula, Z – Hypostome
- D) X – Porifera, Y – Osculum, Z – Radula

152.

Column-I contains organisms and column-II contains their excretory structures. Choose the correct match form the options given below.

	Column-I (Organism)		Column-II (Excretory structures)
A.	Insects	I.	Nephridia
B.	Radula	II.	Malpighian tubules
C.	Earthworm	III.	File like rasping organ
D.	Balanoglossus	IV.	Flame cells
E.	Flatworm	V.	Proboscis gland

- A) A-I; B-III; C-II; D-IV; E-V
- C) A-II; B-I; C-III; D-V; E-IV

- B) A-III; B-I; C-II; D-V; E-IV
- D) A-II; B-III; C-I; D-V; E-IV

153.

Match the characteristics feature/terms given in column I with the phylum to which they belongs given in column II and choose the correct option.

	Column-I (characteristics feature/term)		Column-II (Phylum)
A.	Choanocytes	I.	Platyhelminthes
B.	Cnidoblasts	II.	Ctenophora
C.	Flame cells	III.	Porifera
D.	Nephridia	IV.	Coelenterata
E.	Comb plates	V.	Annelida

A) A-II; B-I; C-IV; D-V; E-III

B) A-II; B-IV; C-I; D-V; E-III

C) A-V; B-I; C-III; D-II; E-IV

D) A-III; B-IV; C-I; D-V; E-II

154.

Column I contains zoological names of animals and column II contains their common name. Match the following and choose the correct option.

	Column-I		Column-II
A.	Physalia	I.	Sea anemone
B.	Meandrina	II.	Brain coral
C.	Gorgonia	III.	Sea fan
D.	Adamsia	IV.	Portuguese man-of-war

A) A-III; B-II; C-I; D-IV

B) A-IV; B-III; C-II; D-I

C) A-IV; B-II; C-III; D-I

D) A-II; B-III; C-I; D-IV

155.

Match the organisms given in column-I with their common name given in column-II and choose the correct option.

	Column-I (Organisms)		Column-II (Common name)
A.	Pennatula	I.	Sea-lily
B.	Antedon	II.	Sea-pen
C.	Echinus	III.	Sea-urchin
D.	Cucumaria	IV.	Sea-cucumber

A) A-II; B-III; C-I; D-IV

B) A-II; B-IV; C-I; D-III

C) A-II; B-I; C-III; D-IV

D) A-II; B-III; C-I; D-IV

156.

In which one of the following the genus name, its two characters and phylum are not correctly matched?

A) Genus – Pila, Two characters – Body segmented, Mouth with radula, Phylum – Mollusca

B) Genus – Asterias, Two characters – Spiny skinned, Water vascular system, Phylum – Echinodermata

C) Genus – Sycon, Two characters – Pore bearing, Canal system, Phylum – Porifera

D) Genus – Insect, Two characters – Jointed appendages, Chitinous exoskeleton, Phylum – Arthropoda

157.

Column I contains the characteristics features and column II contains the function/location. Selection the correct match from the option given below.

	Column-I (Characteristics feature)		Column-II (Function/Location)
A.	Water canal system	i.	Sponges
B.	Comb plates	ii.	Help in swimming
C.	Nephridia	iii.	Present in mollusca
D.	Jointed appendages	iv.	Characteristics of roundworm
E.	Muscular foot	v.	A body part of arthropoda
		vi.	Helps in reproduction
		vii.	Platyhelminthes
		viii.	Helps in osmoregulation and excretion
		ix.	Eight ciliated external rows present in a body of ctenophora.

A) A-i; B-ix; C-viii; D-v; E-iii

C) A-ii; B-v; C-i; D-iv; E-ix

B) A-iii; B-i; C-vi; D-ii; E-v

D) A-iii; B-vi; C-iv; D-v; E-i

158.

Match the terms/feature given in column I with their examples given in column II and select the correct match from the option given below.

	Column-I (Term/Feature)		Column-II (Examples)
A.	Gregarious pest	i.	Hirudinaria
B.	Vector	ii.	Planaria
C.	Oviparous with indirect development	iii.	Sepia
D.	Metameres	iv.	Aedes
E.	High regeneration capacity	v.	Locust

A) A-i; B-ii; C-iii; D-iv; E-v

C) A-iii; B-i; C-v; D-ii; E-iv

B) A-iii; B-v; C-ii; D-iv; E-v

D) A-v; B-iv; C-iii; D-i; E-ii

159.

Match the feature given in column I with their examples given in column II and select the correct match from the option given below.

	Column-I (Features)		Column-II (Examples)
A.	Pseudocoelomates	i.	Hydra, Adamsia
B.	Diploblastic	ii.	Ctenoplane, Aurelia
C.	Cellular level of organization	iii.	Ascaris, Wuchereria
D.	Radial symmetry	iv.	Sycon, Spongilla
E.	Metamerism	v.	Pheretima, Neries

A) A-v; B-ii; C-iv; D-iii; E-i

B) A-iii; B-i; C-iv; D-ii; E-v

C) A-ii; B-i; C-iii; D-v; E-iv

D) A-iii; B-iv; C-ii; D-i; E-v

160.

Match the following Choose Correct one :-

Column – I	Column – II
(1) Sycon	(p) Fresh water sponge
(2) Spongilla	(q) Sea fan
(3) Euspongia	(r) Scypha
(4) Gorgonia	(s) Bath sponge

A) 1 – q, 2 – p, 3 – s, 4 – r

B) 1 – s, 2 – r, 3 – p, 4 – q

C) 1 – r, 2 – s, 3 – p, 4 – q

D) 1 – r, 2 – p, 3 – s, 4 – q

161.

Match the following :- Choose correct one :-

Column – I	Column – II
(1) Physalia	(p) Sea anemone
(2) Adamsia	(q) Sea pen
(3) Pennatula	(r) Brain coral
(4) Meandrina	(s) Portuguese man of war

A) 1 – p, 2 – q, 3 – r, 4 – s

B) 1 – s, 2 – p, 3 – r, 4 – q

C) 1 – s, 2 – p, 3 – q, 4 – r

D) 1 – r, 2 – q, 3 – p, 4 – s

162.

Match the following :- Choose correct one:-

Column – I	Column – II
(1) Ascaris	(p) Filarial worm
(2) Wuchereria	(q) tape worm
(3) Ancylostoma	(r) Hookworm
(4) Taenia	(s) Giant intestinal round worm

A) 1 – p, 2 – q, 3 – r, 4 – s

B) 1 – q, 2 – p, 3 – s, 4 – s

C) 1 – r, 2 – s, 3 – p, 4 – q

D) 1 – s, 2 – p, 3 – r, 4 – q

163.

