

(for NEET-2022)

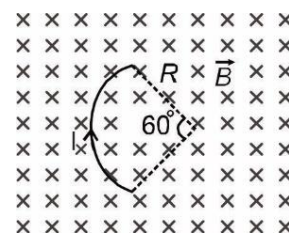
**Test - 3****Topics covered :****Physics** : Moving Charges and Magnetism, Magnetism and Matter**Chemistry** : Aldehydes, Ketones and Carboxylic Acids, Amines**Botany** : Molecular Basis of Inheritance**Zoology** : Evolution**Instructions :**

- There are two sections in each subject, i.e. Section-A & Section-B. You have to attempt all 35 questions from Section-A & only 10 questions from Section-B out of 15.
- Each question carries 4 marks. For every wrong response 1 mark shall be deducted from the total score. Unanswered / unattempted questions will be given no marks.
- Use blue/black ballpoint pen only to darken the appropriate circle.
- Mark should be dark and completely fill the circle.
- Dark only one circle for each entry.
- Dark the circle in the space provided only.
- Rough work must not be done on the Answer sheet and do not use white-fluid or any other rubbing material on the Answer sheet.

**PHYSICS****Choose the correct answer:****SECTION-A**

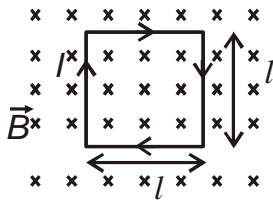
- A point charge  $+q_0$  is projected in a magnetic field  $\vec{B} = (\hat{i} + 2\hat{j} - 3\hat{k})$ . If acceleration of the particle is  $\vec{a} = (2\hat{i} + b\hat{j} + \hat{k})$ , then value of  $b$  will be
  - 1
  - $\frac{1}{2}$
  - 2
  - $\frac{3}{2}$
- A current carrying circular arc which subtends an angle of  $60^\circ$  at its geometrical centre is placed in a uniform transverse magnetic field  $\vec{B}$  as shown

in the figure. If radius of the arc is 50 cm, current in the wire is 2 A and magnetic field intensity is 2 T, then the magnitude of magnetic force on the arc is

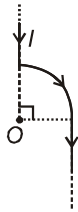


- 1 N
- 4 N
- 2 N
- Zero

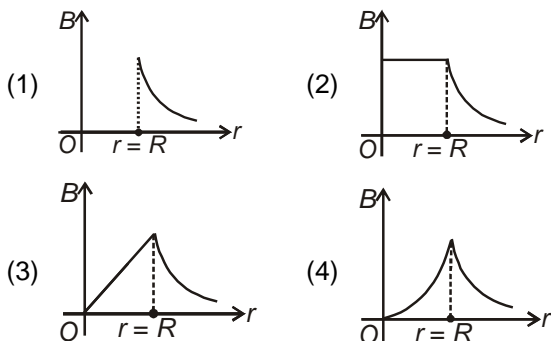
3. A current carrying conducting square frame of side  $l$  carrying current  $I$  is placed in a uniform transverse magnetic field  $\vec{B}$  as shown in the figure. Choose the incorrect statement.



- (1) Magnitude of force on the frame is  $4IlB$   
 (2) Magnitude of torque on the frame is  $Il^2B$   
 (3) Torque on the frame is zero  
 (4) Both (1) and (2)
4. A segment of wire as shown in the figure carries a current  $I$  and radius of the circular arc is  $R$ . The magnitude of magnetic field at the geometrical centre ( $O$ ) of the arc is

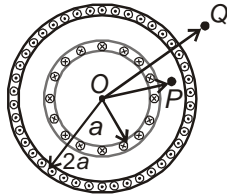


- (1)  $\frac{\mu_0 I}{4\pi R} \left( \frac{\pi}{2} + 1 \right)$       (2)  $\frac{\mu_0 I}{4R} \left( \frac{\pi}{2} + 1 \right)$   
 (3)  $\frac{\mu_0 I}{4\pi R} \left( \frac{\pi}{4} + 1 \right)$       (4)  $\frac{\mu_0 I}{8R} \left( \frac{\pi}{2} + 1 \right)$
5. A long straight conducting solid cylindrical wire of radius  $R$  carries a steady current  $I$  that is uniformly distributed throughout the cross section of the wire. Choose the correct graph of magnetic field  $B$  versus  $r$  (where  $r$  is distance from the axis of the wire)

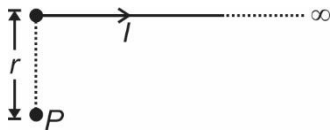


6. The magnetic dipole moment of a current carrying conducting loop depends on
- (1) Magnetic field in which it is lying  
 (2) Area of the loop  
 (3) Current in the loop  
 (4) Both (2) and (3)
7. The magnetic field at a distance  $X$  from the centre, on the axis of a current carrying circular coil of radius  $R$  is  $\frac{1}{27}$ th of that at the centre. The value of  $X$  is
- (1)  $\sqrt{2} R$   
 (2)  $2\sqrt{2} R$   
 (3)  $2 R$   
 (4)  $\sqrt{3} R$
8. A positively charged particle is moving along the positive  $x$ -axis in a uniform electric field  $\vec{E} = E_0 \hat{j}$  and magnetic field  $\vec{B} = B_0 \hat{k}$  (where  $E_0$  and  $B_0$  are positive constants), then
- (1) Particle must deflect towards positive  $y$ -axis  
 (2) Particle may deflect towards positive  $z$ -axis  
 (3) Kinetic energy of the particle must remain same  
 (4) Particle may pass undeflected
9. A uniformly charged ring of radius  $R$  having linear charge density  $\lambda$  is rotating in  $X$ - $Y$  plane with uniform angular speed  $\omega$  about its own axis inside a uniform magnetic field  $B$  along the  $y$ -direction. The magnitude of maximum torque acting on the ring about its diameter is
- (1)  $\lambda\omega B\pi R^3$   
 (2)  $\frac{\lambda\omega B\pi R^3}{2}$   
 (3)  $2\lambda\omega B\pi R^3$   
 (4)  $3\lambda\omega B\pi R^3$

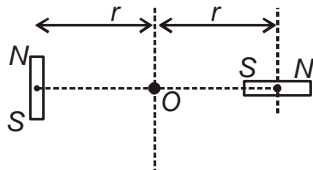
10. Two co-axial hollow cylinders of radius  $a$  and  $2a$  having current  $I$  and  $\frac{3I}{2}$  in opposite directions respectively as shown in the figure. The ratio of the magnitude of magnetic field at the point  $P$  and point  $Q$  will be  $\left( OP = \frac{3a}{2} \text{ and } OQ = \frac{5a}{2} \right)$



- (1)  $\frac{4}{5}$  (2)  $\frac{10}{3}$   
 (3)  $\frac{5}{3}$  (4)  $\frac{4}{3}$
11. A conducting wire carrying current  $I$  is shown in the figure. The magnitude of magnetic field at the point  $P$  will be

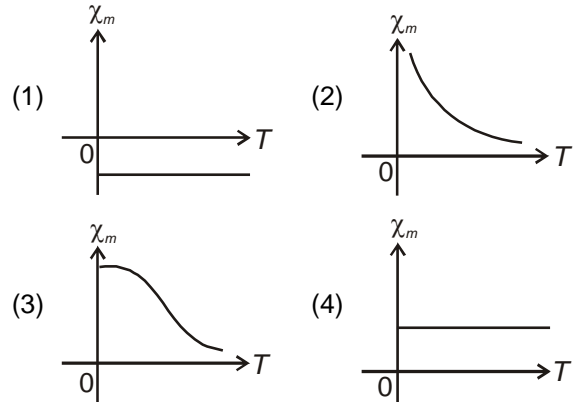


- (1)  $\frac{\mu_0 I}{2\pi r}$  (2)  $\frac{\mu_0 I}{4\pi r}$   
 (3)  $\frac{\mu_0 I}{8\pi r}$  (4) Zero
12. Orientation of two identical small bar magnet of magnetic moment ' $M$ ' is as shown in figure. The magnitude of magnetic field at the point  $O$  which lies on equatorial line of one magnet and axial line of another magnet is ( $r \gg$  size of magnet)



- (1)  $\frac{\mu_0 M}{4\pi r^3}$  (2)  $\frac{\sqrt{3}\mu_0 M}{4\pi r^3}$   
 (3)  $\frac{\sqrt{5}\mu_0 M}{4\pi r^3}$  (4)  $\frac{\mu_0 M}{2\pi r^3}$

13. Choose the correct graph of variation of magnetic susceptibility  $\chi_m$  of paramagnetic substance versus absolute temperature  $T$ .



14. A magnetising field intensity of  $1000 \frac{A}{m}$  produces a magnetic flux density  $0.25 \frac{Wb}{m^2}$  in a ferromagnetic substance. The relative permeability of ferromagnetic substance is nearly
- (1)  $2.0 \times 10^4$   
 (2)  $2.0 \times 10^2$   
 (3)  $4.0 \times 10^3$   
 (4)  $1.0 \times 10^5$
15. A bar magnet of magnetic moment  $M$  is hung by a thin cotton thread in a uniform magnetic field  $\vec{B}$ . Work done by the external agent to rotate the bar magnet from stable equilibrium position to  $120^\circ$  with the direction of magnetic field is (consider change in angular speed is zero)
- (1)  $\frac{3MB}{2}$  (2)  $\frac{MB}{2}$   
 (3)  $MB$  (4)  $\frac{-MB}{2}$
16. At a place true dip angle is  $60^\circ$ . The apparent dip when plane of dip circle is at an angle of  $30^\circ$  with the magnetic meridian is
- (1)  $\tan^{-1}\left(\frac{1}{2}\right)$   
 (2)  $\tan^{-1}(4)$   
 (3)  $45^\circ$   
 (4)  $\tan^{-1}(2)$

17. A bar magnet of magnetic moment  $M$  is gently placed inside the two mutually perpendicular magnetic field  $B_V = 6$  T and  $B_H = 2$  T. The net torque on the bar magnet will be zero ( $B_V$  is vertical and  $B_H$  is horizontal field)

- (1) When it makes angle  $\theta = \tan^{-1}\left(\frac{3}{2}\right)$  with the vertical field
- (2) When it makes angle  $\theta = \tan^{-1}\left(\frac{1}{3}\right)$  with the vertical field
- (3) When it makes angle  $\theta = \tan^{-1}\left(\frac{1}{3}\right)$  with the horizontal field
- (4) When it makes angle  $\theta = \tan^{-1}\left(\frac{2}{3}\right)$  with the horizontal

18. A proton and an  $\alpha$ -particle are projected with same momentum in uniform magnetic field. Direction of velocity is perpendicular to the magnetic field. Then path of

- (1) Proton is more curved than that of  $\alpha$ -particle
- (2)  $\alpha$ -Particle is more curved than that of proton
- (3)  $\alpha$ -Particle and proton are equally curved
- (4) Insufficient information

19. If a proton is again projected in a uniform transverse magnetic field with half of its initial linear momentum, then time period of revolution will

- (1) Become twice
- (2) Become half
- (3) Become quadrupled
- (4) Remains same

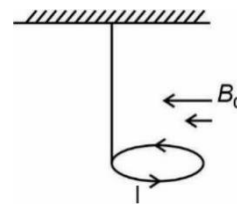
20. Current sensitivity of moving coil galvanometer can be decreased by

- (1) Increasing the number of turns in coil
- (2) Increasing the area of coil
- (3) Decreasing the area of coil
- (4) Decreasing the current in the coil

21. In cyclotron, the field that is used to accelerate the charged particle is

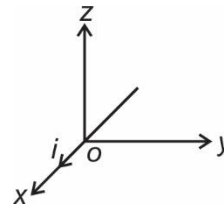
- (1) Magnetic field only
- (2) Electric field only
- (3) Both electric and magnetic field
- (4) Neither electric nor magnetic field

22. A uniform current carrying ring of mass  $m$  and radius  $R$  is connected by massless string as shown. A uniform magnetic field  $B_0$  exist in the region to keep the ring horizontal, then current in the ring is



- (1)  $\frac{mg}{RB_0}$
- (2)  $\frac{mg}{\pi RB_0}$
- (3)  $\frac{mg}{3\pi RB_0}$
- (4)  $\frac{mg}{\pi R^2 B_0}$

23. A thin long wire carrying current  $i$  is placed along positive  $x$ -axis. The unit vector of magnetic field at a point  $(0, a, a)$



- (1)  $\frac{\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}$
- (2)  $\frac{\hat{j}}{\sqrt{2}} - \frac{\hat{k}}{\sqrt{2}}$
- (3)  $\frac{-\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}$
- (4)  $\frac{-\hat{j}}{\sqrt{2}} - \frac{\hat{k}}{\sqrt{2}}$

24. A charged particle is released at rest in uniform electric ( $\vec{E}$ ) and magnetic field ( $\vec{B}$ ). If  $\vec{E} \times \vec{B} = 0$  then path of charge will be

- (1) Straight line
- (2) Helix
- (3) Circle
- (4) Parabola

25. A charge of 2 C is moving in a magnetic field of 1 T with velocity 5 m/s. Force experienced by it may be

- (1) 10 N
- (2) 5 N
- (3) Zero
- (4) All of these

26. A positive charged particle is moving with uniform velocity  $v\hat{j}$  through a uniform magnetic field

- $B(-\hat{i})$  and a uniform electric field  $\vec{E}$ . Then  $\vec{E}$  is
- (1)  $-Bv\hat{k}$
  - (2)  $Bv\hat{k}$
  - (3)  $\frac{v}{B}\hat{k}$
  - (4)  $\frac{-B}{v}\hat{k}$

27. A ferromagnetic material is placed inside a solenoid having  $n$  turns per unit length and current  $i$ , then net magnetic field in the material is [ $I$  is the intensity of magnetisation]

- (1)  $B = \mu_0(ni + I)$                       (2)  $B = 0$   
 (3)  $B = ni + I$                           (4)  $B = \mu_0(ni - I)$

28. The susceptibility of a substance at 500 K is  $-0.00004$ . Its susceptibility at 1000 K is

- (1)  $-0.00004$                               (2)  $-0.00002$   
 (3)  $-0.00003$                               (4)  $-0.00001$

29. A magnetic substance of cross-sectional area  $A$  and length  $L$  is magnetised to develop an intensity of magnetisation  $I$ . The pole strength of substance is

- (1)  $\frac{IL}{A}$     (2)  $ILA$   
 (3)  $IA$     (4)  $\frac{I}{L}$

30. A proton enters perpendicularly into a uniform magnetic field with kinetic energy  $K$ . After time  $t = 2$  s, the kinetic energy of proton will be

- (1)  $\frac{K}{2}$     (2)  $K$   
 (3)  $2K$     (4)  $4K$

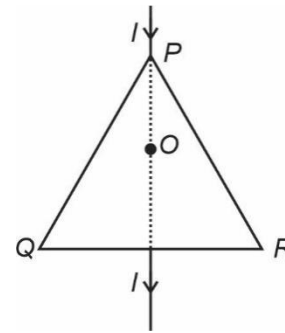
31. When 2 A current is passing through a tangent galvanometer, it gives deflection of  $30^\circ$ . For  $60^\circ$  deflection current must be

- (1) 3 A    (2) 6 A  
 (3)  $3\sqrt{3}$  A                                      (4) 4 A

32. A spherical shell of radius  $R$  and total charge  $q$  rotates about its diameter with constant angular speed  $\omega$ . The magnetic moment of the shell will be

- (1)  $\frac{qR^2\omega}{3}$     (2)  $\frac{2qR^2\omega}{3}$   
 (3)  $\frac{qR^2\omega}{5}$     (4)  $\frac{2qR^2\omega}{5}$

33. An equilateral triangle is made by uniform wires  $PQ, QR, RP$  made up of same material. A current  $I$  enters at  $P$  and leaves from the mid point of  $QR$ . If lengths of each side of triangle is  $L$ , then magnetic field at the centroid  $O$  of the triangle is



- (1) Zero    (2)  $\frac{\mu_0}{4\pi} \left( \frac{4I}{L} \right)$   
 (3)  $\frac{\mu_0}{2\pi} \left( \frac{I}{L} \right)$                                       (4)  $\frac{3\mu_0}{4\pi} \left( \frac{2I}{L} \right)$

34. Two bar magnet of same length and breadth, magnetic moment  $2M$  and  $3M$  are joined with like poles together and suspended by a string. The time period of oscillation of this assembly in a magnetic field strength  $B$  is 2 s. What will be time period of oscillation if polarity of one of the magnet is reversed and combination again made to oscillate in the same field?

