

HORIZON ACADEMY[®] Since 2003

Medical | IIT-JEE | Foundations

(Divisions of Horizon Study Circle Pvt. Ltd.)

Name.:

Date :

Test No.:

Time : 3 Hrs.

M.M. : 720

HORIZON TEST SERIES for Medical Entrance Exam. 2016

[Test No. 1]

INSTRUCTIONS FOR STUDENTS

1. Read each question carefully.
2. It is mandatory to use Blue/Black Ball Point Pen to darken the appropriate circle in the answer sheet.
3. Mark should be dark and should complete fill the circle.
4. Rough work must not be done on the Question Paper, no additional sheet will be provided for this purpose.
5. Do not use white-fluid or any other rubbing material on answer sheet. No change in the answer once marked.
6. Student cannot use log tables and calculators or any other material in the examination hall.
7. Before attempting the question paper, student should ensure that the test paper contains all pages and no page is missing.
8. Each correct answer carries four marks. One mark will be deducted for each incorrect answer from the total score.
9. Before handing over the answer sheet to the invigilator, candidate should check the particulars have been filled and marked correctly.
10. Immediately after the prescribed examination time is over, the answer sheet to be returned to the invigilator.
11. Use of Calculator and other Electronic device is not permitted.

Test No. 1

Topics of The Test

Physics

Electrostatics I (Electric Charge and Coulomb's Law, Electric Field).

Chemistry

Chemical Bonding

Biology

Botany : Cell Division (Mitosis and Meiosis)

Zoology : Morphology of Cockroach Complete.

Test No. 1

[PHYSICS]

1. The unit of physical quantity obtained by the line integral of electric field is
 (A) NC^{-1} (B) Vm^{-1}
 (C) JC^{-1} (D) $C^2N^{-1}m^{-2}$
2. Charge q_2 of mass m revolves around a stationary charge q_1 in a circular orbit of radius r . The orbital periodic time of q_2 would be
 (A) $\left[\frac{4\pi^2mr^3}{kq_1q_2}\right]^{1/2}$ (B) $\left[\frac{kq_1q_2}{4\pi^2mr^3}\right]^{1/2}$
 (C) $\left[\frac{4\pi^2mr^4}{kq_1q_2}\right]^{1/2}$ (D) $\left[\frac{4\pi^2mr^2}{kq_1q_2}\right]^{1/2}$
3. The work done in carrying a charge q once round a circle of radius a with a charge Q at its centre is
 (A) $\frac{qQ}{4\pi\epsilon_0a}$ (B) $\frac{qQ}{4\pi\epsilon_0a^2}$
 (C) $\frac{q}{4\pi\epsilon_0a}$ (D) Zero
4. A charge Q is placed at the origin. The electric potential due to this charge at a given point in space is v . The work done by an external force in bringing another charge q from infinity up to the point is
 (A) $\frac{V}{q}$ (B) Vq
 (C) $V+q$ (D) v
5. Domestic electrical wiring has three wires
 (A) positive, negative and neutral
 (B) positive, negative and earth
 (C) live, neutral and earth
 (D) positive, negative and live
6. Which of the following is not true ?
 (A) For a point charge, the electrostatic potential varies as $1/r$.
 (B) For a dipole, the potential depends on the position vector and dipole moment vector.
 (C) The electric dipole potential varies as $1/r$ at large distance.
 (D) For a point charge, the electrostatic field varies as $1/r^2$.
7. The mobility of charge carriers increases with
 (A) increase in the average collision time
 (B) increase in the electric field
 (C) increase in the mass of the charge carriers
 (D) decrease in the charge of the mobile carriers
8. A charge q is placed at the centre of the line joining two equal charges Q . The system of the three charges will be in equilibrium if q is equal to
 (A) $-\frac{Q}{2}$ (B) $-\frac{Q}{4}$
 (C) $+\frac{Q}{4}$ (D) $+\frac{Q}{2}$

Space for Rough Work

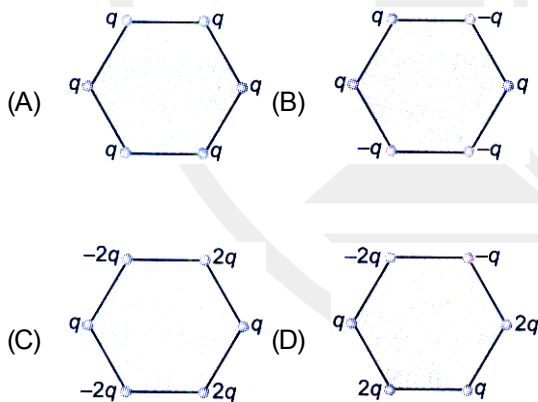
9. Two copper balls, each weighing 10 g, are kept in air 10 cm apart. If one electron from every 10^6 atoms is transferred from one ball to the other, the coulomb force between them is (atomic weight of copper is 63.5)
- (A) 2.0×10^{10} N (B) 2.0×10^4 N
(C) 2.0×10^8 N (D) 2.0×10^6 N
10. If 10^{10} electrons are acquired by a body every second, the time required for the body to get a total charge of C will be
- (A) 2h (B) 2 days
(C) 2 yr (D) 20 yr
11. A ball with charge $-50e$ is placed at the centre of a hollow spherical shell has a net charge of $-50e$. What is the charge on the shell's outer surface ?
- (A) $-50e$ (B) Zero
(C) $-100e$ (D) $+100e$
12. A charged particle of mass 0.003 g is held stationary in space by placing it in a downward direction of electric field of 6×10^4 N/C. Then the magnitude of charge is
- (A) 5×10^{-4} C (B) 5×10^{-10} C
(C) 5×10^{-6} C (D) 5×10^{-9} C
13. Mark the correct option.
- (A) In electrostatics, there is no motion of charge at all in conductor;s bulk
(B) In electrostatics, there is a motion of charged particle in conductor's bulk
(C) In electrostatics and current electricity there is a net motion of charged particles in the bulk of the material of the conductor
(D) In electrostatics and current electricity there is no net motion of charged particles in the bulk of the material of the conductor
14. The charge given to any conductor resides on its outer surface, because
- (A) the free charge tends to be in its minimum potential energy state
(B) the free charge tends to be in its minimum kinetic energy state
(C) the free charge tends to be in its maximum potential energy state
(D) the free charge tends to be in its maximum kinetic energy state
15. A comb run through one's dry hair attracts small bits of paper. This is due to
- (A) comb is a good conductor
(B) paper is a good conductor
(C) the atoms in the paper get polarised by the charged comb
(D) the comb possesses magnetic properties
16. Each of the two point charges are doubled and their distance is halved. Force of interaction becomes n times, where n is
- (A) 4 (B) 1
(C) 1/16 (D) 16
17. Three charges $1\mu\text{C}$, $1\mu\text{C}$ and $2\mu\text{C}$ are kept at the vertices A, B and C of an equilateral triangle ABC of 10 cm side, respectively. The resultant force on the charge at C is
- (A) 0.9 N (B) $\sqrt{3} \times 1.8$ N
(C) 2.72 N (D) 3.6 N
18. If charge and distance between two charges are reduced to half. Force between them
- (A) remains same (B) increases four times
(C) reduce four times (D) None of the above
19. Two point charges $+2\text{C}$ and $+6\text{C}$ repel each other with a force of 12 N. If a charge of -2C is given to each of these charges the force will now be
- (A) zero (B) 8 N (attractive)
(C) 8 N (repulsive) (D) None of these
20. An electron is moving round the nucleus of a hydrogen atom in a circular orbit of radius r. The Coulomb force **F** between the two is
- (A) $k \frac{e^2}{r^3} \mathbf{r}$ (B) $-k \frac{e^2}{r^3} \mathbf{r}$
(C) $k \frac{e^2}{r} \mathbf{r}$ (D) $-k \frac{e^2}{r} \mathbf{r}$
- (where $k = \frac{1}{4\pi\epsilon_0}$)