Consider following statements regarding phylum Aschelminthes?

(1) Often females are longer than males (2) Fertilization is internal
(3) Development is direct only (4) All members are parasites on plants & animals Choose correct combination:-

A) 1, 2 and 3 only

B) 2, 3 and 4 only

C) 1 and 2 only

D) 1, 2, 3 and 4

164.

Match the following :-

Column – I	Column – II
(1) Apis	(p) locust
(2) Bombyx	(q) Honey bee
(3) Laccifer	(r) Silkworm
(4) Locusta	(s) Lac insect

Choose correct one:-

- A) 1 – p, 2 – r, 3 – s, 4 – q
 B) 1 – q, 2 – s, 3 – r, 4 – p
 C) 1 – q, 2 – r, 3 – s, 4 – p
 D) 1 – p, 2 – q, 3 – r, 4 – s

165.

Match the following:-

Column – I	Column – II
(1) Asterias	(p) Sea urchin
(2) Echinus	(q) brittle star
(3) Antedon	(r) Star fish
(4) Ophiura	(s) Sea lily

- A) 1 – q, 2 – r, 3 – s, 4 – p
 B) 1 – r, 2 – s, 3 – p, 4 – q
 C) 1 – p, 2 – q, 3 – r, 4 – s
 D) 1 – r, 2 – p, 3 – s, 4 – q

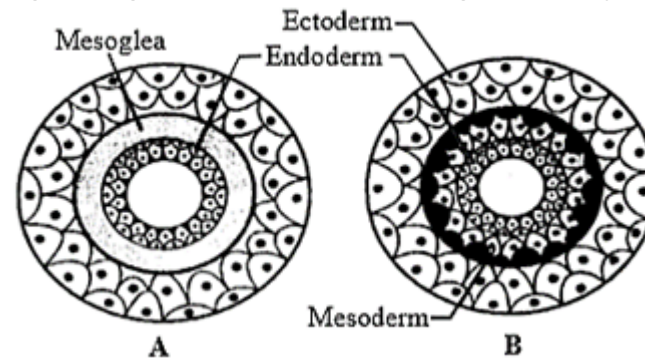
166.

Animals with bilateral symmetry, triploblastic, segmented, coelomate and open circulatory system are

- A) Annelids
 B) Arthropods
 C) Molluscs
 D) Platyhelminthes

167.

The given figures (A & B) shows the germinal layer.



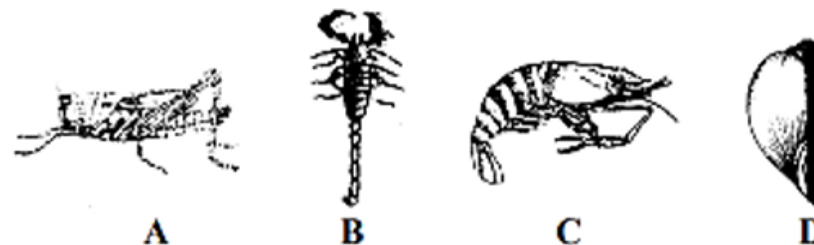
The animals

having structures shown in the figures are respectively called

- A) diploblastic, triploblastic
 B) triploblastic, diploblastic
 C) diploblastic, diploblastic
 D) triploblastic, triploblastic

168.

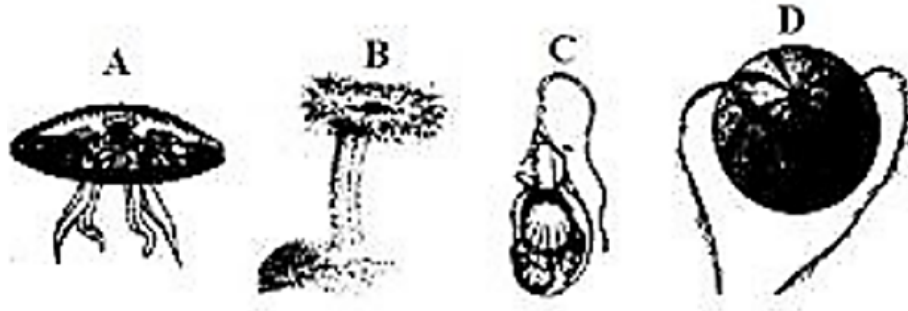
Refer the figures A, B, C and D given below. Which of the following options shows the correct name of the animals shown by the figures A,B,C and D ?



- A) A-Locust, B-Scorpion, C-Prawn, D-Pila
 B) A-locust, B-Prawn, C-Scorpion, D-Pila
 C) A-Locust, B-Scorpion, C-Prawn, D- Hydra
 D) A-Butterfly, B-Scorpion, C-Prawn, D-Pila

169.

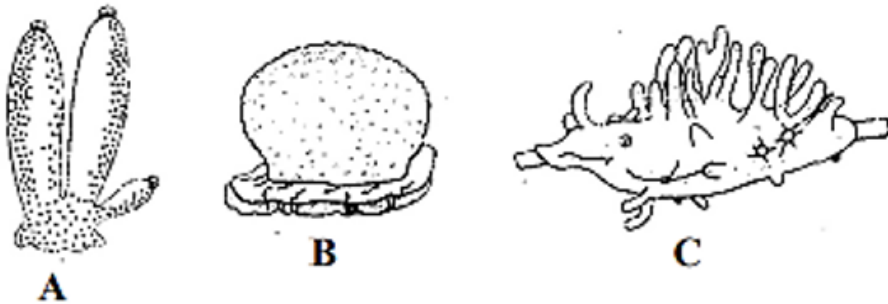
Refer the given figures A, B, C and D and identify the option which shows their correct name.



- A) A – Pleurobrachia, B – Cnidoblast, B) A – Aurelia, B – Adamsia, C –
C – Aurelia, D – Adamsia Cnidoblast, D – Pleurobrachia
C) A – Cnidoblast, B – Pleurobrachia, D) A – Adamsia, B – Aurelia, C –
C – Adamsia, D – Aurelia Pleurobrachia, D – Cnidoblast

170.

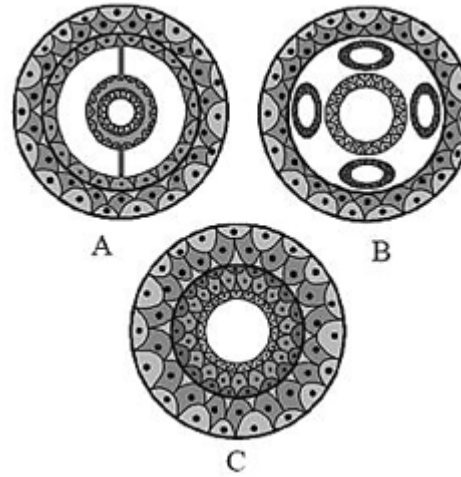
Examine the figures A, B and C. In which one of the four options all the items A, B and C are correctly identified?