- (1)  $2\sqrt{3}$  s  
 (2)  $2\sqrt{5}$  s  
 (3) 2 s  
 (4)  $2\sqrt{2}$  s

35. A steel wire of length  $l$  has magnetic moment  $M$ , it is bent into L shape from middle. The new magnetic moment will be

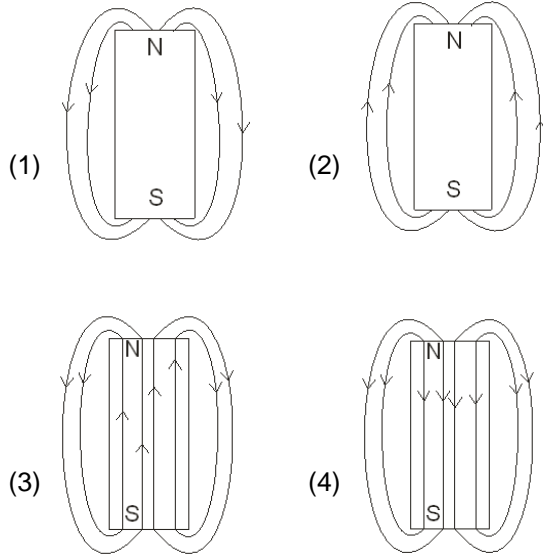
- (1)  $\frac{M}{2}$     (2)  $\frac{M}{\sqrt{2}}$   
 (3)  $\frac{M}{3}$     (4)  $\sqrt{2}M$

### SECTION-B

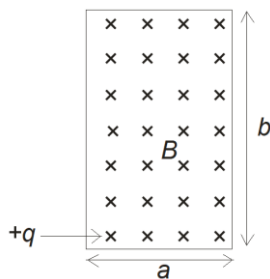
36. Relative permittivity and relative permeability of a material are  $\epsilon_r$  and  $\mu_r$ , respectively. Which of the following value of these quantities are allowed for diamagnetic material?

- (1)  $\epsilon_r = 0.5, \mu_r = 1.5$   
 (2)  $\epsilon_r = 0.5, \mu_r = 0.9$   
 (3)  $\epsilon_r = 1.5, \mu_r = 1.5$   
 (4)  $\epsilon_r = 1.5, \mu_r = 0.9$

37. The magnetic field lines due to a bar magnet are correctly shown by



38. Figure shows a rectangular region in which a uniform magnetic field exists perpendicular to plane of paper and directed inward. A particle carrying a positive charge  $q$  enters the magnetic field at right angles to it and then moves along a circular path of radius  $r$ . If  $a > r$  and  $b > 2r$  then deviation of the particle from its initial direction as it comes out of the field is

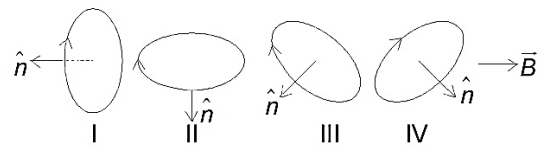


- (1)  $60^\circ$                       (2)  $45^\circ$   
 (3)  $180^\circ$                     (4)  $120^\circ$

39. When a current carrying loop is placed in a uniform magnetic field. The correct possible option may be (symbol have their usual meaning)

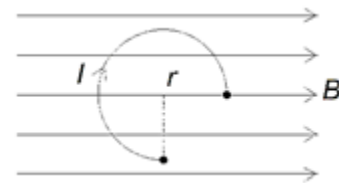
- (1)  $\vec{F}_R = 0$  and  $\vec{\tau} = 0$     (2)  $\vec{F}_R \neq 0$  and  $\vec{\tau} \neq 0$   
 (3)  $\vec{F}_R = 0$  and  $\vec{\tau} \neq 0$     (4) Both (1) and (3)

40. Figure represents four position of a identical current carrying coil and there is magnetic field directed towards right. Vector  $\hat{n}$  represents the direction of area vector of the coil. Their correct order of potential energy is



- (1)  $I < III < II < IV$                       (2)  $III < II < IV < I$   
 (3)  $I > III > II > IV$                       (4)  $IV < I < II < III$

41. A current carrying circular arc of radius  $r$  is placed in plane of paper in a uniform magnetic field  $\vec{B}$  as shown in the figure. The force experienced by the arc will be



- (1) Zero                                      (2)  $\sqrt{2} IrB$   
 (3)  $2 IrB$                                       (4)  $IrB$

42. A wire of length  $L$  carrying a current  $I$  bent in the form of square. Its magnetic moment will be

- (1)  $\frac{IL^2}{8}$   
 (2)  $\frac{IL^2}{16}$   
 (3)  $\frac{IL^2}{4}$   
 (4)  $IL^2$

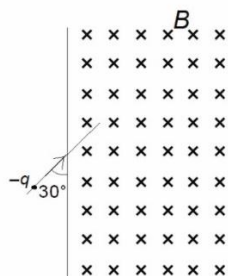
43. The angle of dip at two places are  $30^\circ$  and  $60^\circ$  respectively, then the ratio of horizontal component of earth magnetic field at the respective places will be (Assume earth's magnetic field is same at both places)

- (1)  $\sqrt{3} : 1$                                       (2)  $1 : \sqrt{3}$   
 (3)  $2 : \sqrt{3}$                                       (4)  $\sqrt{3} : 2$

44. In the hysteresis cycle, the value of H needed to make the residual intensity of magnetization zero is called

- (1) Coercivity  
 (2) Lorentz force  
 (3) Retentivity  
 (4) Both (2) and (3)

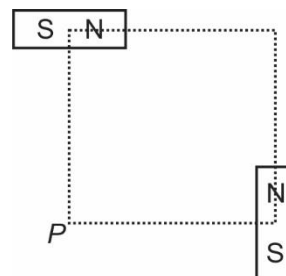
45. A particle of mass  $m$  having charge  $-q$  enters in a uniform inward magnetic field in semi-infinite region as shown in the figure. The time spent by the particle inside the magnetic field will be



- (1)  $\frac{2\pi m}{3qB}$                       (2)  $\frac{5\pi m}{3qB}$   
 (3)  $\frac{\pi m}{6qB}$                       (4)  $\frac{4\pi m}{3qB}$
46. Two long conductors, separated by a distance  $d$  carry current  $I_1$  and  $I_2$  in the same direction. They exert a force  $F$  on each other. Now current in one of them is increased to three times of its previous value and its direction reversed. If distance between them is also increased to  $2d$ , then new value of the force between them is
- (1)  $\frac{2}{3}F$                       (2)  $\frac{3}{2}F$   
 (3)  $\frac{4}{7}F$                       (4)  $\frac{7}{4}F$
47. For which of the following material magnetic susceptibility is negative?
- (1) Paramagnetic material  
 (2) Ferromagnetic material  
 (3) Diamagnetic material

- (4) Both (1) and (2)

48. Two short bar magnets of magnetic moments  $400 \text{ A m}^2$  are placed at the corners of a square of side  $50 \text{ cm}$  as shown in the figure. Value of net magnetic field intensity at point 'P' is

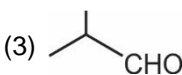
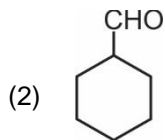
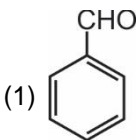


- (1)  $2.3 \times 10^{-4} \text{ T}$                       (2)  $6.4 \times 10^{-4} \text{ T}$   
 (3)  $4.5 \times 10^{-4} \text{ T}$                       (4) Zero
49. If an electron and a proton having same momenta enter perpendicular to a uniform magnetic field, then
- (1) Path of electron and proton will be equally curved  
 (2) Both particles will move undeflected  
 (3) Path of electron is more curved than path of proton  
 (4) Path of proton is more curved than path of electron
50. A magnetic needle lying parallel to a magnetic field required  $x$  unit of work to turn it through  $53^\circ$ . The torque needed to maintain the needle in this position will be
- (1)  $\frac{3}{5}x$                       (2)  $\frac{5}{3}x$   
 (3)  $\frac{4}{3}x$                       (4)  $2x$

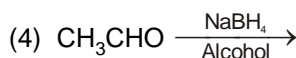
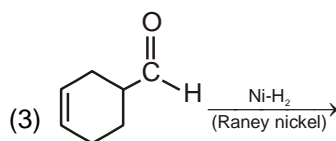
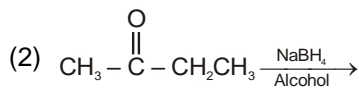
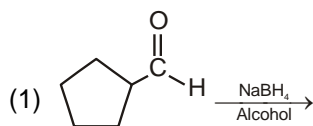
## CHEMISTRY

### SECTION-A

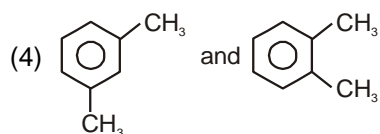
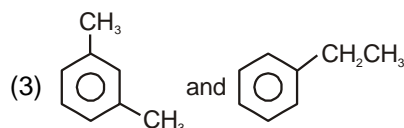
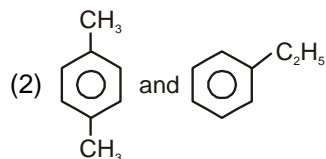
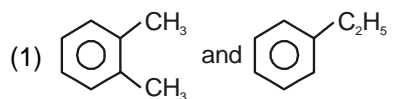
51. The compound which will not reduce Fehling's solution is



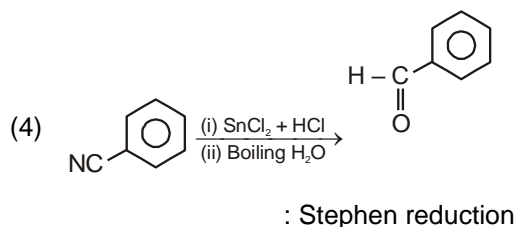
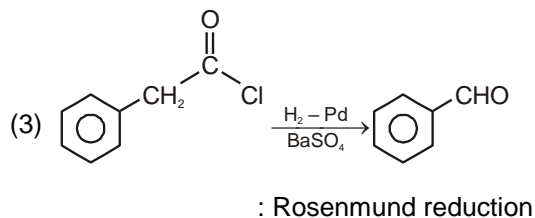
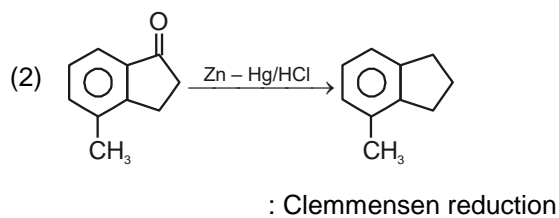
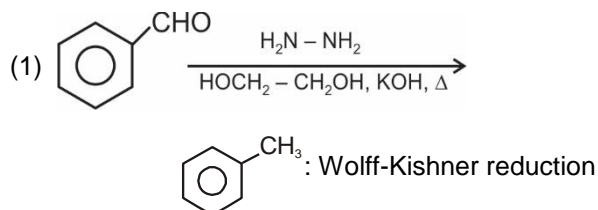
52. In which of the following, product will be a racemic mixture?



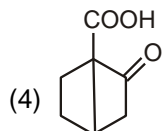
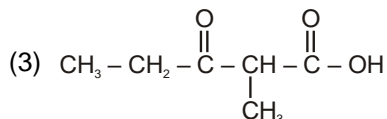
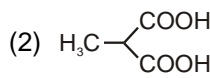
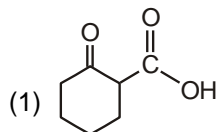
53. Compounds A and B on oxidation with alkaline  $\text{KMnO}_4$  give phthalic acid and benzoic acid respectively. If both A and B have molecular formula  $\text{C}_8\text{H}_{10}$ , then A and B respectively are



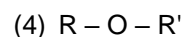
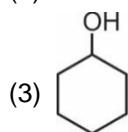
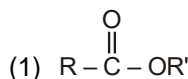
54. Choose the **incorrect** match.



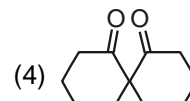
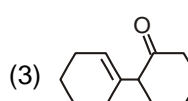
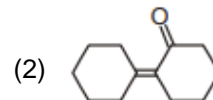
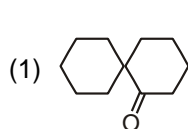
55. Which among the following is most difficult to decarboxylate on heating?



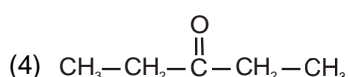
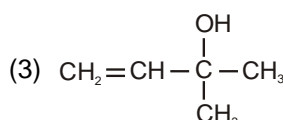
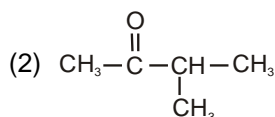
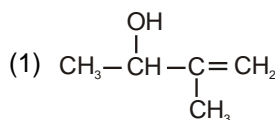
56. Which of the following is more reactive than amides but less reactive than acid anhydride towards nucleophilic substitution?