Space for Rough Work

21. Two identical charges repel each other with a force equal to 10 mg wt when they are 0.6 m apart in air ($g=10 \text{ ms}^{-2}$). The value of each charge is
 (A) 2 mC (B) $2 \times 10^{-7} \text{ C}$
 (C) 2 nC (D) $2 \mu \text{ C}$
22. The voltage of clouds is $4 \times 10^6 \text{ V}$ with respect to ground. In a lightning strike lasting 100 ms, a charge of 4 C is delivered to the ground. The power of lightning strike is
 (A) 160 MW (B) 80 MW
 (C) 20 MW (D) 500 kW
23. The top of the atmosphere is about 400 kV with respect to the surface of the earth, corresponding to an electric field that decreases with altitude. Near the surface of the earth, the field is about 100 Vm^{-1} . Still, we do not get an electric shock as we step out of our house into the open house because (assume the house to be a steel cage so that there is no field inside)
 (A) there is a potential difference between our body and the ground
 (B) 100 Vm^{-1} is not a high electric field so that we do not feel the shock
 (C) our body and the ground forms an equipotential surface
 (D) the dry atmosphere is not a conductor
24. Charges $4Q, q$ and Q are placed along x-axis at position $x=0, x=l/2$ and $x=l$, respectively. Find the value of q , so that force on charge Q is zero.
 (A) Q (B) $\frac{Q}{2}$
 (C) $-\frac{Q}{2}$ (D) $-Q$
25. Four metal conductors having different shapes
 1. a sphere 2. cylinder
 3. pear 4. lightning conductor
 are mounted on insulating stands and charged. The one which is best suited to retain the charges for a longer time is
 (A) 1 (B) 2
 (C) 3 (D) 4
26. A charged particle is free to move in an electric field. It will travel
 (A) always along a line of force
 (B) along a line of force, if its initial velocity is zero
 (C) along a line of force, if it has same initial velocity in the direction of an electric field with the line of force
 (D) None of the above
27. An electron of mass m and charge q is accelerated from rest in a uniform electric field of strength E . The velocity acquired by it as it travels a distance l is
 (A) $\sqrt{\frac{2Eq l}{m}}$ (B) $\sqrt{\frac{2Eq}{ml}}$
 (C) $\sqrt{\frac{2Em}{ql}}$ (D) $\sqrt{\frac{Eq}{ml}}$
28. Two parallel infinite line charges $+\lambda$ and $-\lambda$ are placed with a separation distance R in free space. The net electric field exactly mid-way between the two line charges is
 (A) zero (B) $\frac{2\lambda}{\pi\epsilon_0 R}$
 (C) $\frac{\lambda}{\pi\epsilon_0 R}$ (D) $\frac{1}{2\pi\epsilon_0 R}$
29. The electric intensity outside a charged sphere of radius R at a distance r ($r > R$) is
 (A) $\frac{\sigma R^2}{\epsilon_0 r^2}$ (B) $\frac{\sigma r^2}{\epsilon_0 R^2}$
 (C) $\frac{\sigma r}{\epsilon_0 R}$ (D) $\frac{\sigma R}{\epsilon_0 r}$
30. A charged oil drop is suspended in uniform field of $3 \times 10^4 \text{ V/m}$ so that it neither falls nor rises. The charge on the drop will be (Take the mass of the charge $=9.9 \times 10^{-15} \text{ kg}$ and $g = 10 \text{ m/s}^2$)
 (A) $3.3 \times 10^{-18} \text{ C}$ (B) $3.2 \times 10^{-18} \text{ C}$
 (C) $1.6 \times 10^{-18} \text{ C}$ (D) $4.8 \times 10^{-18} \text{ C}$

Space for Rough Work

31. One of the following is not a property of field lines
 (A) field lines are continuous curves without any breaks
 (B) two field lines cannot cross each other
 (C) field lines start at positive charges and end at negative charges
 (D) they form closed loops
32. The electric potential at a point in free space due to a charges Q coulomb is $Q \times 10^{11} \text{V}$. The electric field at that point is
 (A) $4\pi\epsilon_0 Q \times 10^{22} \text{Vm}^{-1}$ (B) $12\pi\epsilon_0 Q \times 10^{20} \text{Vm}^{-1}$
 (C) $4\pi\epsilon_0 Q \times 10^{20} \text{Vm}^{-1}$ (D) $12\pi\epsilon_0 Q \times 10^{22} \text{Vm}^{-1}$
33. A charge Q is uniformly distributed over a large square plate of copper. The electric field at a point very close to the centre of the plate is 10Vm^{-1} . If the copper plate is replaced by a plastic plate of the same geometrical dimensions and carrying the same charge Q uniformly distributed, then the electric field at the point P will be
 (A) 5Vm^{-1} (B) zero
 (C) 10Vm^{-1} (D) 20Vm^{-1}
34. Figure below show regular hexagons, with charges at the vertices. In which case is the electric field at the centre zero ?