- A) A – Sycon, B – Euspongia, C – Spongilla
B) A – Euspongia, B – Spongilla, C – Sycon
C) A – Spongilla, B – Sycon, C – Euspongia
D) A – Euspongia, B – Sycon, C – Spongilla

171.

Identify the figures and select the correct option.



- A) A-Pseudocoelomate; B-Coelomate, C-Acoelomate
B) A- Coelomate, B-Pseudocoelomate; C- Acoelomate
C) A- Coelomate, B-Acoelomate; C-Pseudocoelomate
D) A- Coelomate, B-Acoelomate; C-Euocoelomate

172.

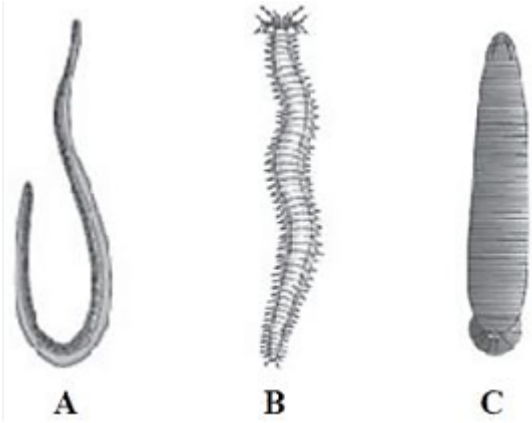
Identify the figure with its correct name and phylum.



- A) Sycon - Porifera
B) Aurelia – Coelenterata
C) Pleurobrachia – Ctenophora
D) Tapeworm – Platyhelminthes

173.

Identify the figures A, B and C and choose the correct option.



A) A – Male Ascaris, B – Hirudinaria (leech), C-Nereis

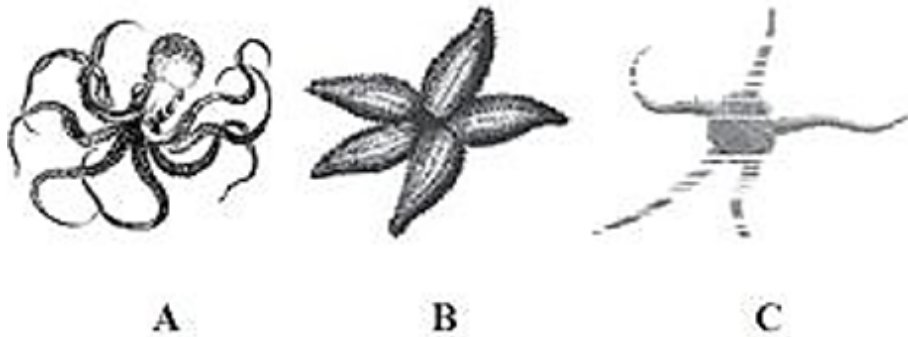
C) A – Female Ascaris, B – Hirudinaria (leech), C- Nereis

B) A – Female Ascaris, B – Nereis, C-Hirudinaria (leech)

D) A – Male Ascaris, B – Nereis, C- Hirudinaria (leech)

174.

Identify the animals shown in the given figures A, B and C from options given below.



A) A – Octopus; B-Asterias, C- Ophiura

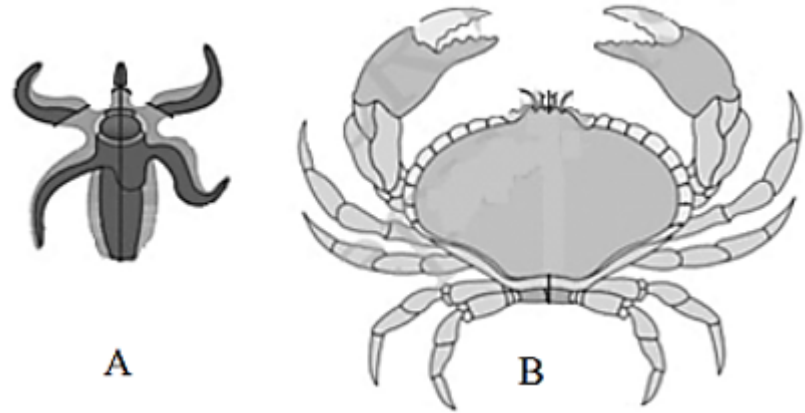
C) A – Echinus; B – Octopus C – Ophiura

B) A – Asterias; B- Ophiura, C- Octopus

D) A – Ophiura; B - Echinus; C- Octopus

175.

The given figures of animals (A & B) are distinguished on the basis of symmetry. Select the correct option which shows the type of symmetry and its description against the animals.



A) A : Biradial, organisms is divided into unequal halves by any plane through the central axis.

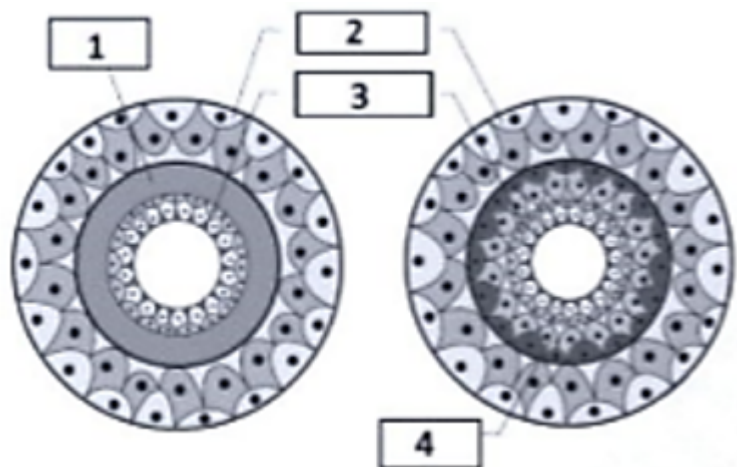
C) A : Asymmetrical, organisms is not divided into equal halves by any plane through the central axis.

B) B : Bilateral, body is divided into equivalent right and left halves by only one plane.

D) B : Radial, in which any plane passing through the central axis of the body divides the organism into two identical halves.

176.

The figure given below shows the germinal layers marked as A, B, C and D. Identify the label showing undifferentiated layer and its location?



A) 1, Between 2 & 3

B) 2, Between 1 & 3

C) 3, Between 1 & 2

D) 4, Between 1 & 3

177.

Which of the following characteristic features holds true for all the animals of the corresponding group?