57. The product of base catalysed aldol condensation of cyclohexanone is

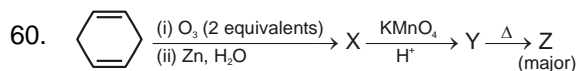
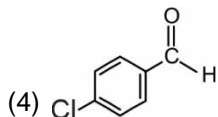
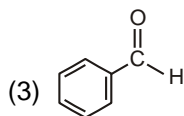
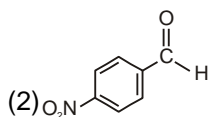
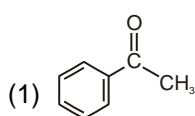


58. Compound A ( $\text{C}_5\text{H}_{10}\text{O}$ ) does not give Tollens' test and iodoform test. On heating with Cu metal it gives 2-methylbuta-1,3-diene. The compound A is





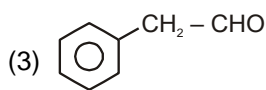
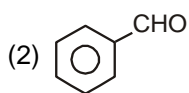
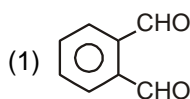
59. Which of the following is least reactive towards nucleophilic addition?



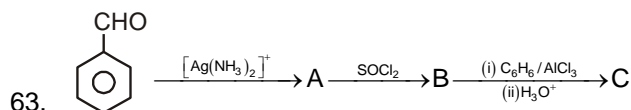
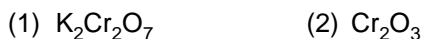
Z is



61. Identify the compound which will not undergo Cannizzaro reaction.



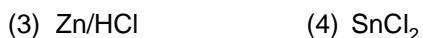
62. Reagent used in Etard's reaction is



Product C is



64. Catalyst used in Wacker's process is



65. Statement-I : Aniline does not undergo Friedel-Crafts reaction.

Statement-II : Aniline on reaction with ethanoic anhydride gives acetanilide as major product.

In light of the above statements, choose the correct answer.

(1) Statement I is correct but statement II is incorrect

(2) Statement I is incorrect but statement II is correct

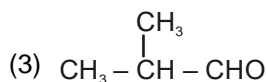
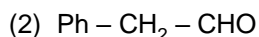
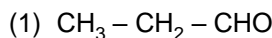
(3) Both statement I and statement II are correct statements

(4) Both statement I and statement II are incorrect statements

66. Calcium acetate on heating majorly gives

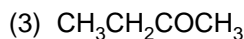
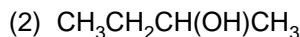
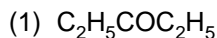


67. Which of the following does not give aldol condensation reaction?

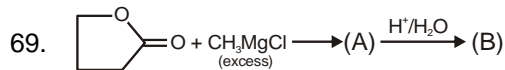


(4) Both (2) & (3)

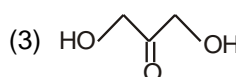
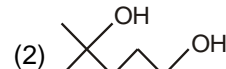
68. An organic compound (X) shows haloform reaction. The compound (X) can be



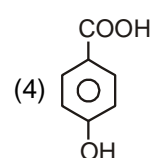
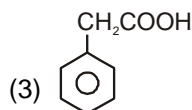
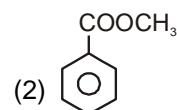
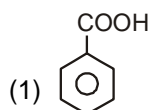
(4) Both (2) & (3)



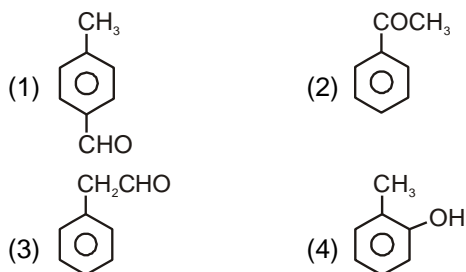
(B) is



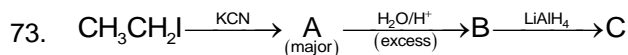
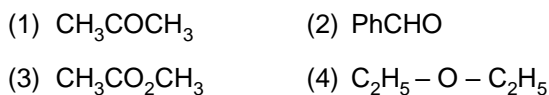
70. Which among the following will not react with  $\text{NaHCO}_3$  to produce  $\text{CO}_2$  gas?



71. Compound 'X' ( $C_8H_8O$ ) gives DNP test, but does not give yellow precipitate with NaOI. X on heating with acidified  $KMnO_4$  solution produces  $Y(C_7H_6O_2)$ . X can be



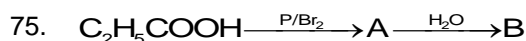
72. The compound which will not react with  $LiAlH_4$  is



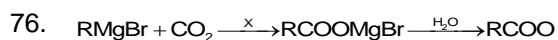
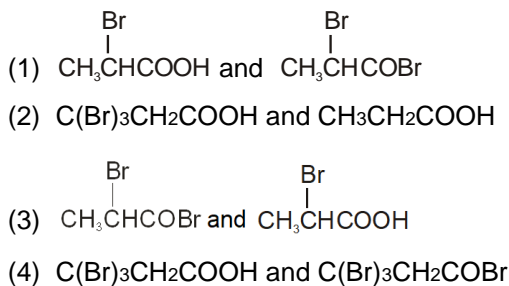
The incorrect statement(s) for the above reaction is/are

- (1) Product A gives  $1^\circ$  amine on reduction with  $LiAlH_4$   
 (2) Product B gives chiral compound on HVZ reaction  
 (3) Product C gives haloform test  
 (4) Both (1) and (3)

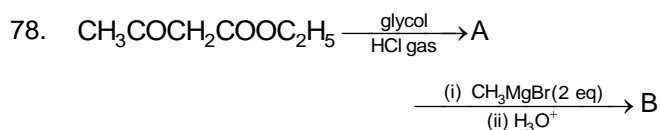
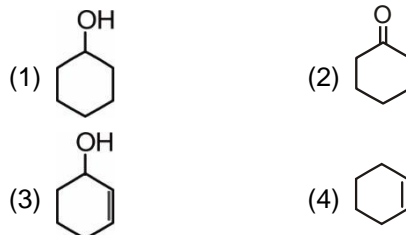
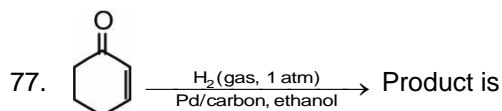
74. The compound which cannot form oxime is



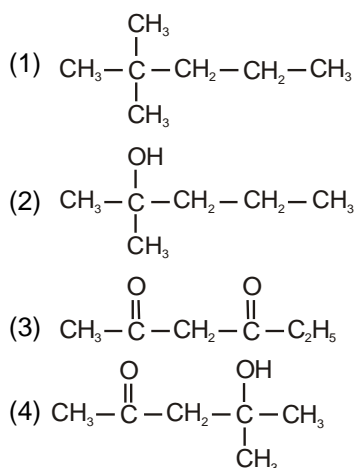
Products A and B respectively are



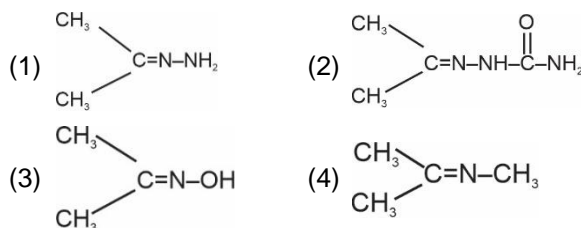
X can be



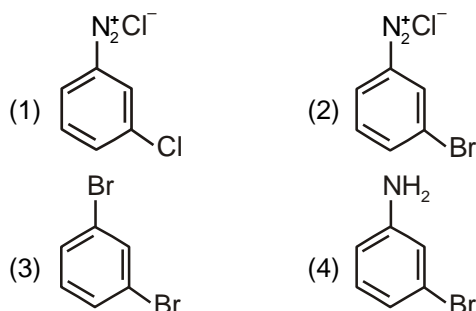
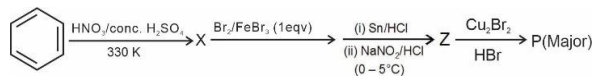
B is



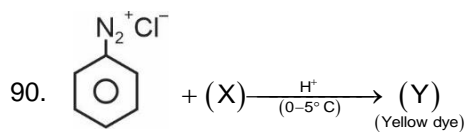
79. Which of the following is semicarbazone?



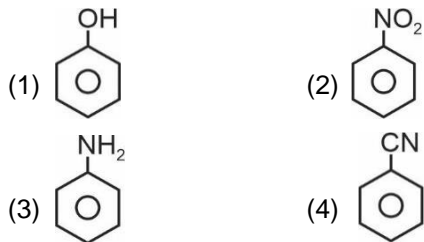
80. In the following sequence of reactions, the final product P is







Reactant X is



91. Maximum number of enolisable hydrogen atoms present in cyclohexanone is

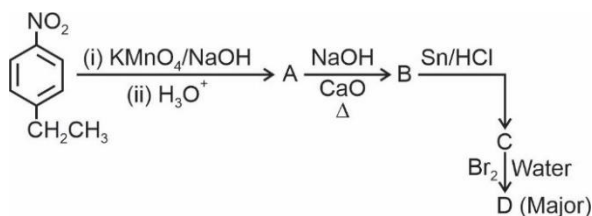
- (1) 6 (2) 5  
(3) 4 (4) 2



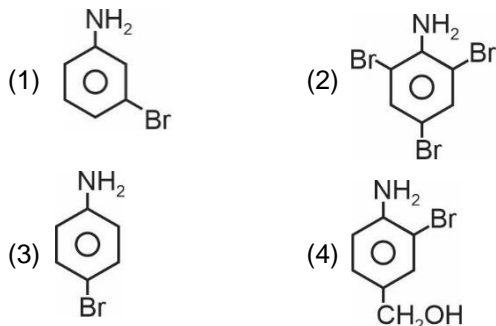
The above reaction is

- (1) Gattermann reaction  
(2) Sandmeyer reaction  
(3) Gattermann Koch reaction  
(4) Balz Schiemann reaction

93. Consider the following reaction



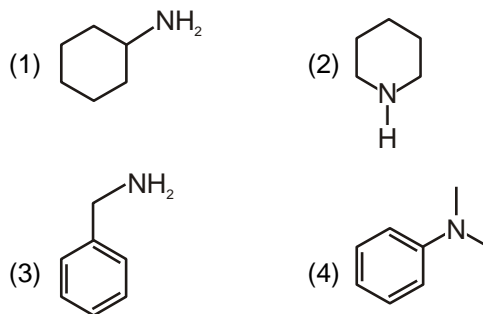
Major product D is



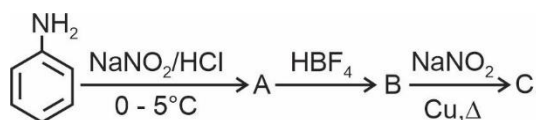
94. Product formed when nitrobenzene is treated with zinc dust and aqueous sodium hydroxide is

- (1)  $\text{PhNH}_2$  (2)  $\text{PhNHNHPh}$   
(3)  $\text{PhNHOH}$  (4)  $\text{PhN}=\overset{\oplus}{\text{N}}\text{Ph} \overset{\ominus}{\text{O}}$

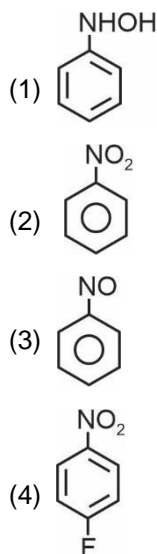
95. Which compound will not react with Hinsberg's reagent?



96. Consider the following reaction



Product C is



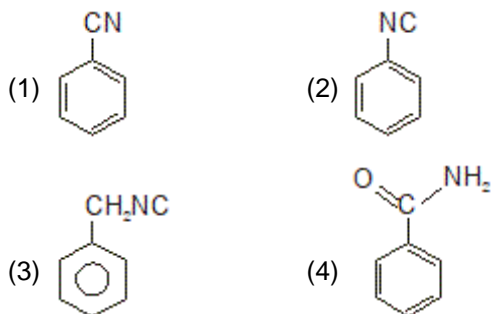
97. Which among the following has highest boiling point?

- (1) n-Butane  
(2) Methoxyethane  
(3) Propanal  
(4) Acetone

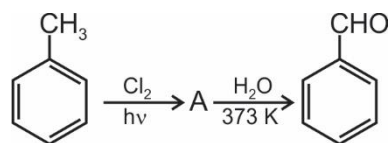
98. Benzene diazonium chloride on reaction with phenol in alkaline medium forms

- (1) p-Hydroxyazobenzene (Blue dye)  
(2) p-Hydroxyazobenzene (Orange dye)  
(3) p-Aminoazobenzene (Yellow dye)  
(4) p-Aminoazobenzene (Orange dye)

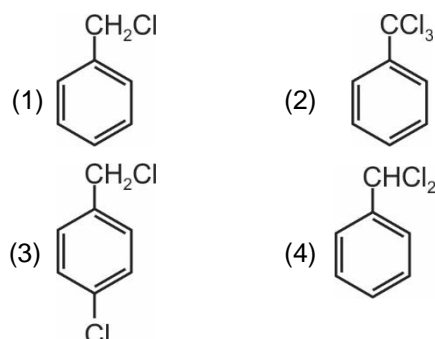
99. When benzyl amine is treated with chloroform in presence of ethanolic potassium hydroxide solution then the product formed is



100. Consider the following reaction sequence



Compound A is



## BOTANY

### SECTION-A

101. Nucleoside in DNA can be represented as

- (1) Adenine + ribose sugar
- (2) Thymine + pentose sugar
- (3) Uracil + pentose sugar
- (4) Guanine + ribose sugar

102. N-glycosidic linkages in a polynucleotide chain join

- (1) A nitrogenous base to a pentose sugar
- (2) A nucleotide to a ribose sugar
- (3) A nucleoside to a pentose sugar
- (4) A phosphate group to a nucleoside

103. Read the following statements and choose the **correct** one(s).

- A. In a DNA molecule, base ratio  $(A + T)/(C + G)$  for all the species is always 1.
- B. Chargaff's rule is applicable only for double stranded DNA.
- C. A purine is heterocyclic, 9-membered double-ring structure.