35. How does, the electric field (E) between the plates of a charged cylindrical capacitor vary with the distance r from the axis of the cylinder ?
 (A) $E \propto \frac{1}{r^2}$ (B) $E \propto \frac{1}{r}$
 (C) $E \propto r^2$ (D) $E \propto r$
36. Two parallel plates have equal and opposite charge. When the space between them is evacuated, the electric field between the plates is $2 \times 10^5 \text{Vm}^{-1}$. When the space is filled with dielectric the electric field becomes $1 \times 10^5 \text{Vm}^{-1}$. The dielectric constant of dielectric material is
 (A) 1/2 (B) 1
 (C) 2 (D) 3
37. The potential of the electric field produced by point charge at any point (x,y,z) is given by $V = 3x^2 + 5$, where x, y are in metre and V is in volt. The intensity of the electric field at $(-2, 1, 0)$ is
 (A) $+17 \text{Vm}^{-1}$ (B) -17Vm^{-1}
 (C) $+12 \text{Vm}^{-1}$ (D) -12Vm^{-1}
38. Two spheres of radii R_1 and R_2 respectively are charged and joined by a wire. The ratio of electric fields of spheres is
 (A) $\frac{R_2^2}{R_1^2}$ (B) $\frac{R_1^2}{R_2^2}$
 (C) $\frac{R_2}{R_1}$ (D) $\frac{R_1}{R_2}$
39. A solid metallic sphere has a charge $+3Q$. Concentric with this sphere is a conducting spherical shell having charge $-Q$. The radius of the sphere is a and that of the spherical shell is $b(b > a)$. What is the electric field at a distance $R(a < R < b)$ from the centre ?
 (A) $\frac{4Q}{2\pi\epsilon_0 R^2}$ (B) $\frac{3Q}{4\pi\epsilon_0 R^2}$
 (C) $\frac{3Q}{2\pi\epsilon_0 R^2}$ (D) $\frac{Q}{2\pi\epsilon_0 R}$

Space for Rough Work

40. Two unlike charges of the same magnitude Q are placed at a distance d . The intensity of the electric field at the middle point in the line joining the two charges

(A) zero (B) $\frac{8Q}{4\pi\epsilon_0 d^2}$

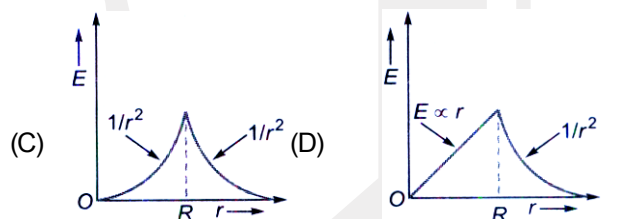
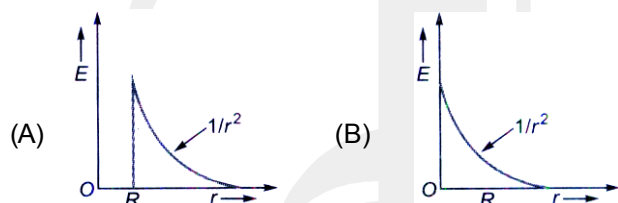
(C) $\frac{6Q}{4\pi\epsilon_0 d^2}$ (D) $\frac{4Q}{4\pi\epsilon_0 d^2}$

41. A cube has point charges of magnitude $-q$ at all its vertices. Electric field at the centre of the cube is

(A) $\frac{1}{4\pi\epsilon_0} \frac{6q}{3a^2}$ (B) $\frac{1}{4\pi\epsilon_0} \frac{8q}{a^2}$

(C) zero (D) $\frac{1}{4\pi\epsilon_0} \frac{-8q}{a^2}$

42. Which of the following plots represents the variation of the electric field with distance from the centre of a uniformly charged non-conducting sphere of radius R ?



43. Force exerted by a uniform electric field on an electron having mass m_e and proton of mass m_p are represented as F_e and F_p respectively are related as

(A) $F_p = F_e$ (B) $\frac{F_e}{F_p} = \frac{m_e}{m_p}$

(C) $\frac{F_e}{F_p} = \frac{m_p}{m_e}$ (D) $\frac{F_e}{F_p} = \frac{m_e^2}{m_p^2}$

44. Which of the following is not the property of equipotential surfaces ?

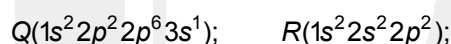
- (A) They do not cross each other
- (B) They are concentric spheres for uniform electric field
- (C) Rate of change of potential with distance on them is zero
- (D) They can be imaginary spheres

45. Two infinitely long parallel conducting plates having surface charge densities $+\sigma$ and $-\sigma$ respectively, are separated by a small distance. The medium between the plates is vacuum, If ϵ_0 is the dielectric permittivity of vacuum, then the electric field in the region between the plates is

- (A) 0 volt m^{-1} (B) $\sigma / 2\epsilon_0 \text{ volt m}^{-1}$
- (C) $\sigma / \epsilon_0 \text{ volt m}^{-1}$ (D) $z\sigma / \epsilon_0 \text{ volt m}^{-1}$

[CHEMISTRY]

46. The electronic configuration of four atoms are given in brackets :



The element that would most readily form a diatomic molecule is

- (A) Q (B) M
- (C) R (D) L

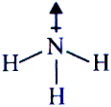
47. Which of the following shows the Lewis dot formula for CO_2 ?