A) Marine and asymmetrical animals with cellular level of organisation, Porifera

B) A soft and spongy layer of skin forms a mantle over the visceral hump, Mollusca

C) Marine, bilaterally symmetrical diploblastic animals with tissue level of organisation, Ctenophora

D) Endoparasites with dorso-ventrally flattened body and nutrients absorbed through body surface, Platyhelminthes

178.

Which of the following are triploblastic animals with radial symmetry?

A) Freshwater sponges

B) Freshwater fish

C) Sea walnuts

D) Sea urchins

179.

Which one of the following animals reproduces only by sexual means?

A) Pleurobrachia

B) Scypha

C) Obelia

D) Spongilla

180.

	Animal	Help in locomotion
1	Pleurobrachia	Comb plates
2	Scypha	Canal system
3	Star fish	Water vascular system
4	Pila	Muscular foot
5	Taenia	Hooks and suckers
6	Earthworm	Jointed appendages
7	Honey bee	Jointed legs
8	Plurobrachia	Comb plates
9	Leech	Longitudinal and circular muscles
10	Aplysia	Muscular foot

How many animals are correctly matched ?

A) Eight

B) Five

C) Six

D) Seven

ANSWER KEY

Physics

1.	3	13.	2	25.	3	37.	4
2.	3	14.	1	26.	2	38.	1
3.	3	15.	3	27.	1	39.	2
4.	4	16.	3	28.	2	40.	4
5.	1	17.	2	29.	2	41.	2
6.	4	18.	4	30.	4	42.	3
7.	3	19.	2	31.	1	43.	3
8.	3	20.	1	32.	2	44.	2
9.	3	21.	3	33.	3	45.	4
10.	2	22.	2	34.	2		
11.	3	23.	1	35.	4		
12.	4	24.	4	36.	3		

Chemistry

46.	2	57.	3	68.	4	79.	1
47.	3	58.	3	69.	3	80.	2
48.	4	59.	2	70.	3	81.	3
49.	2	60.	2	71.	1	82.	3
50.	1	61.	3	72.	4	83.	4
51.	4	62.	4	73.	4	84.	1
52.	3	63.	3	74.	2	85.	4
53.	2	64.	3	75.	1	86.	1
54.	2	65.	4	76.	4	87.	1
55.	3	66.	3	77.	3	88.	4
56.	3	67.	3	78.	4	89.	3

90. 2

Botany

91.	4	103.	1	115.	4	127.	1
92.	3	104.	1	116.	3	128.	4
93.	3	105.	3	117.	3	129.	2
94.	2	106.	4	118.	4	130.	3
95.	1	107.	2	119.	2	131.	4
96.	2	108.	4	120.	2	132.	2
97.	2	109.	4	121.	3	133.	4
98.	2	110.	1	122.	3	134.	3
99.	1	111.	1	123.	2	135.	2
100.	1	112.	4	124.	1		
101.	4	113.	2	125.	4		
102.	1	114.	1	126.	1		

Zoology

136.	1	147.	3	158.	4	169.	2
137.	1	148.	3	159.	2	170.	1
138.	1	149.	4	160.	4	171.	2
139.	1	150.	3	161.	3	172.	4
140.	4	151.	1	162.	4	173.	2
141.	1	152.	4	163.	3	174.	1
142.	4	153.	4	164.	3	175.	2
143.	3	154.	3	165.	4	176.	1
144.	3	155.	3	166.	2	177.	2
145.	3	156.	1	167.	1	178.	4
146.	3	157.	1	168.	1	179.	1

SOLUTIONS

Q1.

Answer: C

Explanation:

In the Bohr model, the radius of the n th orbit scales as n^2 , so the enclosed area scales as n^4 . For the second excited state ($n = 3$) and the ground state ($n = 1$), the area ratio is $3^4 : 1^4 = 81 : 1$.

Q2.

Answer: C

Explanation:

In the Bohr model the radius (and hence the diameter) of the n th orbit scales as n^2 , so $d_n = d_1 n^2$. With $d_1 = 1.06$ and $n = 20$, the diameter is $1.06 \times 400 = 424$.

Q3.

Answer: C

Explanation:

The energy absorbed equals the difference between the final and initial orbit energies: $\Delta E = E_3 - E_1 = \frac{-18}{9} - \left(\frac{-18}{1}\right) = -2 + 18 = 16 \text{ eV}$.

Q4.

Answer: D

Explanation:

For a hydrogen-like ion, the binding energy scales as $\frac{Z^2}{n^2}$, so $E = 16 \times \frac{Z^2}{n^2} \text{ eV}$. For Li^{++} ($Z = 3$) in the first excited state ($n = 2$), this gives $16 \times \frac{9}{4} = 36 \text{ eV}$.

Q5.

Answer: A

Explanation:

From the Rydberg formula, $\frac{1}{\lambda} = RZ^2 \left(\frac{1}{1^2} - \frac{1}{2^2} \right)$, so for the same transition $\lambda \propto \frac{1}{Z^2}$. With $Z = 4, 3, 2$, the ratio is $\frac{1}{16} : \frac{1}{9} : \frac{1}{4} = 9 : 16 : 36$.

Q6.

Answer: D

Explanation:

The photon energy equals the difference between the two level energies:

$$\Delta E = E_3 - E_2 = \frac{-36}{9} - \left(\frac{-36}{4}\right) = -4 + 9 = 5 \text{ eV}.$$

Q7.

Answer: C

Explanation:

Using the Bohr model dependences $R \propto n^2$, $v \propto \frac{1}{n}$ and $E \propto \frac{1}{n^2}$, the combination $\frac{R}{v} \propto n^2 \times n = n^3$, so R/v is proportional to n^3 .

Q8.

Answer: C

Explanation:

For a hydrogen-like ion, the energy of the n th orbit scales as Z^2 , so $E_n(Z) = Z^2 E_n$. For doubly ionised lithium, $Z = 3$, giving $3^2 E_n = 9 E_n$.

Q9.

Answer: C

Explanation:

Using the Rydberg formula, $\frac{1}{\lambda_0} = R \left(1 - \frac{1}{4} \right) = \frac{3R}{4}$ for the $2 \rightarrow 1$ jump and $\frac{1}{\lambda} = R \left(\frac{1}{4} - \frac{1}{16} \right) = \frac{3R}{16}$ for the $4 \rightarrow 2$ jump, so $\lambda = 4\lambda_0$.

Q10.

Answer: B

Explanation:

By Bohr's quantization condition, $L_n = \frac{n\hbar}{2\pi}$, so the change is $\Delta L = (6 - 3) \frac{\hbar}{2\pi} = 3 \times \frac{6.28 \times 10^{-34}}{6.28} = 3 \times 10^{-34} \text{ J-s}$.