- (1) A and B
- (2) B and C
- (3) Only B
- (4) Only C

104. The structures which appear as "beads on string" in chromatin under electron microscope do not have

- (1) H<sub>2</sub>A histone proteins
- (2) H<sub>3</sub> histone proteins
- (3) H<sub>2</sub>B histone proteins
- (4) Ribosomes

105. Methylated form of uracil

- (1) Is a purine base
- (2) Is present in DNA
- (3) Is present in mRNA
- (4) Has four N-atoms

106. The unequivocal proof that DNA is the genetic material came from the experiment

- (1) Performed by Avery, MacLeod and McCarty
- (2) Performed by Alfred Hershey and Martha Chase
- (3) That used heavy isotope of nitrogen
- (4) In which radioactive thymidine was used

107. If the proportion of thymine in dsDNA of all the bases is 43%, then what will be the proportion of bicyclic nitrogenous-bases in this DNA?

- (1) 43%
- (2) 7%
- (3) 14%
- (4) 50%

108. All of the given are pyrimidines, **except**

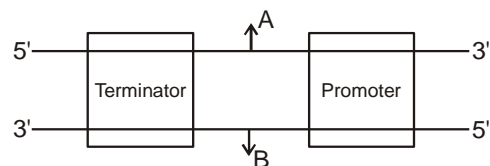
- (1) Guanine
- (2) Cytosine
- (3) Uracil
- (4) Thymine

109. In Griffith's experiments, mice died when injected with

- (1) Heat killed R-strain bacteria
- (2) Live R-strain bacteria
- (3) Heat killed S-strain combined with live R strain bacteria
- (4) Only heat killed S-strain bacteria

110. DNA is preferred over RNA as genetic material due to many reasons. One of them is
- (1) It can directly code for protein synthesis
  - (2) Thymine in DNA confers additional stability
  - (3) DNA is able to mutate at a faster rate
  - (4) It has a reactive 2'-OH group in nucleotide
111. According to the reverse central dogma
- (1) DNA is synthesized from RNA
  - (2) RNA is synthesized from proteins
  - (3) DNA is directly translated into proteins
  - (4) Different types of RNA are formed from hnRNA
112. By performing a series of experiments that showed the effect of R and S strains of *Streptococcus pneumoniae* on mice, Griffith concluded that
- (1) Protein digesting enzyme does not affect transformation
  - (2) DNA is more stable genetic material than RNA
  - (3) DNA can be synthesised from RNA
  - (4) Non-virulent bacteria were transformed by heat-killed virulent bacteria
113. Which of the following features is/are associated with heterochromatin?
- (i) Light stained region
  - (ii) Densely packed
  - (iii) Transcriptionally inactive
- (1) (i) and (ii)
  - (2) (ii) and (iii)
  - (3) Only (ii)
  - (4) (i) and (iii)
114. Select **incorrect** statement w.r.t. human genome.
- (1) Smallest known human gene is dystrophin with only 2400 bases
  - (2) Human genome contains 3164.7 million nucleotide bases
  - (3) Less than 2 percent of genome codes for proteins
  - (4) The sequence of chromosome 1 was completed in May 2006

115. Number of genes associated with chromosome 1 in human beings is
- (1) 14
  - (2) 2968
  - (3) 3000
  - (4) 231
116. The formation of peptide bond between two amino acids during translation in *E. coli* bacterium is catalysed by
- (1) 18S rRNA
  - (2) 23S rRNA
  - (3) 16S rRNA
  - (4) 28S rRNA
117. Tailing of hnRNA is the addition of (A) residues with the help of (B).
- Select the **correct** option for A and B.
- (1) (A) 200–300 adenylate, (B) Poly A polymerase
  - (2) (A) 100–200 adenylate, (B) Guanyl transferase
  - (3) (A) 200–300 adenylate, (B) Guanyl transferase
  - (4) (A) 100–200 adenylate, (B) Poly T polymerase
118. Choose **correct** option for A and B w.r.t. schematic representation of a transcription unit given in figure.



- (1) A–Non-template strand B–Coding strand
  - (2) A–Coding strand B–Non-template strand
  - (3) A–Template strand B–Coding strand
  - (4) A–Sense strand B–Antisense strand
119. In prokaryotic DNA replication
- (1) DNA polymerase II is the main polymerising enzyme
  - (2) Deoxyribonucleoside triphosphates provide energy for polymerisation
  - (3) Only DNA polymerases are required
  - (4) Five types of RNA polymerases are used
120. In prokaryotes, RNA polymerase binds to a region of DNA which is recognised by
- (1)  $\rho$  factor
  - (2) tRNA
  - (3)  $\sigma$  factor
  - (4) Core enzyme

121. Which of the following is **wrong** w.r.t. RNA polymerase enzyme in bacteria?

- (1) It facilitates opening of the DNA helix
- (2) Needs RNA primer to initiate transcription
- (3) It is a holoenzyme
- (4) Catalyses polymerisation in 5' → 3' direction

122. What would be the number of amino acids in the polypeptide coded by mRNA with given nucleotide sequence if the 15th nucleotide from 5' end is deleted?

5'-AUGGUGUUUUGUUGGACCUGAA-3'

- (1) 4                      (2) 5
- (3) 6                      (4) 3

123. In the synthesis of which of the following, DNA is **not** directly involved?

- (1) mRNA                (2) rRNA
- (3) Polypeptide chain   (4) tRNA

124. All the termination codons of universal genetic codes begin with a particular nitrogenous base, that is

- (1) Adenine              (2) Cytosine
- (3) Uracil               (4) Thymine

125. Identify the option in which difference between prokaryotic and eukaryotic transcription is **not** mentioned correctly.

<b>Prokaryotic Transcription</b>	<b>Eukaryotic Transcription</b>
(1) Splicing is generally not required	- Splicing is required
(2) There is only one type of RNA polymerase	- There are three types of RNA polymerase
(3) Structural gene is polycistronic	- Structural gene is monocistronic
(4) Post transcriptional modification takes place only in the cytoplasm	- Post transcriptional modification takes place in nucleolus as well as in cytoplasm

126. Peptidyl transferase plays an important role during protein synthesis. What is **true** about this enzyme?

- (1) It is proteinaceous
- (2) It is ribozyme
- (3) It enhance the rate of peptide bond formation
- (4) Both (2) and (3)

127. Smallest RNA is

- (1) rRNA                  (2) mRNA
- (3) hnRNA               (4) tRNA

128. Select an option that shows the **correct** sequence of the events involved in the translation mechanism.

- a. Binding of mRNA to smaller subunit of ribosome
  - b. Aminoacylation of tRNA
  - c. Binding of initiator tRNA to the P-site of the ribosome
  - d. Formation of polypeptide
  - e. Formation of peptide bond between first and second amino acids at the A site
- (1) a → b → c → d → e
  - (2) b → a → e → c → d
  - (3) b → d → a → c → e
  - (4) b → a → c → e → d

129. Select the **correct** statement(s) about *lac* operon.

- a. Glucose or galactose acts as inducer for the expression of *lac* operon
  - b. In the presence of lactose/allolactose the repressor protein binds with the lactose/allolactose molecules
  - c. It has four structural genes and two regulator genes
  - d. Its regulation by repressor protein is called positive regulation
- (1) a and b                      (2) b and c
  - (3) Only b                      (4) Only d

130. If a eukaryotic cell lacks RNA polymerase III, then it **cannot** synthesize

- (1) tRNA                      (2) 28S rRNA
- (3) 5.8S rRNA               (4) mRNA

131. Minisatellites

- (1) Are not surrounded by conserved restriction sites
- (2) Are also known as variable number of tandem repeats (VNTR)
- (3) Code for structural proteins only
- (4) Form a very small portion of human genome

132. Match the columns w.r.t. the process of translation and choose the **correct** option

Column-I	Column-II
a. UTRs	(i) Catalyst
b. rRNA	(ii) Template RNA
c. mRNA	(iii) Adapter RNA
d. tRNA	(iv) Are not translated

(1) a(i), b(ii), c(iii), d(iv)    (2) a(iv), b(i), c(ii), d(iii)  
(3) a(iv), b(iii), c(ii), d(i)    (4) a(ii), b(iii), c(iv), d(i)

133. Science of collecting and analyzing complex biological data such as genetic codes is called

- (1) Bioenergetics                      (2) Biomathematics
- (3) Biostatistics                      (4) Bioinformatics

134. Some amino acids are coded by more than one codon. It reflects which of the given features of genetic code?

- (1) Universality                      (2) Degeneracy
- (3) Commaless nature    (4) Non-overlapping

135. Which of the given is required for termination of transcription in prokaryotes?

- (1) Sigma factor                      (2) Rho factor
- (3) DNA helicase                      (4) Topoisomerase

**SECTION-B**

136. The technique of DNA fingerprinting was developed by

- (1) Sutton and Boveri
- (2) Alec Jeffreys
- (3) Sanger
- (4) Hershey and Chase

137.   A   are locations where single base DNA differences occur in human genome.

Here 'A' is

- (1) SNP                                      (2) NHC proteins
- (3) mRNA                                      (4) UTRs

138. Select the **mis-match**.

- (1) Exons : Present in processed RNA
- (2) Cistron : Segment of DNA coding for a polypeptide
- (3) Split genes : Common in prokaryotes
- (4) Introns : Intervening sequences

139. In universal genetic codes, the initiator codon codes for

- (1) Valine                                      (2) Methionine
- (3) Alanine                                      (4) Phenylalanine

140. How many of the following can be **true** for structural RNA in eubacteria?

Catalyst, Genetic material, Ribozyme, Peptidyl transferase

- (1) Two    (2) Four
- (3) Three    (4) One

141. DNA dependent DNA polymerases

- (1) Initiate the process of replication
- (2) Initiate replication randomly at any place
- (3) Catalyse polymerisation only in one direction 5' → 3'
- (4) Use ribonucleotide triphosphates as substrate

142. The length of DNA in a typical mammalian cell having  $6.6 \times 10^9$  bp is about

- (1) 2.2 Å    (2) 2.2 nm
- (3) 2.2 cm    (4) 2.2 m

143. Hershey and Chase worked with

- (1) Baculovirus
- (2) Tobacco mosaic virus
- (3) Bacteriophage
- (4) *Agrobacterium*

144. How many of base pairs of DNA are present in a typical nucleosome?

- (1) 150    (2) 200
- (3) 250    (4) 300

145. Histone proteins are basic due to excess of amino acids

- (1) Arginines only
- (2) Lysines only
- (3) Aspartic acid only
- (4) Both arginines and lysines



146. Which of the following is **not** true for DNA?
- (1) Polymer of deoxyribonucleotides
  - (2) Are always in double stranded form in bacteriophages
  - (3) Adenine and thymine are present
  - (4) Sugar and nitrogenous base is linked through N-glycosidic linkage

147. Consider the following statements

- a. Purines and pyrimidines are in equal amounts
- b. Functions as genetic material
- c. Can be adaptor or structural molecule
- d. A long polymer of deoxyribonucleotides

Which of these are **correct** for DNA found in eukaryotes?

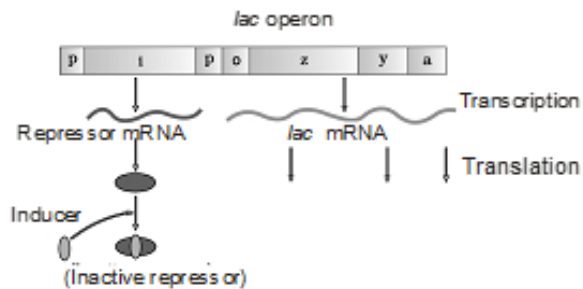
- (1) a, b and d only
- (2) a, c and d only
- (3) b, c and d only
- (4) All a, b, c and d

148. State **true (T)** or **false (F)** regarding transcription and select the **correct** option

- A. There is single DNA dependent RNA polymerase that catalyses transcription of all types of RNA in *E. coli* and yeast.
- B. The RNA polymerase II transcribes precursor of mRNA.
- C. Transcription and translation can be coupled in *E. coli*.

- |     | <b>A</b> | <b>B</b> | <b>C</b> |
|-----|----------|----------|----------|
| (1) | F        | F        | F        |
| (2) | F        | T        | T        |
| (3) | T        | F        | T        |
| (4) | F        | F        | T        |

149. Examine the figure given below and select the **correct** match



- (1) 'i' – Constitutive expression
- (2) 'z' - Produce transacetylase
- (3) 'a' - Codes for permease
- (4) 'o' – Binding site for RNA polymerase

150. A genetic material contains guanine (G) = 14%. Which of the following base proportion confirms that it is double stranded DNA?

- (1) T = 36%, C = 14%, A = 36%
- (2) C = 36%, T = 14%, A = 14%
- (3) A = 14%, T = 36%, C = 36%
- (4) U = 36%, C = 14%, A = 36%

## ZOOLOGY

### SECTION-A

151. The control apparatus of the S.L. Miller's experiment was devoid of

- (1) Methane and ammonia
- (2) Energy source
- (3) Water vapour
- (4) Being a closed system

152. Choose the **incorrect** option w.r.t. homologous and analogous structures.

	<b>Homologous structures</b>	<b>Analogous structures</b>
(1)	Brain of vertebrates	Heart of

		vertebrates
(2)	Forelimbs of bats and whales	Flippers of Penguins and Dolphins
(3)	Thorn of <i>Bougainvillea</i> and tendril of <i>Cucurbita</i>	Eye of octopus and mammals
(4)	Forelimbs of cheetah and humans	Wings of butterfly and birds

153. Study of history of life forms on earth is known as

- (1) Evolutionary biology
- (2) Morphology
- (3) Physiology
- (4) Biogenesis

154. Read the following statements carefully and choose the **correct** option.

**Statement-A** : According to the theory of spontaneous generation, units of life called spores were transferred to different planets including earth.