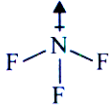
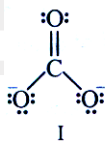
- (A) $:\ddot{O}::C::\ddot{O}:$ (B) $:\ddot{O}::\ddot{C}::\ddot{O}:$
- (C) $:\ddot{O}::C::\ddot{O}:$ (D) $:\ddot{O}::C::\ddot{O}:$

Space for Rough Work

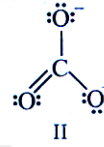
48. How many and what types of bonds are present in NH_4^+ ?
- (A) Four covalent bonds
 (B) Three covalent bonds and one ionic bond
 (C) Four ionic bonds
 (D) Three covalent bonds and one coordinate bond
49. What are the exceptions of the octet rule ?
- (A) The incomplete octet of central atom
 (B) An odd number of electrons on central atom
 (C) expanded octet of the central atom
 (D) All of these
50. In which of the following molecules octet rule is not followed ?
- (A) NH_3 (B) CH_4
 (C) CO_2 (D) NO
51. A pair of electrons present between two identical non-metals
- (A) is shifted to one of the atoms
 (B) is shared equally between them
 (C) undergoes addition reactions
 (D) have same spin
52. Two elements P and Q combine to form a compound. If P has 2 and Q has 6 electrons in their outermost shell, what will be formula of the compound formed ?
- (A) PQ (B) P_2Q
 (C) P_2Q_3 (D) PQ_2
53. Which of the following molecules contains covalent and coordinate bonds ?
- (A) CCl_4 (B) H_2SO_4
 (C) $NaCl$ (D) $Mg(OH)_2$
54. How many number of electrons are involved in the formation of a nitrogen molecule ?
- (A) Three (B) Four
 (C) Eight (D) Six
55. In a covalent bond formation,
- (A) transfer of electrons takes place
 (B) equal sharing of electrons between two atoms takes place
 (C) electrons are shared by one atom only
 (D) electrons are donated by one atom and shared by both atoms.
56. During a coordinate bond formation,
- (A) one electron from an atom is transferred to other
 (B) one electron each is lost from both the atoms
 (C) a pair of electrons is contributed by one atom and shared by both the atoms
 (D) a pair of electrons is transferred to the other atom.
57. What is the formal charge on carbon atom in the following two structures :
- $:\ddot{S}=C=\ddot{S}:$ $\left[\begin{array}{c} :\ddot{O}: \\ || \\ :\ddot{C}: \\ / \quad \backslash \\ :\ddot{O}: \quad :\ddot{O}: \end{array} \right]^{2-}$
- (A) 0, -2 (B) 0, 0
 (C) +2, -2 (D) +1, -1
58. Sodium chloride has a crystalline structure made up of Na^+ and Cl^- ions. Why does NaCl not conduct electricity in solid state ?
- (A) Solids do not conduct electricity.
 (B) The ions of NaCl become mobile only in molten state and are not free to move in solid state.
 (C) The crystalline structure does not have ions.
 (D) When a bond is formed between ions they lose their charge.
59. Two elements X and Y combine to form a compound XY. Under what conditions the bond formed between them will be ionic ?
- (A) If the difference in electronegativities of X and Y is 1.7.
 (B) If the difference in electronegativities of X and Y is more than 1.7.
 (C) If the difference in electronegativities of X and Y is less than 1.7.
 (D) If both X and Y are highly electronegative.

Space for Rough Work

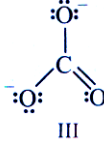
60. In which of the following species the bond is non-directional ?
 (A) NCl_3 (B) $RbCl$
 (C) $BeCl_2$ (D) BCl_3
61. Arrange the following in order of increasing dipole moment : H_2O, H_2S, BF_3 .
 (A) $BF_3 < H_2S < H_2O$ (B) $H_2S < BF_3 < H_2O$
 (C) $H_2O < H_2S < BF_3$ (D) $BF_3 < H_2O < H_2S$
62. Which of the following is non-polar ?
 (A) SO_2 (B) CO_2
 (C) H_2O (D) NH_3
63. The correct order of decreasing bond lengths of CO , CO_2 and CO_3^{2-} is
 (A) $CO > CO_2 > CO_3^{2-}$ (B) $CO_3^{2-} > CO_2 > CO$
 (C) $CO_2 > CO > CO_3^{2-}$ (D) $CO_2 > CO_3^{2-} > CO$
64. Which of the following molecules does not show any resonating structures ?
 (A) NH_3 (B) CO_3^{2-}
 (C) O_3 (D) SO_3
65. Although F is more electronegative than H, the resultant dipole moment of NH_3 is much more than that of NF_3 . It can be explained as
- 


- (A) the lone pair of nitrogen opposes the dipole moment of NF_3 while it is added to the dipole moment of NH_3
 (B) all the dipoles of NF_3 are in same direction
 (C) all the dipoles of NH_3 are in opposite direction
 (D) NH_3 has a regular geometry while NF_3 has irregular geometry which makes dipole moment of NH_3 more than NF_3 .
66. Which of the following elements forms predominantly covalent compounds as compared to other elements which form ionic compounds ?
 (A) Be (B) Mg
 (C) Ca (D) Sr
67. In a diatomic molecule the bond distance is 1×10^{-8} cm. Its dipole moment is 1.2 D. What is the fractional electronic charge on each atom ?
 (A) 0.50 (B) 1.2×10^{-10}
 (C) 0.25 (D) 1.2
68. The correct sequence of bond length in single bond, double bond and triple bond of C is
 (A) $(C - C) = (C = C) = (C \equiv C)$
 (B) $C \equiv C < C = C < C - C$
 (C) $C - C < C = C < C \equiv C$
 (D) $C = C < C \equiv C < C - C$
69. Which of the following are arranged in the decreasing order of dipole moment ?
 (A) CH_3Cl, CH_3Br, CH_3F
 (B) CH_3Cl, CH_3F, CH_3Br
 (C) CH_3Br, CH_3Cl, CH_3F
 (D) CH_3Br, CH_3F, CH_3Cl
70. What is the correct dipole moment of NH_3 and NF_3 respectively ?
 (A) 4.90×10^{-30} C m and 0.80×10^{-30} C m
 (B) 0.80×10^{-30} C m and 4.90×10^{-30} C m
 (C) 4.90×10^{-30} C m and 4.90×10^{-30} C m
 (D) 0.80×10^{-30} C m and 0.80×10^{-30} C m
71. The given structures I, II and III of carbonate ion represent
- 