Q11.

Answer: C

Explanation:

Writing $E_n = \frac{-E_i}{n^2}$ where E_i is the ionization energy, the given difference is $E = E_i \left(\frac{1}{9} - \frac{1}{36} \right) = \frac{E_i}{12}$, so $E_i = 12E$.

Q12.

Answer: D

Explanation:

The period of revolution is $T = \frac{2\pi r}{v}$, and since $r \propto n^2$ and $v \propto \frac{1}{n}$, we get $T \propto n^3$. Hence the ratio is $3^3 : 1^3 = 27 : 1$.

Q13.

Answer: B

Explanation:

The excitation energy is $\Delta E = 13.6 \times Z^2 \left(\frac{1}{1^2} - \frac{1}{2^2} \right) = 13.6 \times 9 \times \frac{3}{4} = 91.8$ eV, so the wavelength is $\lambda = \frac{hc}{\Delta E} = \frac{12400}{91.8} \approx 135$.

Q14.

Answer: A

Explanation:

The number of absorption transitions equals $n_2 - n_1 = 4$, so the number of levels involved is $N = 5$. The emission transitions are all possible downward jumps between these levels: $\frac{N(N-1)}{2} = \frac{5 \times 4}{2} = 10$.

Q15.

Answer: C

Explanation:

The photon wavelength is inversely proportional to the energy gap. For $3 \rightarrow 1$, $\Delta E = 2E - E = E = \frac{hc}{\lambda}$; for $2 \rightarrow 1$, $\Delta E = \frac{5E}{4} - E = \frac{E}{4}$, so the wavelength is $\frac{4hc}{E} = 4\lambda$.

Q16.

Answer: C

Explanation:

The $3 \rightarrow 2$ transition has a smaller energy gap than the $6 \rightarrow 2$ transition, so the emitted photon has a longer wavelength. Among visible colours, the longest wavelength corresponds to red light.

Q17.

Answer: B

Explanation:

The excitation energy is $\Delta E = 13.6Z^2 \left(\frac{1}{1^2} - \frac{1}{3^2} \right) = 13.6Z^2 \times \frac{8}{9}$. Setting this equal to 108.8 eV gives $Z^2 = 9$, so $Z = 3$.

Q18.

Answer: D

Explanation:

For the first member ($3 \rightarrow 2$), $\frac{1}{\lambda_1} = R \left(\frac{1}{4} - \frac{1}{9} \right) = \frac{5R}{36}$; for the short wavelength limit ($\infty \rightarrow 2$), $\frac{1}{\lambda_s} = \frac{R}{4}$. Hence $\lambda_s = \lambda_1 \times \frac{5}{9} = 6561 \times \frac{5}{9} = 3645$.

Q19.

Answer: B

Explanation:

The first Balmer line ($3 \rightarrow 2$) gives $\frac{1}{\lambda_B} = R \left(\frac{1}{4} - \frac{1}{9} \right) = \frac{5R}{36}$, and the first Paschen line ($4 \rightarrow 3$) gives $\frac{1}{\lambda_P} = R \left(\frac{1}{9} - \frac{1}{16} \right) = \frac{7R}{144}$, so $\frac{\lambda_B}{\lambda_P} = \frac{36}{5} \times \frac{7}{144} = \frac{7}{20}$.

Q20.

Answer: A

Explanation:

The third Balmer line corresponds to $5 \rightarrow 2$, so $\frac{1}{\lambda} = RZ^2 \left(\frac{1}{4} - \frac{1}{25} \right) = \frac{21}{100} RZ^2$. Substituting $\lambda = 48.2$ nm gives $Z^2 = 9$, so the ground state energy is 13.6×9 eV, i.e. 9 in units of 13.6 eV.

Q21.

Answer: C

Explanation:

For the same transition, $\frac{1}{\lambda} = RZ^2 \left(\frac{1}{2^2} - \frac{1}{3^2} \right)$, so $\lambda \propto \frac{1}{Z^2}$. With $Z = 1, 1, 3, 4$ for H, D, Li^{++} and Be^{+++} , the wavelengths are in ratio $1 : 1 : \frac{1}{9} : \frac{1}{16}$, giving $\lambda_1 = \lambda_2 = 9\lambda_3 = 16\lambda_4$.

Q22.

Answer: B

Explanation:

The incident photon energy is $\frac{hc}{\lambda} = \frac{12400}{950} \approx 13.05$ eV, which raises the electron from -13.6 eV to about -0.55 eV, i.e. to $n = 5$. The number of emission lines is $\frac{n(n-1)}{2} = \frac{5 \times 4}{2} = 10$.

Q23.

Answer: A

Explanation:

After absorbing the photon, the electron energy is $-13.6 + 12.09 = -1.51$ eV. Since $E_n = \frac{-13.6}{n^2}$, we get $n^2 = \frac{13.6}{1.51} = 9$, so $n = 3$.

Q24.

Answer: D

Explanation:

The wave number scales as Z^2 since $\bar{\nu} = RZ^2 \left(\frac{1}{n_1^2} - \frac{1}{n_2^2} \right)$. For Li^{++} , $Z = 3$, so the wave number is $9 \times 82259 = 740331 \text{ cm}^{-1}$.

Q25.

Answer: C

Explanation:

Since $r \propto n^2$, the radii R and $9R$ correspond to quantum numbers in ratio $1 : 3$. The period $T = \frac{2\pi r}{v}$ with $v \propto \frac{1}{n}$ gives $T \propto n^3$, so the ratio of periods is $1 : 27$, i.e. $1/27$.

Q26.

Answer: B

Explanation:

The ionisation energy from the n th state of a hydrogen-like ion is $\frac{13.6Z^2}{n^2} = E \frac{Z^2}{n^2}$. For Be^{+++} ($Z = 4$) in the first excited state ($n = 2$), this gives $E \times \frac{16}{4} = 4E$.

Q27.

Answer: A

Explanation:

The emitted photon carries energy $\Delta E = 13.6 \left(1 - \frac{1}{4} \right) = 10.2$ eV and momentum $\frac{E}{c} = 10.2$ eV/c. By momentum conservation, the atom recoils with equal momentum, 10.2 eV/c.

Q28.

Answer: B

Explanation:

The maximum number of electrons in a shell is $2n^2$. Allowing only $n = 1, 2, 3$, the total number of electrons is $2 + 8 + 18 = 28$, so 28 elements (each atomic number up to 28) would be possible.

Q29.