**Statement-B** : Oparin and Haldane proposed that life arises from non-living organic molecules by chemical evolution.

- (1) Both the statements are correct
- (2) Both the statements are incorrect
- (3) Statement A is incorrect but B is correct
- (4) Statement A is correct but B is incorrect

155. Big-Bang theory attempts to explain the

- (1) Origin of life
- (2) Origin of species
- (3) Origin of Earth
- (4) Origin of Universe

156. Which of the following is **not** correctly matched?

(1)	Charles Darwin	–	H.M.S Beagle
(2)	Hugo deVries	–	Saltation
(3)	Thomas Malthus	–	An essay on principles of population
(4)	Herbert Spencer	–	Theory of Germplasm

157. Select the **odd** one w.r.t. Australian marsupials.

- (1) Bobcat
- (2) Wombat
- (3) Bandicoot
- (4) Spotted cuscus

158. Present day finches on Galapagos Islands share common ancestry with

- (1) Seed eating finch
- (2) Fruit eating finch
- (3) Cactus eating finch
- (4) Insect eating finch

159. Which among the following is most likely the earliest event according to chemical theory of origin of life?

- (1) Formation of protobionts
- (2) Synthesis of organic monomers
- (3) Synthesis of organic polymers
- (4) Formation of DNA based genetic systems

160. When more than one adaptive radiation appeared to have occurred in an isolated geographical area representing different habitats one can call this

- (1) Convergent evolution
- (2) Parallel evolution
- (3) Saltation
- (4) Immigration

161. The presence of embryonic features such as tail and gill slits, in the embryo of all vertebrates support the theory of

- (1) Recapitulation
- (2) Atavism
- (3) Retrogressive metamorphosis
- (4) Germplasm

162. Pattern of bones in forelimbs of humans and wings of bat are examples of

- (1) Parallel evolution
- (2) Vestigial organs
- (3) Analogous organs
- (4) Homologous organs

163. Golden age of reptiles is considered to be \_\_\_\_\_ era. Select the **correct** option to fill in the blank.

- (1) Cenozoic
- (2) Jurassic
- (3) Mesozoic
- (4) Devonian

164. Sweet potato is a A modification and potato is a B modification which are together examples of C.

Choose the option that fills the blanks **correctly**.

	A	B	C
(1)	Stem	Root	Analogy
(2)	Root	Stem	Analogy
(3)	Stem	Root	Homology
(4)	Root	Stem	Homology

165. Which of the following are key concepts of Darwinian theory of evolution?

- (1) Branching descent and natural selection
- (2) Saltation and mutations
- (3) Genetic drift and variations
- (4) Population statistics and physical fitness of organism

166. Choose the **incorrect** statement among the following.
- (1) Studies suggest that first organisms that invaded land were plants.
  - (2) Saltations are large mutations and directionless while Darwinian variations are small and directional
  - (3) Sauropsids were common ancestors of therapsids and thecodonts
  - (4) *Homo habilis* was the first human-like being the hominid with brain capacity ranging between 650-800 cc.
167. Use and disuse of organs and theory of inheritance of acquired characters were main postulates of
- (1) Malthusian theory      (2) Lamarckism
  - (3) Darwinism              (4) Mutation theory
168. The most significant change in human evolution is regarded as
- (1) Evolution of language
  - (2) Erect posture
  - (3) Increase in cranial capacity
  - (4) Increase in body hair
169. The extinct hominid with a brain size of 1400 cc who lived in near east and central Asia between 1,00,000-40,000 years back, used hides to protect their body and buried their dead was
- (1) Cro-magnon man      (2) *Homo habilis*
  - (3) *Homo erectus*        (4) Neanderthal man
170. Random, non-directional changes in gene frequencies within small populations that occur by chance or by accident are referred to as
- (1) Gene flow
  - (2) Genetic drift
  - (3) Genetic recombination
  - (4) Gene migration
171. Which among the following is age of fishes?
- (1) Triassic                  (2) Carboniferous
  - (3) Cretaceous              (4) Devonian
172. "It is a stochastic process based on chance events in nature and chance mutations in the organisms". This statement tells us about
- (1) Non directional nature of evolution
  - (2) Directional mutations leading to natural selection
  - (3) Lack of anthropogenic impact on the evolutionary time scale
  - (4) Constant rate of reproduction and evolution in all organisms
173. Read the following statements and choose the correct option.
- Statement-A:** Geological history of earth closely correlates with biological history of earth.
- Statement-B:** Non-cellular form of life possibly originated around 3 million years ago.
- (1) Both statements A and B are correct
  - (2) Both statements A and B are incorrect
  - (3) Only statement A is correct
  - (4) Only statement B is correct
174. Appearance of antibiotic resistance in bacteria is an example of
- (1) Adaptive radiation
  - (2) Transduction
  - (3) Pre-adaptive mutation
  - (4) Divergent evolution
175. Select the odd one w.r.t. vestigial organs in humans.
- (1) Vermiform appendix    (2) Wisdom teeth
  - (3) Auricular muscles      (4) Epiglottis
176. In which geological period seed ferns originated?
- (1) Carboniferous          (2) Cretaceous
  - (3) Silurian                  (4) Devonian
177. Initially early humans/hominids were food-gatherers but later they started agriculture around
- (1) 10,000 years ago
  - (2) 25,000 years ago
  - (3) 18,000 years ago
  - (4) 75,000 years ago

178. Colonization of a new habitat by a very small number of individuals lead to  
 (1) Bottle-neck effect (2) Founder effect  
 (3) Stabilizing selection (4) Disruptive selection
179. Giraffes in an attempt to forage leaves on tall trees, stretched their neck resulting in elongation. This trait was passed on to succeeding generations. Such ideas was given through  
 (1) Origin of species by Natural selection  
 (2) Theory of inheritance of acquired characters  
 (3) Descent of man in relation to sex  
 (4) Process of Organic evolution
180. Choose the **incorrect** match linking human evolution to cranial capacity

	Hominid species	Cranial capacity
(1)	<i>Australopithecines</i>	500 c.c.
(2)	<i>Homo habilis</i>	650-800 c.c.
(3)	<i>Homo erectus</i>	900 c.c.
(4)	Neanderthal man	850 c.c.

181. Presence of which of the following factor(s) do not affect Hardy-Weinberg equilibrium?  
 (1) Gene migration  
 (2) Genetic recombination  
 (3) Random mating  
 (4) Genetic drift
182. Choose the **correct** statement regarding natural selection.  
 (1) In a mixed population, those who can better adapt, survive and increase their progeny.  
 (2) The weaker variant gets completely wiped out  
 (3) Mostly the selection is of disruptive type  
 (4) The largest and strongest organisms in a population are always selected
183. Arrange the following in the chronological order for human evolution.  
 a. *Homo habilis*      b. *Homo erectus*  
 c. *Australopithecines*      d. *Ramapithecus*  
 e. *Homo sapiens*  
 (1) d → c → a → b → e (2) d → c → b → a → e  
 (3) c → d → a → b → e (4) c → d → e → b → a

184. Which among the following is a direct ancestor of turtles?  
 (1) Therapsids (2) Thecodonts  
 (3) Sauropsids (4) Tuataras
185. Ferns, conifers and gnetales evolved from  
 (1) Zoosterophyllum (2) Psilophyton  
 (3) Seed ferns (4) Progymnosperms

#### SECTION-B

186. Find out the **incorrect** match w.r.t. evolution of man.

(1)	Tuang baby	–	<i>Australopithecines Africans</i>
(2)	Cro-Magnon man	–	<i>Homo sapiens fossilis</i>
(3)	Java Ape man	–	<i>Homo sapiens</i>
(4)	Handy man	–	<i>Homo habilis</i>

187. An example of three horned dinosaur that was common during upper cretaceous period is  
 (1) *Brachiosaurus* (2) *Stegosaurus*  
 (3) *Triceratops* (4) *Tyrannosaurus*
188. Dinosaur which had about 20 feet height, fearsome appearance and dagger like teeth was  
 (1) *Brachiosaurus* (2) *Stegosaurus*  
 (3) *Triceratops* (4) *Tyrannosaurus*
189. Consider the following statements w.r.t. origin of life on earth.  
 (a) Earliest autotrophs were oxygenic photoautotrophs.  
 (b) Chemical origin of life occurred in water.  
 Choose the **correct** option.  
 (1) Only (a) is correct  
 (2) Only (b) is correct  
 (3) Both (a) and (b) are correct  
 (4) Both (a) and (b) are incorrect
190. Among the following, closest, though extinct, ancestors of modern day mammals are  
 (1) Sauropsids (2) Synapsids  
 (3) Therapsids (4) Pelycosaur

191. Choose the **incorrect** option w.r.t. primitive atmosphere.

- (1) Presence of reducing conditions
- (2) H<sub>2</sub>O, CH<sub>4</sub>, NH<sub>3</sub> and H<sub>2</sub> clouds
- (3) High temperature and volcanic eruptions
- (4) Presence of ozone to prevent entry of UV rays into the atmosphere

192. Natural selection which leads to more individuals acquiring a characteristic of one extreme other than the mean character value and rejection of other extreme as observed in industrial melanism will be termed as

- (1) Stabilizing selection (2) Disruptive selection
- (3) Directional selection (4) Balancing selection

193. Genetic drift is **not** observed in

- (1) Founder effect
- (2) Interbreeding large sized population
- (3) Inbreeding small population
- (4) Isolated small population

194. Miller observed formation of simple amino acids in his experiment by using a mixture of

- (1) CH<sub>3</sub>, NH<sub>3</sub>, H<sub>2</sub>, and water vapour at 600°C
- (2) CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub> and water vapour at 800°C
- (3) CH<sub>4</sub>, NH<sub>3</sub>, N<sub>2</sub> and H<sub>2</sub> at 800°C
- (4) CH<sub>3</sub>, NH<sub>3</sub>, O<sub>2</sub> and water vapour at 600°C

195. Read the following statements A and B and choose the **correct** option.

**Statement-A:** Evolution is not a directed process in the sense of determinism.

**Statement-B:** Any population has built in variation in characteristics.

- (1) Both the statements A and B are correct
- (2) Both the statements A and B are incorrect
- (3) Only statement A is incorrect
- (4) Only statement B is incorrect

196. How many statements given below are **correct**?

- (a) Sea cows and dolphins are aquatic mammals.
- (b) The first mammals were like shrews.
- (c) Only dicots are the dominating land plants in the present era.
- (d) North American fauna was overridden by South American fauna due to continental drift.

Choose the **correct** option.

- (1) Three (2) Two
- (3) One (4) Four

197. In a population of white (dominant) and red (recessive) flowers that is in Hardy-Weinberg equilibrium, the percentage of white flowers is 96%. Calculate the percentage of dominant allele.

- (1) 20% (2) 40%
- (3) 16% (4) 80%

198. Select the **correct** statement.

- (1) *Australopithecines* hunted with stone weapons but essentially ate fruits
- (2) *Dryopithecus* was more man-like while *Ramapithecus* was more ape-like
- (3) *Homo habilis* probably ate meat
- (4) Pre-historic cave art developed around 40,000 years ago

199. In the   A   decade of twentieth century, Hugo de Vries based on his work on   B   brought forth the idea of mutations. Choose the option which correctly fill the blanks.

- (1) A-first, B-Evening primrose
- (2) A-Second, B-*Oenothera lamarckiana*
- (3) A-First, B-*Pisum sativa*
- (4) A-Second, B-*C. elegans*

200. Which of the following is not a placental mammal?

- (1) Mole (2) Lemur
- (3) Flying squirrel (4) Numbat

(for NEET-2022)

**Test - 3****Answers**

1. (2)	41. (4)	81. (4)	121. (2)	161. (1)
2. (3)	42. (2)	82. (4)	122. (1)	162. (4)
3. (4)	43. (1)	83. (2)	123. (3)	163. (3)
4. (1)	44. (1)	84. (1)	124. (3)	164. (2)
5. (3)	45. (2)	85. (3)	125. (4)	165. (1)
6. (4)	46. (2)	86. (4)	126. (4)	166. (3)
7. (2)	47. (3)	87. (4)	127. (4)	167. (2)
8. (4)	48. (3)	88. (3)	128. (4)	168. (3)
9. (1)	49. (1)	89. (1)	129. (3)	169. (4)
10. (2)	50. (4)	90. (3)	130. (1)	170. (2)
11. (2)	51. (1)	91. (3)	131. (2)	171. (4)
12. (3)	52. (2)	92. (2)	132. (2)	172. (1)
13. (2)	53. (1)	93. (2)	133. (4)	173. (3)
14. (2)	54. (3)	94. (2)	134. (2)	174. (3)
15. (1)	55. (4)	95. (4)	135. (2)	175. (4)
16. (4)	56. (1)	96. (2)	136. (2)	176. (1)
17. (2)	57. (2)	97. (4)	137. (1)	177. (1)
18. (2)	58. (3)	98. (2)	138. (3)	178. (2)
19. (4)	59. (1)	99. (3)	139. (2)	179. (2)
20. (3)	60. (2)	100. (4)	140. (3)	180. (4)
21. (3)	61. (3)	101. (2)	141. (3)	181. (3)
22. (2)	62. (3)	102. (1)	142. (4)	182. (1)
23. (3)	63. (4)	103. (2)	143. (3)	183. (1)
24. (1)	64. (1)	104. (4)	144. (2)	184. (3)
25. (4)	65. (3)	105. (2)	145. (4)	185. (2)
26. (1)	66. (2)	106. (2)	146. (2)	186. (3)
27. (1)	67. (3)	107. (4)	147. (1)	187. (3)
28. (1)	68. (4)	108. (1)	148. (2)	188. (4)
29. (3)	69. (2)	109. (3)	149. (1)	189. (2)
30. (2)	70. (2)	110. (2)	150. (1)	190. (3)
31. (2)	71. (3)	111. (1)	151. (2)	191. (4)
32. (1)	72. (4)	112. (4)	152. (1)	192. (3)
33. (1)	73. (3)	113. (2)	153. (1)	193. (2)
34. (2)	74. (1)	114. (1)	154. (3)	194. (2)
35. (2)	75. (3)	115. (2)	155. (4)	195. (1)
36. (4)	76. (1)	116. (2)	156. (4)	196. (2)
37. (3)	77. (2)	117. (1)	157. (1)	197. (4)
38. (3)	78. (4)	118. (3)	158. (1)	198. (1)
39. (4)	79. (2)	119. (2)	159. (2)	199. (1)
40. (3)	80. (3)	120. (3)	160. (1)	200. (4)

(for NEET-2022)