I



II



III
- (A) hybrid structures
 (B) isomeric structures
 (C) canonical structures
 (D) dipole structures


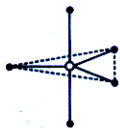

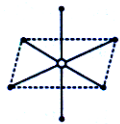
Space for Rough Work

72. Match the bond enthalpies given in column II with the molecules given in column I and mark the appropriate choice.

Column I		Column II	
(A)	Hydrogen (H_2)	(i)	$498.0 \text{ kJ mol}^{-1}$
(B)	Oxygen (O_2)	(ii)	$946.0 \text{ kJ mol}^{-1}$
(C)	Nitrogen (N_2)	(iii)	$435.8 \text{ kJ mol}^{-1}$

- (A) (A) \rightarrow (i), (B) \rightarrow (ii), (C) \rightarrow (iii)
 (B) (A) \rightarrow (iii), (B) \rightarrow (ii), (C) \rightarrow (i)
 (C) (A) \rightarrow (i), (B) \rightarrow (iii), (C) \rightarrow (ii)
 (D) (A) \rightarrow (iii), (B) \rightarrow (i), (C) \rightarrow (ii)
73. The canonical or resonating structures of a molecule is required to describe the structure of a molecule follow which of the rules following ?
 (A) The relative position of all atoms can differ.
 (B) The same number of unpaired and paired electrons in all structures.
 (C) The energy of each structure is different.
 (D) Like charges are present on adjacent atoms.
74. In water molecule, the two $O-H$ bonds are oriented at an angle of 104.5° . In BF_3 , the three $B-F$ bonds are oriented at an angle of 120° . In BeF_2 , the two $Be-F$ bonds are oriented at an angle of 180° . Which of the following will have highest dipole moment ?
 (A) BeF_2
 (B) BF_3
 (C) H_2O
 (D) All have zero dipole moment.
75. Arrange the following in increasing order of covalent character - $NaCl, MgCl_2, AlCl_3$
 (A) $NaCl < MgCl_2 < AlCl_3$
 (B) $MgCl_2 < NaCl < AlCl_3$
 (C) $AlCl_3 < MgCl_2 < NaCl$
 (D) $NaCl < AlCl_3 < MgCl_2$

76. Which of the following will be the strongest bond ?
 (A) $F-O$ (B) $O-Cl$
 (C) $N-H$ (D) $O-H$
77. Few examples of the compounds formed by chemical bonding are given below. Mark the incorrect example.
 (A) A molecule with central atom devoid of octet - BF_3
 (B) A molecule with linear shape - CO_2
 (C) A non-polar covalent compound between two different atoms - CH_4
 (D) A molecule which is V-shaped with a bond angle 104.5° - NH_3
78. Match the molecules given in column I with their shapes given in column II and mark the appropriate choice.

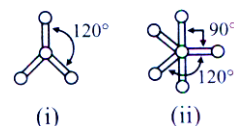
Column I (Molecule)		Column II (Shape)	
(A)	SF_6	(i)	
(B)	$SiCl_4$	(ii)	
(C)	AsF_5	(iii)	
(D)	BCl_3	(iv)	

- (A) (A) \rightarrow (iv), (B) \rightarrow (ii), (C) \rightarrow (iii), (D) \rightarrow (i)
 (B) (A) \rightarrow (iv), (B) \rightarrow (i), (C) \rightarrow (ii), (D) \rightarrow (iii)
 (C) (A) \rightarrow (iii), (B) \rightarrow (i), (C) \rightarrow (ii), (D) \rightarrow (iv)
 (D) (A) \rightarrow (ii), (B) \rightarrow (iii), (C) \rightarrow (i), (D) \rightarrow (iv)

Space for Rough Work

79. In which of the following molecules the central atom does not retain any lone pair of electrons ?
- (A) NO_2 (B) NH_3
 (C) BF_3 (D) H_2O
80. What is common between the following molecules:
 $\text{SO}_3, \text{CO}_3^{2-}, \text{NO}_3^-$?
- (A) All have linear shape.
 (B) All have trigonal planar shape.
 (C) All have tetrahedral shape.
 (D) All have trigonal pyramidal shape.
81. In a bonded molecule, the order of repulsion between the bonded and non-bonded electrons is
- (A) lone pair - lone pair > bond pair - bond pair > lone pair - bond pair
 (B) bond pair - bond pair > lone pair - lone pair > lone pair - bond pair
 (C) lone pair - lone pair > lone pair - bond pair > bond pair - bond pair
 (D) bond pair - bond pair > lone pair - bond pair > lone pair - lone pair
82. Oxygen molecule is formed by
- (A) one axial s-s overlap and one p-p axial overlap
 (B) two p-p axial overlaps
 (C) two p-p sidewise overlaps
 (D) one p-p axial and one p-p sidewise overlap
83. Which of the following statements is correct regarding the structure of PCl_5 ?
- (A) three $\text{P}-\text{Cl}$ bonds lie in one plane and two $\text{P}-\text{Cl}$ bonds lie above and below the equatorial plane.
 (B) Five $\text{P}-\text{Cl}$ bonds lie in the same plane.
 (C) The bond angle in all $\text{P}-\text{Cl}$ bonds is 90°
 (D) The bond length of all $\text{P}-\text{Cl}$ bonds is same

84. Which molecule is depicted by the given ball and stick models ?



- (A) (i) BeCl_2 , (ii) CH_4 (B) (i) BF_3 , (ii) PCl_5
 (C) (i) BF_4 , (ii) CH_4 (D) (i) BeCl_2 , (ii) PCl_5
85. Given below is the table showing shapes of some molecules having lone pairs of electrons. Fill up the blanks left in it.