Answer: B

Explanation:

After the first electron is removed, He^+ is hydrogen-like with $Z = 2$, so removing the second electron needs $13.6 \times 2^2 = 54.4$ eV. The total energy is $25.6 + 54.4 = 80$ eV.

Q30.

Answer: D

Explanation:

After two electrons are removed, Li^{++} is hydrogen-like with $Z = 3$, so removing the third electron needs $13.6 \times 3^2 = 122.4$ eV. The total energy is $81.0 + 122.4 = 203.4 \approx 203$ eV.

Q31.

Answer: A

Explanation:

The de-Broglie wavelength is $\lambda = \frac{h}{mv}$, so at equal speed $\lambda \propto \frac{1}{m}$. With $m_d = 2$ u and $m_\alpha = 4$ u, the ratio is $\frac{\lambda_d}{\lambda_\alpha} = \frac{4}{2} = 2$, i.e. 2 : 1.

Q32.

Answer: B

Explanation:

Bohr's quantization condition as a standing wave gives $n\lambda = 2\pi r_n$, so $\lambda = \frac{2\pi r_n}{n}$. For $n = 3$, $r_3 = 0.53 \times 9 = 4.77$, giving $\lambda = \frac{2\pi \times 4.77}{3} \approx 10$.

Q33.

Answer: C

Explanation:

Bohr's quantization condition requires the orbit circumference to contain an integral number of de-Broglie wavelengths: $2\pi r_n = n\lambda$. For the fifth orbit, the circumference is 5λ .

Q34.

Answer: B

Explanation:

The thermal de-Broglie wavelength is $\lambda = \frac{h}{\sqrt{3mkT}}$, so $\lambda \propto \frac{1}{\sqrt{mT}}$. With $m_H = 2$, $m_{He} = 4$, $T_H = 300$ K and $T_{He} = 600$ K, the ratio is $\sqrt{\frac{4 \times 600}{2 \times 300}} = \sqrt{4} = 2$, i.e. 2 : 1.

Q35.

Answer: D

Explanation:

Since the nucleus was initially at rest, momentum conservation gives the two fragments equal and opposite momenta: $p_1 = p_2$. As $\lambda = \frac{h}{p}$, the wavelengths are equal, giving 1 : 1 regardless of the masses.

Q36.

Answer: C

Explanation:

Equating the momenta, $m_e v = \frac{h}{\lambda}$, so $v = \frac{h}{m_e \lambda} = \frac{6.626 \times 10^{-34}}{9.1 \times 10^{-31} \times 2600 \times 10^{-10}} \approx 2800$ m/s.

Q37.

Answer: D

Explanation:

The photon energy is $E = h\nu$, and by mass-energy equivalence $E = mc^2$, so the effective mass is $m = \frac{E}{c^2} = \frac{h\nu}{c^2}$.

Q38.

Answer: A

Explanation:

In two dimensions the average kinetic energy is $E = 2 \times \frac{1}{2} k_B T = k_B T$, so the average momentum is $p = \sqrt{2mE} = \sqrt{2mk_B T}$ and the de Broglie wavelength is $\lambda = \frac{h}{\sqrt{2mk_B T}}$.

Q39.

Answer: B

Explanation:

Bohr's quantization condition in standing wave form states that the circumference equals an integral number of wavelengths: $C = 2\pi r = n\lambda$. For the third orbit, $n = 3$, so $\lambda = \frac{C}{3}$.

Q40.

Answer: D

Explanation:

The de-Broglie wavelength is $\lambda = \frac{h}{mv}$, so $\frac{\lambda_A}{\lambda_B} = \frac{m_B v_B}{m_A v_A} = \frac{2m \times 0.01}{m \times 0.08} = \frac{0.02}{0.08} = \frac{1}{4}$, i.e. 1 : 4.

Q41.

Answer: B

Explanation:

Using $\lambda = \frac{h}{\sqrt{2mE}}$, the condition $\lambda_p = 4\lambda_\alpha$ gives $m_\alpha E_\alpha = 16m_p E_p$, so $\frac{E_p}{E_\alpha} = \frac{m_\alpha}{16m_p} = \frac{4}{16} = \frac{1}{4}$.

Q42.

Answer: C

Explanation:

The particle gains kinetic energy $E = qV$, so its de-Broglie wavelength is $\lambda = \frac{h}{\sqrt{2mE}} = \frac{h}{\sqrt{2mqV}}$, which shows $\lambda \propto \frac{1}{V^{1/2}}$.

Q43.

Answer: C

Explanation:

Using $\lambda = \frac{h}{\sqrt{2mE}} \approx \frac{12.27}{\sqrt{V}}$ with $V = 12270$ V, we get $\lambda \approx \frac{12.27}{110.8} \approx 0.111 = 11.1$ pm, which is nearest to 10 pm.

Q44.

Answer: B

Explanation:

Momentum conservation for the decay at rest gives both products equal momentum magnitudes p . Since $K = \frac{p^2}{2m}$, the ratio is $\frac{K_1}{K_2} = \frac{m_2}{m_1}$.

Q45.

Answer: D

Explanation:

Using $\lambda = \frac{h}{\sqrt{2mE}} \approx \frac{12.27}{\sqrt{V}}$ with $V = 1.5$ V, we get $\lambda \approx \frac{12.27}{1.225} \approx 10 = 10^{-9}$ m.

Q46.

Answer: B

Explanation:

Rosenmund reduction of acid chloride yields an aldehyde (A). Nucleophilic addition of HCN forms a cyanohydrin (B), which upon acidic hydrolysis of the nitrile group yields an α -hydroxy carboxylic acid (C).

Q47.

Answer: C

Explanation:

Hydration of propyne gives acetone (A). Reaction of acetone with chloroform in basic medium yields chloretone (B). Treatment of acetone with $I_2/NaOH$ gives a yellow precipitate of iodoform ($C = CHI_3$).

Q48.

Answer: D

Explanation:

Benzaldehyde can be prepared by Rosenmund reduction of benzoyl chloride (I), side-chain chlorination of toluene followed by hydrolysis (II), oxidation of toluene with chromic anhydride in acetic anhydride (III), and Etard reaction using chromyl chloride (IV).

Q49.

Answer: B

Explanation:

DIBAL-H (Diisobutylaluminium hydride) selectively reduces both nitriles and esters containing the same acyl chain length to the corresponding aldehydes.

Q50.

Answer: A

Explanation:

Grignard reagent with CO_2 yields a carboxylic acid (A). Kolbe's reaction of phenol with $NaOH/CO_2$ yields salicylic acid (B). Complete hydrolysis of benzonitrile yields benzoic acid (C). Reimer-Tiemann reaction (D) yields salicylaldehyde.

Q51.