## Test - 3

## Answers &amp; Solutions

## PHYSICS

## SECTION-A

1. Answer (2)

$$\vec{F}_m \perp \vec{B} \text{ therefore } \vec{a} \perp \vec{B}$$

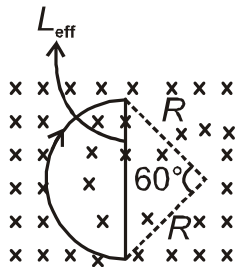
$$\vec{a} \cdot \vec{B} = 0$$

$$\Rightarrow (\hat{i} + 2\hat{j} - 3\hat{k}) \cdot (2\hat{i} + b\hat{j} + 3\hat{k}) = 0$$

$$\Rightarrow 2 + 2b - 3 = 0$$

$$b = \frac{1}{2}$$

2. Answer (3)



$$L_{\text{eff}} = R$$

$$F_m = IRB = 2 \times \frac{1}{2} \times 2 = 2 \text{ N}$$

3. Answer (4)

$$F_m = I l_{\text{eff}} B \sin \theta$$

$$F_m = I \times 0 \times B \sin \theta$$

$$F_m = 0$$

$$\vec{\tau} = \vec{M} \times \vec{B}$$

$$\Rightarrow \tau = MB \sin \theta = l l^2 B \sin \theta = 0$$

Both (1) and (2) are incorrect

4. Answer (1)

$$\vec{B}_{\text{arc}} = \frac{\mu_0 I}{2R} \times \frac{\phi}{2\pi} \otimes$$

$$\Rightarrow \vec{B}_{\text{arc}} = \frac{\mu_0 I}{2R} \times \frac{\pi}{2 \times 2\pi}$$

$$\Rightarrow \vec{B}_{\text{arc}} = \frac{\mu_0 I}{8R} \otimes$$

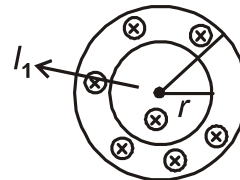
$$\Rightarrow \vec{B}_{\text{straight wire}} = \frac{\mu_0 I}{4\pi R} (\sin \alpha + \sin \beta)$$

$$= \frac{\mu_0 I}{4\pi R} (\sin 90^\circ + \sin 0^\circ) \otimes = \frac{\mu_0 I}{4\pi R} \otimes$$

$$\vec{B}_{\text{net}} = \vec{B}_{\text{arc}} + \vec{B}_{\text{straight wire}} = \left( \frac{\mu_0 I}{8R} + \frac{\mu_0 I}{4\pi R} \right) \otimes$$

$$\vec{B}_{\text{net}} = \frac{\mu_0 I}{4\pi R} \left( \frac{\pi}{2} + 1 \right)$$

5. Answer (3)



$$B = \frac{\mu_0 I r}{2\pi R^2} \text{ when } r \leq R$$

for  $r > R$

$$B = \frac{\mu_0 I}{2\pi r}$$

$$B \propto \frac{1}{r}$$

6. Answer (4)

$$\vec{M} = N\vec{A}$$

Magnetic dipole moment depends on

- (1) Number of turn of the loop
- (2) Current in the loop
- (3) Area of the loop

7. Answer (2)

$$B_{\text{axis}} = \frac{1}{27} B_{\text{centre}}$$

$$\frac{\mu_0 I R^2}{2(R^2 + X^2)^{\frac{3}{2}}} = \frac{1}{27} \frac{\mu_0 I}{2R}$$

$$\frac{1}{2(R^2 + X^2)^{\frac{3}{2}}} = \frac{1}{2R^3 \times 27}$$

$$\sqrt{R^2 + X^2} = 3R$$

$$R^2 + X^2 = 9R^2$$

$$X^2 = 8R^2$$

$$\boxed{X = 2\sqrt{2}R}$$

8. Answer (4)

$$\vec{F}_m = q(\vec{v} \times \vec{B}) = qvB(\hat{i} \times \hat{k}) = -qvB\hat{j}$$

$$\vec{F}_e = qE\hat{j}$$

As both magnetic and electric force are in opposite direction, net force on the charge may be zero. Therefore, particle may pass undeflected.

9. Answer (1)

$$\vec{\tau} = MB\sin\theta$$

$$M = NIA$$

$$I = \frac{q}{t}$$

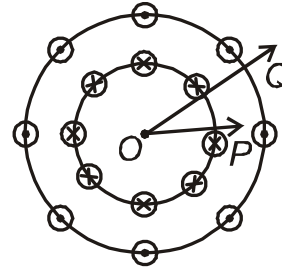
$$\Rightarrow I = \frac{2\pi R\lambda}{\omega}$$

$$\Rightarrow I = \frac{2\pi R\lambda\omega}{2\pi}$$

$$A = \pi R^2$$

$$\text{Hence, } \tau = \frac{2\pi R\lambda\omega}{2\pi} \pi R^2 \times B = \pi R^3 \lambda \omega B$$

10. Answer (2)



$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{\text{enc}}$$

$$\Rightarrow B 2\pi \frac{3a}{2} = \mu_0 I$$

$$\Rightarrow B_P = \frac{\mu_0 I}{3\pi a}$$

$$\oint \vec{B} \cdot d\vec{l} = \mu_0 I_{\text{enc}}$$

$$\Rightarrow B 2\pi \frac{5a}{2} = \left(\frac{3I}{2} - I\right) \mu_0$$

$$\Rightarrow B_Q = \frac{\mu_0 I}{10\pi a}$$

$$\text{Hence, } \frac{B_P}{B_Q} = \left(\frac{10}{3}\right)$$

11. Answer (2)

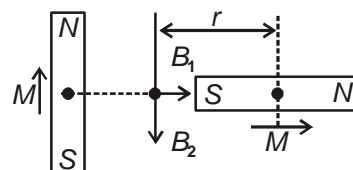
Magnetic field due to current carrying wire

$$B = \frac{\mu_0 I}{4\pi r} [\sin\alpha + \sin\beta] \quad [\alpha = 90^\circ, \beta = 0^\circ]$$

$$= \frac{\mu_0 I}{4\pi r} (1 - 0)$$

$$B = \frac{\mu_0 I}{4\pi r}$$

12. Answer (3)





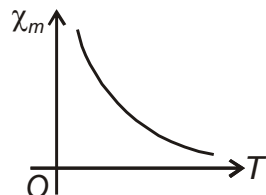
$$B_1 = \frac{\mu_0 2M}{4\pi r^3}$$

$$B_2 = \frac{\mu_0 M}{4\pi r^3}$$

$$B_{\text{net}} = \sqrt{B_1^2 + B_2^2} = \frac{\sqrt{5}\mu_0 M}{4\pi r^3}$$

13. Answer (2)

$$\chi_m = \frac{C\mu_0}{T}$$



14. Answer (2)

$$\mu = \frac{B}{H}$$

$$= \frac{0.25}{1000}$$

$$= 2.5 \times 10^{-4} \text{ TmA}^{-1}$$

$$\mu_r = \frac{\mu}{\mu_0}$$

$$\mu_r = \frac{2.5 \times 10^{-4}}{4\pi \times 10^{-7}}$$

$$= 0.2 \times 10^3$$

$$\mu_r = 2 \times 10^2$$

15. Answer (1)

Work done in rotating a bar magnet

$$W = MB[1 - \cos\theta]$$

$$= MB[1 - \cos 120^\circ]$$

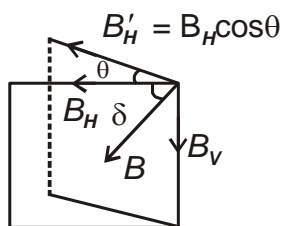
$$= \frac{3}{2} MB$$

16. Answer (4)

$$\tan \delta' = \frac{B_V}{B_H'}$$

$$\tan \delta' = \frac{B \sin \delta}{B \cos \delta \cos \theta}$$

$$\tan \delta' = \frac{\tan \delta}{\cos \theta}$$



$$\tan \delta' = \frac{\tan 60^\circ}{\cos 30^\circ}$$

$$= \frac{\sqrt{3}}{\frac{\sqrt{3}}{2}}$$

$$\delta' = \tan^{-1}(2)$$

17. Answer (2)

$$\tau_H = \tau_V$$

$$MB_H \sin \alpha = MB_V \sin(90 - \alpha)$$

$$\tan \alpha = \frac{B_V}{B_H}$$

$$\alpha = \tan^{-1}(3)$$

This angle is from horizontal

$$\theta = \tan^{-1}\left(\frac{1}{3}\right) \text{ from vertical}$$

18. Answer (2)

$$\therefore r = \frac{mv}{qB} \text{ if } p = mv = \text{Constant}$$

$$r \propto \frac{1}{q}, \text{ lower radius indicates more curved path.}$$

19. Answer (4)

Time period is independent of speed of charge.

20. Answer (3)

$$\text{Current sensitivity} = \frac{NBA}{k} = \frac{\theta}{i}$$

21. Answer (3)

In cyclotron both magnetic and electric field is used to accelerate the charge

22. Answer (2)

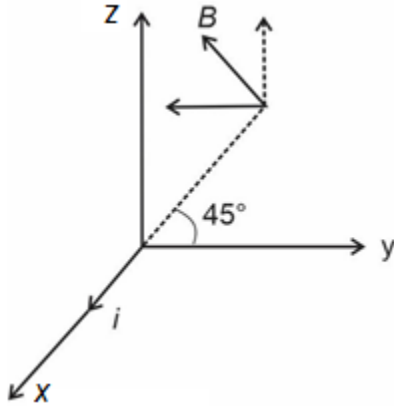
$$T = mg \text{ (Translatory equilibrium)}$$

$$TR = \pi R^2 IB_0 \text{ (Rotatory equilibrium)}$$

$$\Rightarrow mgR = \pi R^2 IB_0$$

$$I = \frac{Mg}{\pi RB_0}$$

23. Answer (3)



$$\vec{B} = -\frac{\mu_0 i}{2\sqrt{2}\pi a} \hat{j} + \frac{\mu_0 i}{2\sqrt{2}\pi a} \hat{k}$$

$$\hat{B} = \frac{-\hat{j}}{\sqrt{2}} + \frac{\hat{k}}{\sqrt{2}}$$

24. Answer (1)

$$\vec{E} \times \vec{B} = 0$$

$$\text{Means } \vec{E} \parallel \vec{B}$$

Particle will move in the direction of  $\vec{E}$

25. Answer (4)

$$\therefore F_{\text{Magnetic}} \leq qvB$$

26. Answer (1)

$$-q\vec{E} = q\vec{v} \times \vec{B}$$

$$-\vec{E} = vB\hat{j} \times (-\hat{i})$$

$$\vec{E} = -vB\hat{k}$$

27. Answer (1)

$$B = \mu_0(ni + I)$$

28. Answer (1)

Susceptibility of diamagnetic substance is negative and independent on temperature

29. Answer (3)

$$I = \frac{M}{V} = \frac{m \cdot L}{AL} \Rightarrow m = IA$$

30. Answer (2)

Speed of proton will not change therefore kinetic energy will be same

31. Answer (2)

$$I \propto \tan \phi$$

$$\frac{I_1}{I_2} = \frac{\tan \phi_1}{\tan \phi_2}$$

$$\frac{2}{I_2} = \frac{\tan 30^\circ}{\tan 60^\circ}$$

$$I_2 = 6 \text{ A}$$

32. Answer (1)

$$M = \frac{qI}{2m}$$

$$= \frac{q \frac{2}{3} m R^2 \omega}{2m}$$

$$= \frac{qR^2 \omega}{3}$$

33. Answer (1)

Magnetic field due to two equal portions of wire will be equal and opposite

34. Answer (2)

$$T_1 = 2\pi \sqrt{\frac{I_1 + I_2}{5M}}$$

$$T_2 = 2\pi \sqrt{\frac{I_1 + I_2}{M}}$$

$$\frac{T_1}{T_2} = \sqrt{\frac{1}{5}}$$

$$T_2 = 2\sqrt{5} \text{ s}$$

35. Answer (2)

$$M_{\text{net}} = \sqrt{M_1^2 + M_2^2}$$

$$M_1 = M_2 = \frac{M}{2}$$

$$M_{\text{net}} = \frac{M}{\sqrt{2}}$$

## SECTION-B

36. Answer (4)

Fact

37. Answer (3)

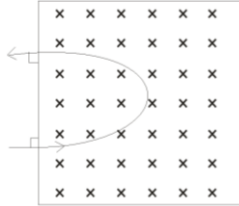
Inside the bar magnet field will be south to north and outside the magnet field will be north to south

38. Answer (3)

$$a > r$$

$$b > 2r$$

It means particle will come out from field as shown in figure



Therefore, deviation will be  $180^\circ$

39. Answer (4)

Force will be zero

Torque may be zero may not be zero

40. Answer (3)

Potential energy of dipole in uniform magnetic field is given by

$$U = -\vec{M} \cdot \vec{B}$$

41. Answer (4)

$$\vec{F} = i\vec{\ell}_{\text{eff}} \times \vec{B}$$

$$F = \sqrt{2}ir \times B \sin 135^\circ$$

$$= irB$$

42. Answer (2)

$$M = 2NiA$$

$$M = \frac{L^2}{16}$$

$$M = \frac{iL^2}{16}$$

43. Answer (1)

$$\frac{BH_1}{BH_2} = \frac{B \cos 30^\circ}{B \cos 60^\circ}$$

$$= \sqrt{3} : 1$$

44. Answer (1)

The value of  $H$  needed to make the residual intensity of magnetization zero is called coercivity

45. Answer (2)

$$= \frac{2\pi M \theta}{qB \ 2\pi}$$

$$= \frac{2\pi m}{qB} \times \frac{5\pi}{3 \times 2\pi}$$

$$= \frac{5\pi m}{3qB}$$

46. Answer (2)

$$|\vec{F}_1| = \frac{\mu_0}{4\pi} \frac{2I_1 I_2}{d} = F \quad \dots(I)$$

$$|\vec{F}_2| = \frac{\mu_0}{4\pi} \frac{2I_1(3I_2)}{2d} = \frac{\mu_0}{4\pi} \frac{3I_1 I_2}{d} \quad \dots(II)$$

From I and II

$$\frac{F_1}{F_2} = \frac{2}{3}$$

$$\Rightarrow F_2 = \frac{3}{2}F$$

47. Answer (3)

Magnetic susceptibility is negative for diamagnetic materials while for paramagnetic and ferromagnetic materials it is positive.