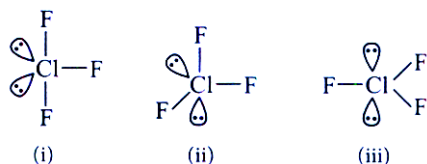
Molecule type	bp	lp	Shape	Example
AB_2E_2	2	<u>P</u>	Bent	H_2O
AB_3E_2	3	2	<u>Q</u>	ClF_3
AB_5E	5	<u>R</u>	<u>S</u>	BrF_5
AB_4E_2	4	2	<u>T</u>	<u>U</u>

	P	Q	R	S	T	U
(A)	2	Square pyramidal	2	T-shaped	Square planar	H_2O_2
(B)	4	T-shaped	5	Square planar	Square pyramidal	SO_3
(C)	2	T-shaped	1	Square pyramidal	Square planar	XeF_4
(D)	3	Square planar	2	T-shaped	Square pyramidal	BrCl_3

86. The shape of water molecule which should be tetrahedral has a bent or distorted tetrahedral shape with a bond angle 104.5° . What could be the reason for this ?
- (A) $lp-lp$ repulsion is more than $lp-bp$ repulsion.
 (B) $lp-bp$ repulsion is more than $lp-lp$ repulsion.
 (C) $lp-lp$ repulsion is equal to $lp-bp$ repulsion.
 (D) Presence of lone pair does not affect the bond angle.

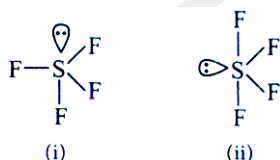
Space for Rough Work

87. The most stable shape of ClF_3 is shown by



- (A) (i) only (B) (i) and (iii)
 (C) (ii) only (D) (iii) only

88. Which of the following shapes of SF_4 is more stable and why ?



- (A) (i), due to 3 lp-bp repulsions at 90° .
 (B) (ii), due to 2 lp-bp repulsions.
 (C) Both are equally stable due to 2 lp-bp repulsions.
 (D) Both are unstable since SF_4 has tetrahedral shape.

89. According to VSEPR theory.

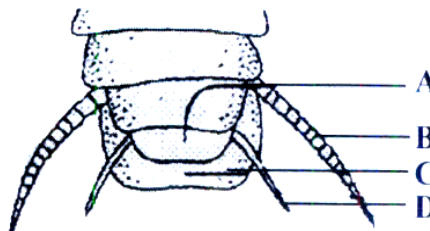
- (A) the shape of the molecule depends upon the bonded electron pairs
 (B) pair of electrons attract each other in valence shells
 (C) the pairs of electrons tend to occupy such positions that minimise repulsions
 (D) the pairs of electrons tend to occupy such positions that minimise distances from each other.

90. Which of the following does not show octahedral geometry ?

- (A) SF_6 (B) IF_5
 (C) SiF_6^{2-} (D) SF_4

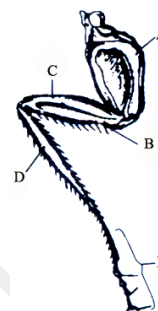
[ZOOLOGY]

91. The given figure represents posterior region of male cockroach. Identify the parts labelled as A, B, C and D.



- | A | B | C | D |
|-----------------------------|-------------|--------------------------|-------------------------|
| (A) 9 th sternum | anal style | 10 th tergum | Anal Circus |
| (B) anal style | Anal circus | 10 th tergum | 9 th sternum |
| (C) 9 th sternum | Anal circus | 10 th tergum | Anal style |
| (D) 9 th tergum | anal circus | 10 th sternum | Anal style |

92. In the given diagram of a leg of cockroach parts have been indicated by alphabets. Select the answer in which these alphabets have been correctly matched with the parts which they indicate.

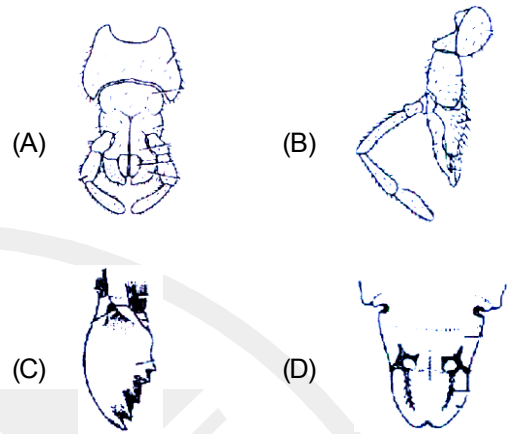


- | A | B | C | D | E |
|----------|------------|------------|--------|------------|
| (A) Coxa | Tibia | Tarsus | Femur | Trochanter |
| (B) Coxa | Femur | Trochanter | Tarsus | Tibia |
| (C) Coxa | Tarsus | Femur | Tibia | Trochanter |
| (D) Coxa | Trochanter | Femur | Tibia | Tarsus |

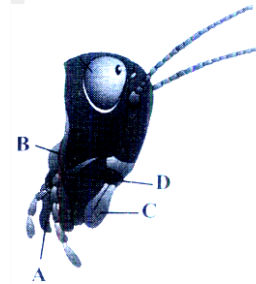
Space for Rough Work

93. Which of the following statements is correct regarding cockroach ?
 (A) It possesses ventral nerve cord.
 (B) Its spiracles help in excretion.
 (C) Phallomere is present in female cockroach.
 (D) Compound eye is also called as ocellus.
94. Which of the following is correct for the common cockroach ?
 (A) Malpighian tubules are excretory organs projecting out from the colon.
 (B) Oxygen is transported by haemoglobin in blood.
 (C) Nitrogenous excretory product is urea.
 (D) The food is grinded by mandibles and gizzard.
95. About how many times does the nymph of the *Periplaneta americana* undergo moulting before becoming an adult ?
 (A) 4 (B) 2
 (C) 17 (D) 13
96. Select the correct statement from the ones given below with respect to *Periplaneta americana*.
 (A) Nervous system located dorsally, consists of segmentally arranged ganglia joined by a pair of longitudinal connectives.
 (B) Males bear a pair of short thread like anal styles.
 (C) there are 16 very long Malpighian tubules present at the junctions of midgut and hindgut.
 (D) Grinding of food is carried out only by the mouth parts.
97. Male cockroach differs from female cockroach in having
 (A) antennae (B) labrum
 (C) maxillae (D) anal styles

98. Which of the following figures shows the mandibles of cockroach ?



99. The given figure represents head region of cockroach. In which one of the options all the four parts A, B, C and D are labelled correctly ?