Answer: D

Explanation:

Sodium hydrogen sulphite forms crystalline addition adducts with aldehydes and methyl ketones. Since these adducts regenerate the original carbonyl compound upon treatment with acid or alkali, the reaction is used for purification and separation.

Q52.

Answer: C

Explanation:

Reactivity towards nucleophilic addition decreases with increasing steric crowding and electron-donating $+I/+R$ effects. Aliphatic aldehydes are most reactive, followed by aliphatic ketones, then aromatic aldehydes, and finally aromatic ketones.

Q53.

Answer: B

Q54.

Answer: B

Explanation:

Addition of HCN to acetaldehyde (CH_3CHO) produces 2-hydroxypropanenitrile, which contains a chiral carbon atom ($CH_3 - *CH(OH)CN$). Hydrolysis yields 2-hydroxypropanoic acid (lactic acid), which is optically active.

Q55.

Answer: C

Explanation:

Formaldehyde with Grignard reagent gives 1° -alcohol; other aldehydes give 2° -alcohols; ketones (like acetone) react with Grignard reagents to yield tertiary (3°) alcohols.

Q56.

Answer: C

Explanation:

The iodoform test requires the presence of a $CH_3C=O$ group or a $CH_3CH(OH)$ group. Propionaldehyde (CH_3CH_2CHO) lacks a terminal methyl aldehyde group and does not give the iodoform test.

Q57.

Answer: C

Explanation:

Not reducing Tollen's or Fehling's reagent indicates a ketone. A positive iodoform test indicates a methyl ketone ($CH_3C=O$). Acetone ($(CH_3)_2C=O$) forms cyanohydrin $(CH_3)_2C(OH)CN$, which hydrolyzes to 2-hydroxy-2-methylpropanoic acid (a hydroxy acid with a methyl side chain).

Q58.

Answer: C

Explanation:

Not all secondary alcohols give a positive iodoform test. Only secondary alcohols containing the specific $CH_3 - CH(OH) -$ grouping (such as propan-2-ol, butan-2-ol) give a positive iodoform test.

Q59.

Answer: B

Explanation:

Acetone with $I_2/NaOH$ gives iodoform ($A = CHI_3$). Heating iodoform with Ag powder yields acetylene ($B = HC \equiv CH$). Hydration of acetylene gives acetaldehyde ($C = CH_3CHO$).

Q60.

Answer: B

Explanation:

Both aldehydes (CH_3CHO) and ketones (CH_3COCH_3) readily undergo nucleophilic addition with Grignard reagents ($RMgX$), making it unsuitable for distinguishing between them.

Q61.

Answer: C

Explanation:

Fehling's solution is a mild oxidizing agent that oxidizes aliphatic aldehydes to carboxylate ions with formation of a red Cu_2O precipitate. Aromatic aldehydes (e.g., benzaldehyde) do not reduce Fehling's solution.

Q62.

Answer: D

Q63.

Answer: C

Explanation:

Ketones resist oxidation under mild conditions. Under strong/vigorous oxidizing conditions (e.g., $KMnO_4/\Delta$), oxidation of ketones occurs via C-C bond cleavage to give a mixture of carboxylic acids.

Q64.

Answer: C

Explanation:

Acetone gives 2,4-DNP test (B) as a carbonyl compound. Reduction of acetone with $Mg - Hg/H_2O$ produces pinacol (2,3-dimethylbutan-2,3-diol) (D). Acetone does not restore Schiff's pink color and resists mild oxidation.

Q65.

Answer: D

Q66.

Answer: C

Explanation:

Acetaldehyde (CH_3CHO) reacts with HCN to form 2-hydroxypropanenitrile (not 1-hydroxypropanenitrile) (B). Acetaldehyde contains α -hydrogens and undergoes aldol condensation, NOT Cannizzaro reaction (D). Thus, B and D are incorrect.

Q67.

Answer: C

Explanation:

Cannizzaro reaction is a disproportionation (redox) reaction where one molecule of an aldehyde lacking α -hydrogens is oxidized to a carboxylic acid salt while another molecule is reduced to a primary alcohol.

Q68.

Answer: D

Explanation:

Cannizzaro reaction of formaldehyde (HCHO) with 50% NaOH yields sodium formate (HCOONa) (A) and methanol (CH_3OH) (B/C). In aqueous solution, sodium formate exists as $HCOO^-$ anion (C). Thus, A and C are correct options representing the carboxylate product species.

Q69.

Answer: C

Explanation:

$LiAlH_4$ reduces carboxylic acids to primary alcohols (A). PCC (Pyridinium chlorochromate) selectively oxidizes primary alcohols to aldehydes (B) without further oxidation to carboxylic acids.

Q70.

Answer: C

Explanation:

Acylation of a primary amine (methylamine) with an acyl chloride (acetyl chloride) proceeds via nucleophilic acyl substitution to form an N-substituted amide (N-methylacetamide).

Q71.

Answer: A

Explanation:

Nucleophilic substitution of ethyl chloride with NaCN gives propanenitrile (X). Reduction with Ni/H_2 gives propan-1-amine (Y). Acetylation with acetic anhydride gives N-propylacetamide (Z).

Q72.

Answer: D

Explanation:

Acetic acid with PCl_5 gives acetyl chloride (A). Friedel-Crafts acylation of benzene with A yields acetophenone (B). Grignard addition of C_2H_5MgBr to acetophenone followed by hydrolysis yields 2-phenylbutan-2-ol (C).

Q73.

Answer: D

Explanation:

Acidic hydrolysis of propanenitrile yields butyric acid ($A = CH_3CH_2CH_2COOH$). Heating butyric acid with ammonia forms butyramide ($B = CH_3CH_2CH_2CONH_2$).

Q74.

Answer: B

Explanation:

Reaction of an alkoxide (sodium ethoxide, C_2H_5ONa) with an acyl chloride (ethanoyl chloride, CH_3COCl) is a nucleophilic acyl substitution reaction that forms an ester (ethyl ethanoate, $CH_3COOC_2H_5$).

Q75.

Answer: A

Explanation:

The Hell-Volhard-Zelinsky (HVZ) reaction involves α -halogenation of aliphatic carboxylic acids containing α -hydrogens using $X_2/RedP$ followed by hydrolysis to yield α -halo carboxylic acids ($R - CH(X) - COOH$).

Q76.

Answer: D

Explanation:

Strong electron-withdrawing groups ($-NO_2$) at the para position withdraw electron density from the benzene ring via $-M$ and $-I$ resonance effects, increasing the partial positive charge on the carbonyl carbon and making it most reactive towards nucleophiles.

Q77.