48. Answer (3)

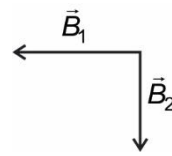
At point 'P'

$$\vec{B}_{\text{net}} = \vec{B}_1 + \vec{B}_2$$

$$\text{Here } B_1 = B_2 = \frac{\mu_0}{4\pi} \frac{M}{r^3} = 10^{-7} \times \frac{400}{\left(\frac{1}{2}\right)^3}$$

$$= 3200 \times 10^{-7}$$

$$= 3.2 \times 10^{-4} \text{ T}$$



$$\text{Here, } B_{\text{net}} = \sqrt{B_1^2 + B_2^2}$$

$$= B\sqrt{2}$$

$$= 4.5 \times 10^{-4} \text{ T}$$

49. Answer (1)

Radius of path of charged particle

$$r = \frac{mv}{qB} = \frac{P}{qB}$$

$$\text{Here, } \frac{r_1}{r_2} = \frac{q_2 B_2}{q_1 B_1} = 1$$

$$\text{So, } r_1 = r_2$$

50. Answer (4)

Work done

$$X = MB(\cos\theta_1 - \cos\theta_2)$$

$$= MB(\cos 0^\circ - \cos 53^\circ)$$

$$= MB \left[ 1 - \frac{3}{5} \right] = \frac{2MB}{5}$$

$$\text{Torque required } \tau = MB \sin\theta = MB \sin 53^\circ$$

$$= MB \cdot \frac{4}{5} = 2X$$

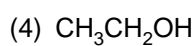
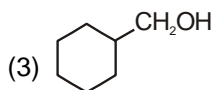
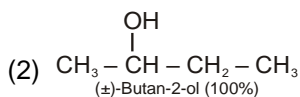
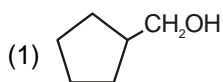
## CHEMISTRY

### SECTION-A

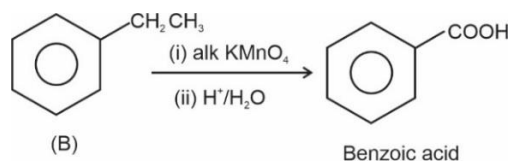
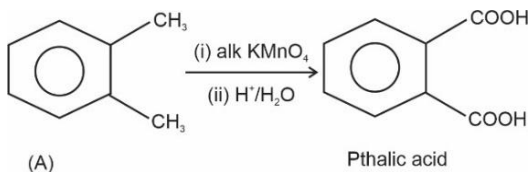
51. Answer (1)

Aromatic aldehyde does not reduce Fehling's solution.

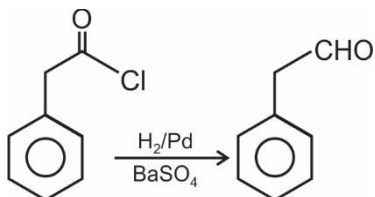
52. Answer (2)



53. Answer (1)



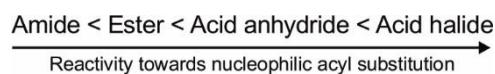
54. Answer (3)



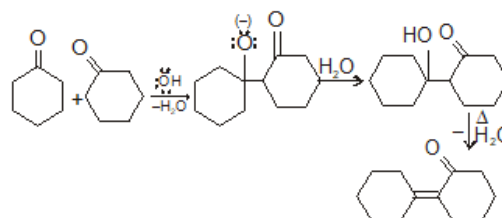
55. Answer (4)

During decarboxylation of β-keto carboxylic acid, intermediate formed is enol and at bridge-head, unsaturation is not possible.

56. Answer (1)

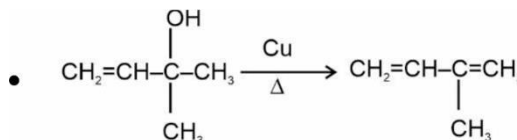


57. Answer (2)



58. Answer (3)

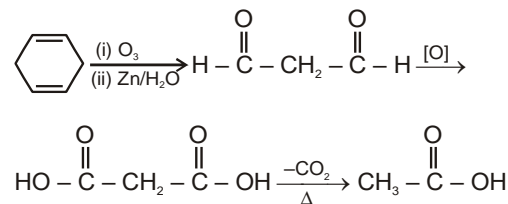
- 3° alcohol does not reduce Tollens' reagent



59. Answer (1)

Electrophilicity of carbonyl carbon is least for ketone. Rate of nucleophilic addition to the carbonyl carbon is governed by electronic as well as steric factors

60. Answer (2)



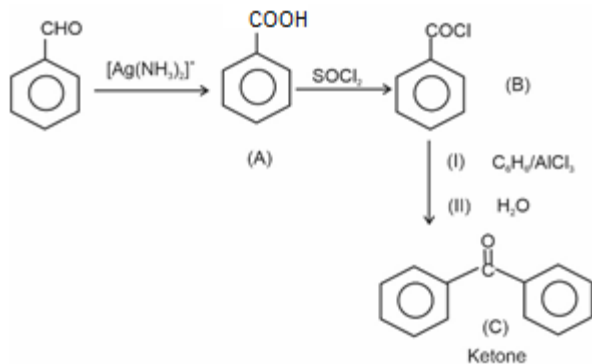
61. Answer (3)

Aldehydes having no α-H-atom undergo Cannizzaro reaction.

62. Answer (3)

Chromyl chloride is used in Etard's reaction

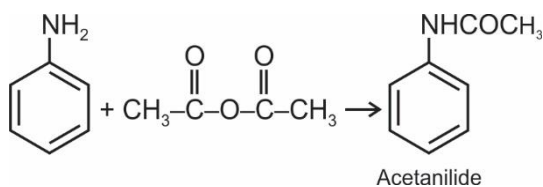
63. Answer (4)



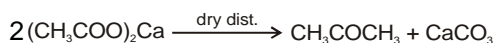
64. Answer (1)

$PdCl_2$  is used as catalyst in Wacker's process.

65. Answer (3)



66. Answer (2)



67. Answer (3)

For aldol condensation there must be at least two  $\alpha$  hydrogen atoms.

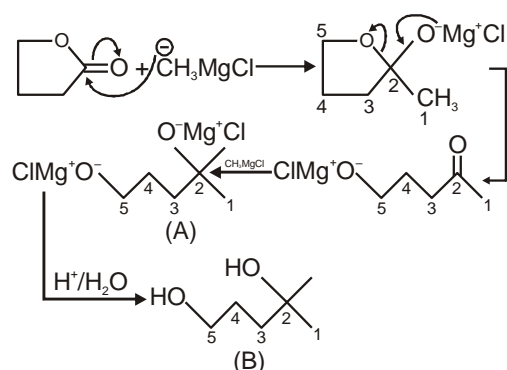
68. Answer (4)

Haloform reaction is shown by the compounds

having the  $(-C-C(=O)-CH_3)$  linkage.

$CH_3CH_2CH(OH)CH_3$  gets oxidized to  $CH_3CH_2COCH_3$  during first step of haloform reaction.

69. Answer (2)

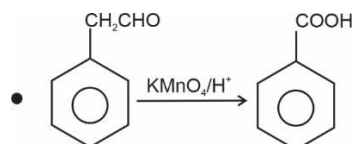


70. Answer (2)

Stronger acid whose acidity is greater than carbonic acid can produce  $CO_2$  gas on reaction with  $NaHCO_3$ .

71. Answer (3)

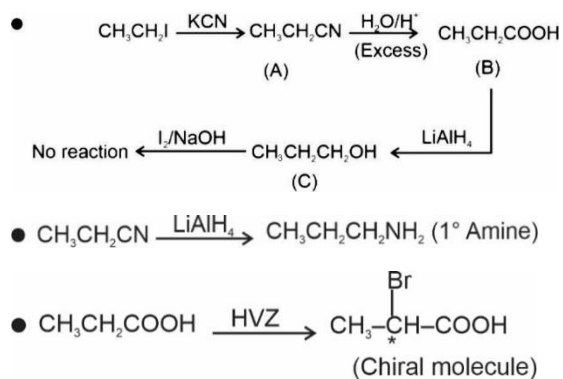
- Aldehydes and ketones give 2,4 DNP test.
- Methyl ketones and acetaldehyde gives iodoform test.



72. Answer (4)

$LiAlH_4$  cannot reduce ether

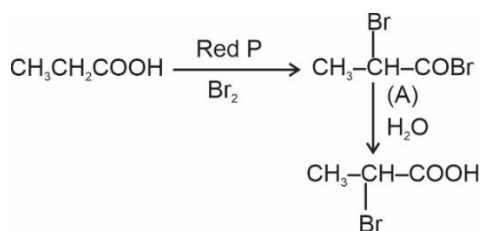
73. Answer (3)



74. Answer (1)

Only aldehydes and ketones form oximes on reaction with  $NH_2OH$ .

75. Answer (3)



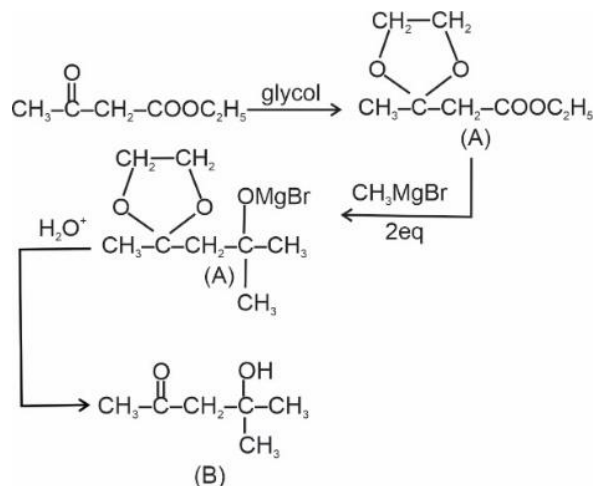
76. Answer (1)

Grignard reagent used in THF solution

77. Answer (2)

Only  $C=C$  is reduced at low pressure i.e. 1 atm.

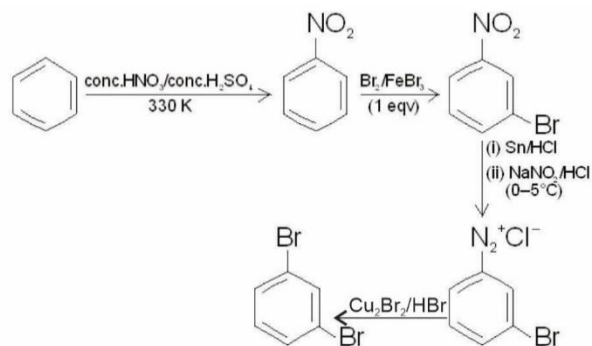
78. Answer (4)



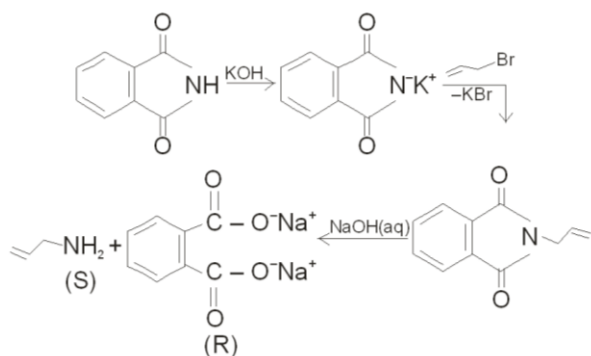
79. Answer (2)



80. Answer (3)



81. Answer (4)

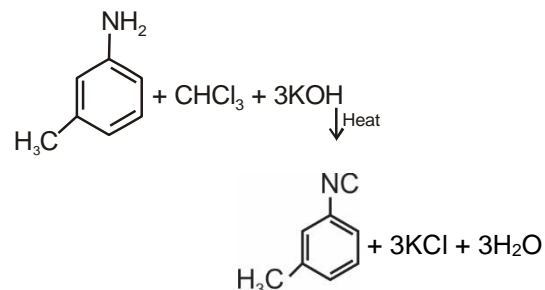


82. Answer (4)

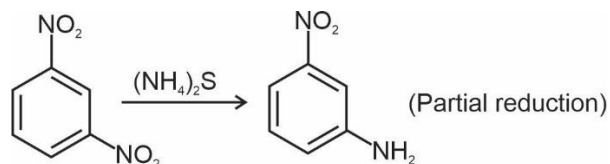
Hydrogen bonding in primary amine is stronger than secondary amine. Hydrogen bonding in tertiary amine is absent.

83. Answer (2)

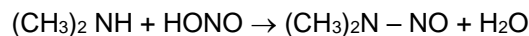
Aliphatic and aromatic primary amines on heating with chloroform and ethanolic potassium hydroxide form isocyanides or carbylamines which are foul smelling substances. Secondary and tertiary amines do not show this reaction. This reaction is known as carbylamine reaction or isocyanide test.



84. Answer (1)

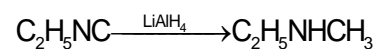


85. Answer (3)

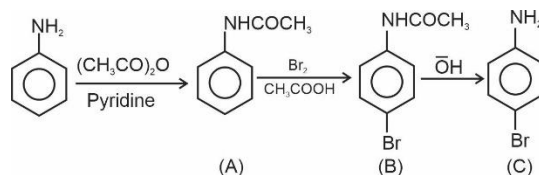


### SECTION-B

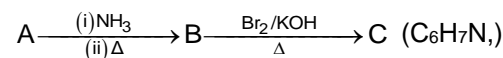
86. Answer (4)



87. Answer (4)

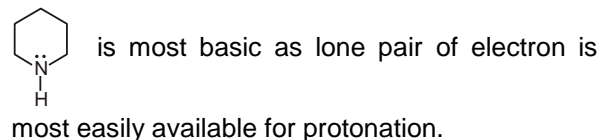


88. Answer (3)

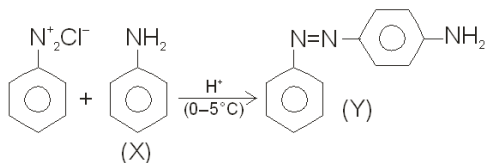


so, the compound 'C' is an amine ( $-\text{NH}_2$ ) and 'B' must be an amide ( $-\text{CONH}_2$ ). Therefore (C) is  $\text{C}_6\text{H}_5\text{NH}_2$ . Hence 'A' is  $\text{C}_6\text{H}_5\text{COOH}$  (Benzoic acid)

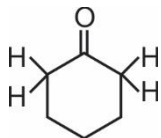
89. Answer (1)



90. Answer (3)



91. Answer (3)

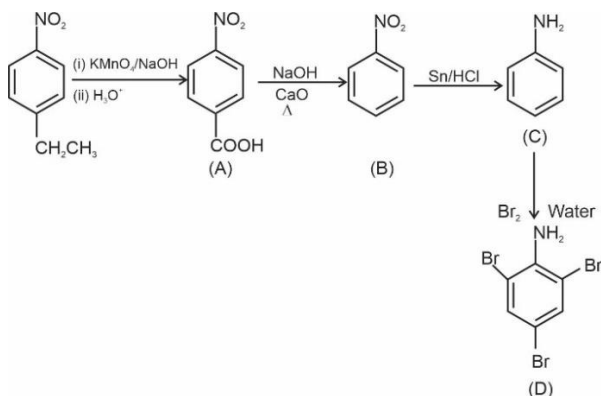


Cyclohexanone contains 4 enolisable hydrogen atoms ( $\alpha$ -H atoms)

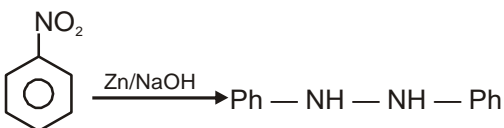
92. Answer (2)

The given reaction is called Sandmeyer reaction

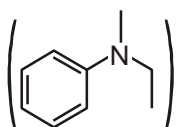
93. Answer (2)