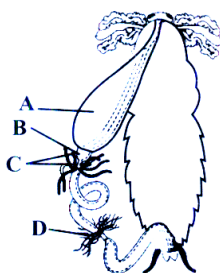


- | | A | B | C | D |
|-----|----------|----------|----------|----------|
| (A) | Labrum | Mandible | Maxilla | Labium |
| (B) | Mandible | Maxilla | Labium | Labrum |
| (C) | Maxilla | Labium | Mandible | Labrum |
| (D) | Labium | Maxilla | Labrum | Mandible |

100. In cockroach, the ootheca is formed by the secretion of
 (A) phallic gland (B) collateral gland
 (C) mushroom gland (D) conglobate gland

Space for Rough Work

101. The given figure shows alimentary canal of cockroach. Identify the parts labelled as A to D and select the correct option.



- | | A | B | C | D |
|-----|---------|---------|--------------------|--------------------|
| (A) | Gizzard | Crop | Hepatic caecae | Malpighian tubules |
| (B) | Crop | Gizzard | Hepatic caecae | Malpighian tubules |
| (C) | Crop | Gizzard | Malpighian tubules | Hepatic caecae |
| (D) | Gizzard | Crop | Malpighian tubules | Hepatic caecae |

102. Read the given paragraph.
 "It is lined by glandular and ciliated cells. It absorbs nitrogenous waste products from haemocoel and convert them into uric acid which is excreted out through the hindgut."
 Which of the following structures of cockroach is referred here?

- (A) Trachea (B) Hepatic caecum
 (C) Tergum (D) Malpighian tubule
103. In the mouth parts of a cockroach, the labium forms (i) while (ii) acts as a tongue.
- (A) (i) - upper lip; (ii) - maxilla
 (B) (i) - upper lip; (ii) - hypopharynx
 (C) (i) - lower lip; (ii) - maxilla
 (D) (i) - lower lip; (ii) - hypopharynx

104. Consider the following four statements (i) - (iv) and select the correct option stating which ones are true(T) and which ones are false(F).
- (i) In male cockroach genital pouch or chamber lies at the hind end of abdomen bounded dorsally by 9th and 10th terga and ventrally by the 9th sternum.
 (ii) In cockroach the haemolymph is composed of colourless plasma and haemocytes.

- (iii) In female cockroach each ovary is formed of a group of ten ovarian tubules or ovarioles, containing a chain of developing ova.
 (iv) In cockroach the nymph grows by moulting about 6-13 times to reach the adult form.

- | | (i) | (ii) | (iii) | (iv) |
|-----|-----|------|-------|------|
| (A) | F | T | F | T |
| (B) | F | F | T | T |
| (C) | T | T | F | T |
| (D) | T | F | T | F |

105. Read the following statement having two blanks A and B.

In cockroach, a ring of 6 - 8 blind tubules called (A) is present at the junction of foregut and midgut while at the junction of midgut and hindgut is present a ring of 100 - 150 yellow coloured thin filamentous (B).

The one correct option that fills the two blanks is

- | | A | B |
|-----|--------------------|--------------------|
| (A) | Malpighian tubules | hepatic caecae |
| (B) | fat bodies | vasa efferentia |
| (C) | hepatic caecae | Malpighian tubules |
| (D) | vas deferens | fat bodies |

106. Read the following statements about cockroach.

- (i) In male cockroach, a characteristic mushroom shaped gland is present in the 6th-7th abdominal segments which junctions as an accessory reproductive gland.
 (ii) Cockroach is uricotelic.
 (iii) The fat body and uricose glands are glandular in function.
 (iv) Blood from sinuses enter heart through ostia and is pumped anteriorly to sinuses again.

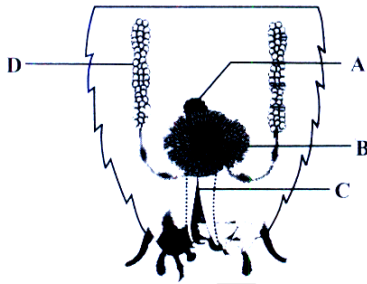
Which of the above statements are correct ?

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

Space for Rough Work

107. Study the given figure of reproductive system of male cockroach.

In which of the labelled parts are the sperms stored ?

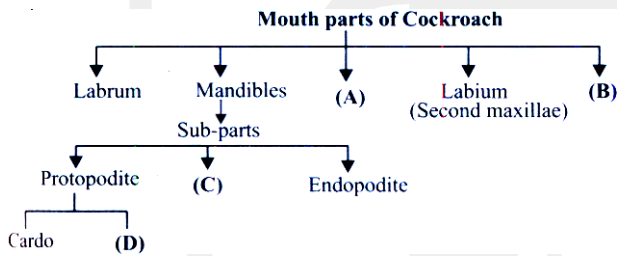


- (A) A
- (B) B
- (C) C
- (D) D

108. *Blatta orientalis* can be distinguished from *periplaneta americana*. The female of *Blatta* is.

- (A) with smaller wings
- (B) with large wings
- (C) with large eyes
- (D) with vestigial wings

109. Complete the following flowchart by selecting the correct option.



A B C D

- (A) Stipes Hypopharynx Exopodite First maxillae
- (B) Stipes Exopodite Hypopharynx First maxillae
- (C) First maxillae Hypopharynx Exopodite Stipes
- (D) First maxillae Exopodite Hypopharynx Stipes

110. The development of *Periplaneta americana* is
 (A) holometabolous (B) paurometabolous
 (C) ametabolous (D) hemimetabolous

111. Choose the incorrect pair from the matches given below.

- (A) Antennae - Sensory receptors
- (B) Metathoracic wings - Flying
- (C) Malpighian tubule - Excretory role
- (D) Crop - Grinding food

112. Metamorphosis of insects is regulated through hormone.

- (A) Pheromones (B) Ecdysone
- (C) Thyroxine (D) All of the above

113. Organ of water balance in cockroach are

- (A) Malpighian corpuscle
- (B) Malpighian tubules
- (C) hepatic caecae
- (D) metanephridia