Answer: C

Explanation:

Alkaline hydrolysis of esters proceeds via nucleophilic attack of OH^- on the carbonyl carbon followed by elimination of the phenoxide leaving group. The $-NO_2$ group strongly stabilizes the phenoxide ion by resonance, facilitating rapid hydrolysis.

Q78.

Answer: D

Explanation:

Catalytic hydrogenation using $H_2/Pd-C$ under mild conditions (1 atm) selectively reduces the carbon-carbon double bond ($C = C$) of an α, β -unsaturated ketone while leaving the carbonyl group ($C = O$) intact.

Q79.

Answer: A

Explanation:

Self-aldol condensation of cyclohexanone produces a β -hydroxy ketone intermediate, which upon dehydration (heating) forms an α, β -unsaturated ketone: 2-(cyclohex-1-en-1-yl)cyclohexan-1-one.

Q80.

Answer: B

Explanation:

Dehydrogenation of ethanol (A) with heated copper gives ethanal (X). Ethanal reduces Tollen's reagent to give a silver mirror and ethanoate ion (Y), and reacts with semicarbazide (Z) to form a semicarbazone.

Q81.

Answer: C

Explanation:

Formation of a yellow precipitate (CHI_3) with $NaOI(NaOH + I_2)$ is the positive iodoform test. This requires the presence of a $CH_3 - CH(OH) -$ group, identifying A as 1-phenylethanol ($C_6H_5 - CH(OH)CH_3$) and reagent Y as I_2 .

Q82.

Answer: C

Explanation:

Pyridinium chlorochromate (PCC) is a mild, selective oxidizing agent that oxidizes primary alcohols (benzyl alcohol) to aldehydes (benzaldehyde) without further oxidation to carboxylic acids.

Q83.

Answer: D

Explanation:

Free radical side-chain chlorination of toluene with 2 equivalents of Cl_2 yields benzal chloride ($C_6H_5CHCl_2$, X). Subsequent hydrolysis at 373K replaces both chlorine atoms with hydroxyl groups to form an unstable gem-diol that dehydrates to benzaldehyde.

Q84.

Answer: A

Explanation:

Phthalic acid (benzene-1,2-dicarboxylic acid) has two adjacent carboxyl groups at ortho positions. Heating causes intramolecular dehydration to form phthalic anhydride. Reaction with NH_3 followed by strong heating yields phthalimide.

Q85.

Answer: D

Explanation:

Formylation of benzene using $CO/HCl/AlCl_3$ is the Gattermann-Koch reaction. Cleavage of methyl ketones with NaOX is the haloform reaction. Reaction of alcohol with acid is esterification. α -Halogenation of carboxylic acids is the HVZ reaction.

Q86.

Answer: A

Explanation:

In the Etard reaction, chromyl chloride (CrO_2Cl_2) in non-polar CS_2 solvent oxidizes the methyl group of toluene to form a brown chromium complex intermediate: $C_6H_5CH(OCrOHCl_2)_2$. Acidic hydrolysis yields benzaldehyde.

Q87.

Answer: A

Explanation:

Cross-aldol condensation between acetone (CH_3COCH_3) and 2-pentanone ($CH_3COCH_2CH_2CH_3$) involves self- and cross-condensation products formed via enolates. Structure A cannot be derived from any combination of enolate attack and dehydration between these two ketones.

Q88.

Answer: D

Explanation:

Clemmensen reduction using zinc amalgam ($Zn - Hg$) and concentrated hydrochloric acid (conc. HCl) completely reduces carbonyl groups ($>C=O$) of aldehydes and ketones into methylene groups ($-CH_2-$).

Q89.

Answer: C

Explanation:

Cyclohexanone reacts with HCN via nucleophilic addition to form cyanohydrin [B] (1-hydroxycyclohexanecarbonitrile). Heating with concentrated H_2SO_4 dehydrates the tertiary -OH group to form an endocyclic double bond and hydrolyzes the $-CN$ group to $-COOH$, yielding cyclohex-1-enecarboxylic acid [C].

Q90.

Answer: B

Explanation:

Tollen's reagent ($[Ag(NH_3)_2]^+/OH^-$) is a selective mild oxidizing agent that oxidizes aldehydes (-CHO) to carboxylate ions ($-COO^-$) in basic solution without affecting phenol or other functional groups.

Q91.

Answer: D

Q92.

Answer: C

Q93.

Answer: C

Q94.

Answer: B

Q95.

Answer: A

Q96.

Answer: B

Q97.

Answer: B

Q98.

Answer: B

Q99.

Answer: A

Q100.

Answer: A

Q101.

Answer: D

Q102.

Answer: A

Q103.

Answer: A

Q104.

Answer: A

Q105.

Answer: C

Q106.

Answer: D

Q107.

Answer: B

Q108.

Answer: D

Q109.

Answer: D

Q110.

Answer: A

Q111.

Answer: A

Q112.

Answer: D

Q113.

Answer: B

Q114.

Answer: A

Q115.

Answer: D

Q116.

Answer: C

Q117.

Answer: C

Q118.

Answer: D

Q119.

Answer: B

Q120.

Answer: B

Q121.

Answer: C

Q122.

Answer: C

Q123.

Answer: B

Q124.

Answer: A

Q125.

Answer: D

Q126.

Answer: A

Q127.

Answer: A

Q128.

Answer: D

Q129.

Answer: B

Q130.

Answer: C

Q131.

Answer: D

Q132.

Answer: B

Q133.

Answer: D

Q134.

Answer: C

Q135.

Answer: B

Q136.

Answer: A

Q137.

Answer: A

Q138.

Answer: A

Q139.

Answer: A

Q140.

Answer: D

Q141.

Answer: A

Q142.

Answer: D

Q143.

Answer: C

Q144.

Answer: C

Q145.

Answer: C

Q146.

Answer: C

Q147.

Answer: C

Q148.

Answer: C

Q149.

Answer: D

Q150.

Answer: C

Q151.

Answer: A

Q152.

Answer: D

Q153.

Answer: D

Q154.

Answer: C

Q155.

Answer: C

Q156.

Answer: A

Q157.

Answer: A

Q158.

Answer: D

Q159.

Answer: B

Q160.

Answer: D

Q161.

Answer: C

Q162.

Answer: D

Q163.

Answer: C

Q164.

Answer: C

Q165.

Answer: D

Q166.

Answer: B

Q167.

Answer: A

Q168.

Answer: A

Q169.

Answer: B

Q170.

Answer: A

Q171.

Answer: B

Q172.

Answer: D

Q173.

Answer: B

Q174.

Answer: A

Q175.

Answer: B

Q176.

Answer: A

Q177.

Answer: B

Q178.

Answer: D

Q179.

Answer: A

Q180.

Answer: D