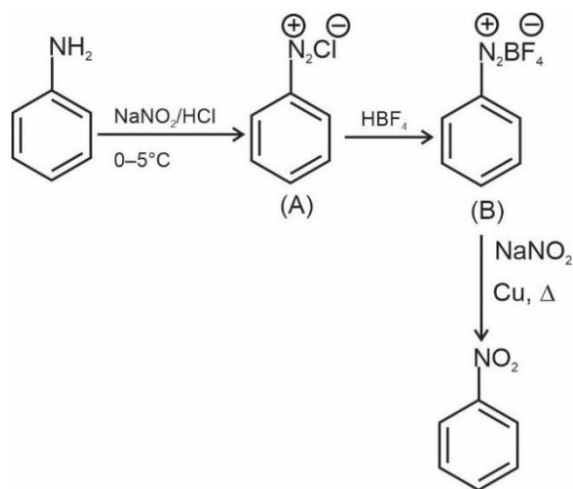
94. Answer (2)



95. Answer (4)

Tertiary amine  will not react with Hinsberg's reagent ( $\text{C}_6\text{H}_5\text{SO}_2\text{Cl}$ )

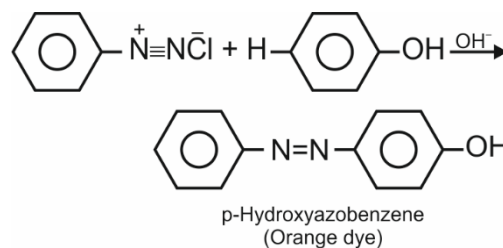
96. Answer (2)



97. Answer (4)

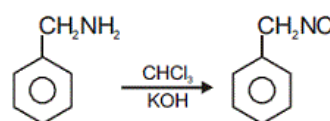
Compounds	Boiling point (K)
n-Butane	273
Methoxyethane	281
Propanal	322
Acetone	329

98. Answer (2)

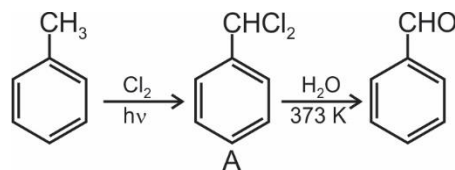


99. Answer (3)

Carbylamine reaction.



100. Answer (4)



## BOTANY

### SECTION-A

101. Answer (2)

Nitrogenous bases (Adenine, thymine, cytosine and guanine) with pentose sugar (deoxyribose sugar) form nucleoside in DNA. Hence, Thymine

+ Pentose sugar (deoxyribose sugar) form deoxythymidine as nucleoside in DNA.

102. Answer (1)

A nitrogenous base is linked to a pentose sugar through N-glycosidic linkage.

103. Answer (2)

Chargaff's rule is not applicable for single stranded DNA.

Base ratio  $\frac{A+T}{C+G}$  is specific for a species. It is  $< 1$  in prokaryotes and  $> 1$  in eukaryotes.

104. Answer (4)

Nucleosomes have histone octamer, *i.e.*, organised form of H<sub>2</sub>A, H<sub>2</sub>B, H<sub>3</sub> and H<sub>4</sub> histones. Ribosome is not a part of nucleosome.

105. Answer (2)

Thymine (5-methyl uracil) is found in DNA.

106. Answer (2)

The unequivocal proof that DNA is the genetic material came from the experiment conducted by Hershey and Chase.

107. Answer (4)

A and G are purines (bicyclic N-bases)

$$A = T = 43\%$$

$$\therefore C = G = 7\%$$

$$A + G = 50\%$$

108. Answer (1)

Guanine is a purine.

109. Answer (3)

In Griffith's experiment, mice died when injected with heat-killed S-strain combined with R-strain bacteria.

110. Answer (2)

One of the reasons that DNA is preferred over RNA as genetic material is presence of thymine (5-methyl uracil) confers additional stability to DNA.

111. Answer (1)

In reverse central dogma, DNA is synthesized over RNA template.

112. Answer (4)

In the experiment, heat-killed smooth bacteria had enabled the R-strain to synthesize a smooth polysaccharide coat and R-strain became virulent.

113. Answer (2)

Heterochromatin is darkly stained region and is transcriptionally inactive.

114. Answer (1)

Largest human gene is dystrophin with 2.4 million bases.

115. Answer (2)

Chromosome 1 has 2968 genes.

116. Answer (2)

Peptide bond formation is catalysed by enzyme peptidyl transferase (a type of ribozyme-catalytic RNA *i.e.*, 23S rRNA in bacteria and 28S rRNA in eukaryotes)

117. Answer (1)

Tailing is the addition of adenylate residues about 200-300 at 3' end in the template-independent manner on newly formed hnRNA with the help of Poly A polymerase.

118. Answer (3)

The terminator is present at 3' end (downstream) of coding strand and it usually defines the end of process of transcription. In the given transcription unit; A is template strand, B is coding strand.

119. Answer (2)

Deoxyribonucleoside triphosphates serves dual purposes. In addition to acting as substrates, they provide energy for polymerisation reaction.

120. Answer (3)

Promoter site of transcription unit is recognised by  $\sigma$  factor.

121. Answer (2)

RNA polymerase itself can start transcription.

122. Answer (1)

After deletion of 15th nucleotide, UGG becomes UGA (Nonsense codon).

Hence, from given sequence 4 amino acids can be coded.

123. Answer (3)

mRNA is synthesized from DNA and has information for protein synthesis. mRNA translates into proteins.

124. Answer (3)

UAA, UAG, UGA are stop codons.



125. Answer (4)  
Splicing occurs in nucleus in eukaryotes whereas in prokaryotes, it is usually absent as introns are absent except in Archaeobacteria.

126. Answer (4)  
Peptidyl transferase is an RNA enzyme rather being proteinaceous. In case of prokaryotes 23S rRNA acts as ribozyme whereas in eukaryotes it is 28S rRNA. It catalyses the peptide bond formation between amino acids.

127. Answer (4)  
tRNA is the smallest RNA.

128. Answer (4)  
mRNA first binds to smaller subunit of ribosome then initiator tRNA comes to P site of ribosome.

129. Answer (3)  
Lactose acts as an inducer. Regulation of *lac* operon by repressor protein is negative regulation.

130. Answer (1)  
tRNA and 5S rRNA are synthesized by RNA polymerase III.

131. Answer (2)  
Minisatellites are also known as VNTR and surrounded by conserved restriction sites.

132. Answer (2)  
The mRNA provides the template to synthesise a protein. The rRNA acts as a catalyst.

133. Answer (4)  
The science of collecting and analyzing complex biological data such as genetic codes is called bioinformatics.

134. Answer (2)  
Some amino acids are coded by more than one codon, hence the code is degenerate.

135. Answer (2)  
Rho factor ( $\rho$ ) is required for termination of transcription.

### SECTION-B

136. Answer (2)  
The technique of DNA fingerprinting was developed by Alec Jeffrey.

137. Answer (1)  
There are about 1.4 million locations where single base DNA differences occur in humans. This is known as SNPs.

138. Answer (3)  
Split genes are usually found in eukaryotes.

139. Answer (2)  
The initiator codon is AUG which codes for methionine.

140. Answer (3)  
Catalyst, ribozyme and peptidyl transferase are associated with structural RNA in eubacteria (prokaryote).

141. Answer (3)  
DNA dependent DNA polymerase catalyses polymerisation only in one direction that is  $5' \rightarrow 3'$ .

142. Answer (4)  
The length of DNA in typical mammalian cell having  $6.6 \times 10^9$  bp is about 2.2 m.

143. Answer (3)  
Hershey and Chase worked with bacteriophage.

144. Answer (2)  
About 200 bp of DNA is present in a typical nucleosome and is wrapped around it.

145. Answer (4)  
Histones are rich in basic amino acid residues lysine and arginine with charged side chain.

146. Answer (2)  
Single stranded DNA is also found in some bacteriophages.

147. Answer (1)  
tRNA is the adaptor molecule.

148. Answer (2)  
Yeast is eukaryotic and have 3 different types of RNA polymerases to catalyze the synthesis of different RNAs in the nucleus.

149. Answer (1)  
Regulator gene (*i*-gene) shows constitutive expression.

150. Answer (1)  
 $G = 14\%$   
Guanine = cytosine  $\therefore C = 14\%$   
Remaining 72% are A and T.  
So,  $A = 36\%$ ,  $T = 36\%$

## ZOOLOGY

### SECTION-A

151. Answer (2)

In the experiment, Miller took molecules similar to early earth's atmosphere and put them into a closed system. The control apparatus comprised similar arrangement except that it was devoid of an energy source.

152. Answer (1)

Hearts in various vertebrates are homologous structures which show similarity in basic plan but have a varied degree of specialization.

153. Answer (1)

Study of external features of organisms is known as morphology. Physiology is the science of body functions and how the body parts work. Biogenesis is formation of organisms from pre-existing organisms.

154. Answer (3)

Life arises from non-living matter according to theory of spontaneous generation.

155. Answer (4)

Origin of species was explained by Charles Darwin and Origin of life by A.I. Oparin. Origin of Universe is explained by the Big-Bang hypothesis.

156. Answer (4)

Theory of germplasm was given by A. Weismann.

157. Answer (1)

Wombat, Bandicoot and Spotted cuscus are Australian marsupials whereas Bobcat is a placental mammal.

158. Answer (1)

The common ancestor of finches was seed eating and other forms arose with altered beaks enabling them to develop different food habits.

159. Answer (2)

During the course of origin of life, events most likely took place in given order.

- (1) Synthesis of organic monomers.
- (2) Synthesis of organic polymers.

(3) Formation of protobionts

(4) Formation of Eobionts with DNA based genetic systems.

160. Answer (1)

A number of marsupials, each different from the other, evolved from an ancestral stock, but all within Australian island. Divergent evolution represents homology while convergent evolution represents analogy. Saltation refers to single step large mutation leading to variation.

161. Answer (1)

Ontogeny is development of embryo and phylogeny is the ancestral sequence. Biogenetic law states that ontogeny is recapitulation of phylogeny. As per this law, the sequence of embryonic development in different vertebrates shows striking similarities.

162. Answer (4)

Organs which have same origin but different function are called homologous organs. e.g., Forelimbs of human, horse and bat.

163. Answer (3)

Mesozoic era is considered as golden age of reptiles because reptiles were dominant. Jurassic period is considered as golden age of dinosaurs.

164. Answer (2)

Sweet potato is a root modification and potato is a stem modification. They are analogous structures.

165. Answer (1)

Key points of evolution *i.e.*, descent with modifications and natural selection was proposed by Darwin. Darwin stressed on reproductive fitness. Saltation was explained by De Vries and genetic drift by Sewall and Wright.

166. Answer (3)

Plants evolved prior to animals. Sauropsids were ancestors of thecodonts.

167. Answer (2)

According to Lamarck, all acquired characters of a generation are passed on to the next one.

168. Answer (3)

Increased cranial capacity led to natural selection. Erect posture appeared in *Australopithecines*.

169. Answer (4)

Cranial capacities of Cro-Magnon man, *H. erectus*, *H. habilis* and *H. neanderthalensis* are 1650, 900, 650-800 & 1400 cc respectively.

Neanderthal man buried his dead with flowers and tools.

170. Answer (2)

When gene migration occurs many times there will be gene flow. If the change in allele frequency occurs by chance, it is called genetic drift. Following two effects are ramifications of genetic drift (1) Founder's effect (2) Bottleneck effect.

171. Answer (4)

Jurassic period is considered as golden age of dinosaurs and dinosaurs extinct in cretaceous period.

172. Answer (1)

Evolution is a non-directional, stochastic process based on chance events and chance mutations. Evolution is occurring at a fast pace due to anthropogenic interference.

173. Answer (3)

Non-cellular form of life possible originated around 3 billion years ago.

174. Answer (3)

Mutations are preadaptive.

175. Answer (4)

Epiglottis is not a vestigial organ it prevents entry of food into wind pipe during swallowing.

176. Answer (1)

Seed ferns originated in carboniferous period from progymnosperms

177. Answer (1)

By 10000 years ago, there are evidences of agriculture by early man.

178. Answer (2)

Founder effect is a kind of genetic drift whereby few individuals migrate and colonise a new habitat.

179. Answer (2)

Lamarck's theory, written in a book named "Philosophie Zoologique".

180. Answer (4)

Neanderthal man was meat eater with the cranial capacity of 1400 cc.

181. Answer (3)

Non-random mating affects the Hardy-Weinberg equilibrium.

182. Answer (1)

Natural selection selects for reproductive fitness.

183. Answer (1)

The correct sequence is

*Ramapithecus* → *Australopithecines* → *Homo habilis* → *Homo erectus* → *Homo sapiens*.

184. Answer (3)

The therapsids (extinct) were the most advanced synapsids that include the ancestor of mammals.

185. Answer (2)

Seed ferns evolved from progymnosperms.

#### SECTION-B

186. Answer (3)

Java Ape Man - *Pithecanthropus erectus*

or

*Homo erectus erectus*

187. Answer (3)

Triceratops was a three-horned herbivorous dinosaur.

188. Answer (4)

*Tyrannosaurus* was giant carnivorous dinosaur.

189. Answer (2)

Earliest autotrophs were chemoautotrophs and anoxygenic photoautotrophs.

190. Answer (3)

Fossils of therapsids are closest and direct ancestors of modern day mammals. Sauropsids were ancestors of modern day reptiles. Pelycosaurs and synapsids also fall on the same lineage as therapsids.

191. Answer (4)

Ozone was not present in primitive atmosphere.

192. Answer (3)

Natural selection of one extreme character is called directional selection.

193. Answer (2)

Genetic drift occurs in small isolated populations as frequency of alleles cannot change suddenly in a large population.

194. Answer (2)

Miller observed formation of simple amino acids by using a mixture of CH<sub>4</sub>, NH<sub>3</sub>, H<sub>2</sub> and water vapour at 800°C in a large flask.

195. Answer (1)

Both statements are correct. Evolution is stochastic process based on chance events in nature and chance mutation in organisms.

196. Answer (2)

Dicots and monocots are the dominating land plants in the present era. Due to continental drift, South American fauna was overridden by North American fauna.

197. Answer (4)

Frequency of red (recessive flowers)  $[q^2] = 4\%$

$q = 0.2$

$p = 0.8$

% of dominant allele =  $0.8 \times 100 = 80\%$

198. Answer (1)

*Homo habilis* did not eat meat

199. Answer (1)

Hugo deVries gave the mutation theory. He believed that it is mutation that causes evolution.

200. Answer (4)

Numbat is an Australian marsupial.