114. *Periplaneta americana* has thermoreceptor sensillae on

- (A) 1st, 2nd and 3rd segments of tarsus of legs
- (B) 3rd, 4th and 5th segments of tarsus of legs
- (C) pedicel of antenna
- (D) 15th segment of anal cerci

115. Chitin is a

- (A) lipid (B) protein
- (C) polysaccharide (D) sphingomylin

116. Largest part of alimentary canal of cockroach is

- (A) Crop (B) Gizzard
- (C) Pharynx (D) Oesophagus

117. Coelom of cockroach is

- (A) Enterocoel (B) Schizocoel
- (C) Pseudocoel (D) Advanced coel

118. Ecdysone is produced by

- (A) prothoracic gland (B) corpora cardiaca
- (C) corpora allata (D) abdominal gland

Space for Rough Work

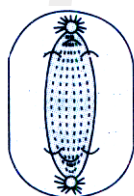
119. In cockroach, vision is due to
 (A) one compound eye
 (B) two compound eyes
 (C) two simple eyes
 (D) two compound and two simple eyes
120. The taste receptors of cockroach are
 (A) compounds eyes
 (B) companiform sensillae
 (C) palps of maxillary and labium
 (D) tactile hairs
121. The correct squence of arrangements of segments in the leg of cockraoch is
 (A) tibia, trochanter, femur, tarsus and coxa
 (B) trochanter, coxa, tibia, femur and tarsus
 (C) coxa, femur, trochanter, tibia and tarsus
 (D) trochanter, coxa, femur, tarsus and tibia
122. The sclerite, covers the top to the head and the space between the two compound eyes in Periplaneta, is
 (A) clypeus (B) labrum
 (C) vertex (D) genae
123. Phallomerase in male Periplaneta arise from
 (A) 8th and 9th sternum
 (B) 7th sternum
 (C) 8th sternum
 (D) 9th sternum
124. Juvenile hormone is secreted by
 (A) thyroid gland (B) thymus gland
 (C) adrenal gland (D) corpora allata
125. Which of the two parts in cockroach are fundamentally similar in structure ?
 (A) Anal styles and labrum
 (B) Maxillae and legs
 (C) Mandibles and antennae
 (D) Wings and anal cerci
126. How many spermathecae are present in cockroaches
 (A) Two, left developed
 (B) Two, right developed
 (C) Two, undeveloped
 (D) Two, non-functional
127. How many eggs are found in egg chamber of female cockroach ?
 (A) 2 (B) 4
 (C) 8 (D) 16
128. Tubular heart of cockroach has how many chambers?
 (A) 10 (B) 13
 (C) 12 (D) 11
129. The adhesive pads (soft-pads) present in the legs of cockroach are
 (A) galea (B) lacinia
 (C) glossa (D) plantulae
130. Basic unit of eye in cockroach is
 (A) Retina
 (B) Rhabdome
 (C) Corneal facet
 (D) Ommatidium
131. The number of segments on the anal cerci of cockroach is
 (A) 12 (B) 15
 (C) 18 (D) 16
132. Spiracles found in cockraoch are
 (A) 2 pairs in thorax and 100 pairs in abdomen
 (B) 2 pairs in thorax and 6 pairs in abdomen
 (C) 2 pairs in thorax and 8 pairs in abdomen
 (D) 2 pairs in thorax and 4 pairs in abdomen
133. Organ of mastication in cockraoch is
 (A) labrum (B) labium
 (C) mandibles (D) maxilla
134. Open circulatory system is not of physiological hindrance in cockroach because
 (A) Heart is simple but chambered.
 (B) Blood is colourless.
 (C) Circulatory and respiratory system are not connected.
 (D) Excretion occurs through malpighian tubules.

Space for Rough Work

135. The young of cockroach is called
 (A) Ephyra (B) Maggot
 (C) Nymph (D) Juvenile

[BOTANY]

136. Select the correct option with respect to mitosis.
 (A) Chromatids start moving towards opposite poles in telophase
 (B) Golgi complex and endoplasmic reticulum are still visible at the end of prophase
 (C) Chromosomes move to the spindle equator and get aligned along equatorial plate in metaphase
 (D) Chromatids separate but remains in the centre of the cell in anaphase
137. During mitosis, ER and nucleolus begin to disappear at
 (A) late prophase (B) early metaphase
 (C) late metaphase (D) early prophase
138. Which stages of cell division do the following figures 'A' and 'B' represent respectively ?



A



B

A - **B**

- (A) Metaphase - Telophase
 (B) Telophase - Metaphase
 (C) Late anaphase - Prophase
 (D) Prophase - Anaphase
139. Small disc-shaped structures at the surface of the centromeres that appear during metaphase are
 (A) kinetochores (B) metaphase plate
 (C) spindle fibres (D) chromatid

140. Chromosomes are arranged along the equator during
 (A) prophase (B) metaphase
 (C) anaphase (D) telophase
141. Which of the following character is related with telophase ?
 (A) Formation of nuclear membrane
 (B) Formation of nucleolus
 (C) Elongation of chromosome
 (D) Formation of two daughter nuclei
142. Spindle fibre is made up of
 (A) tubulin
 (B) humulin
 (C) intermediate filament
 (D) flagellin
143. Chromosomes are visible with chromatids at which phase of mitosis ?
 (A) Interphase (B) Prophase
 (C) Metaphase (D) Anaphase
144. Phragmoplast is
 (A) proplated in cytoplasm of dividing cells
 (B) cell plate formed by vesicles of ER and dictyosomes during cytokinesis
 (C) cell plate formed by ER, dictyosomes, secretory vesicles and spindle fibre
 (D) None of the above
145. Mitosis is a process by which eukaryotic cells
 (A) grow
 (B) get specialized in structure
 (C) multiply
 (D) expose the genes
146. What is not seen during mitosis in somatic cells ?
 (A) Spindle fibres
 (B) Chromosome movement
 (C) Disappearance of nucleolus
 (D) Synapsis
147. Which of the following serves as mitotic spindle poison?
 (A) Ca^{2+} (B) Mg^{2+}
 (C) Tubulin (D) Colchicine

Space for Rough Work

148. During mitosis, number of chromosomes gets
 (A) change
 (B) no change
 (C) may be change if cell is mature
 (D) may be change if cell is immature
149. If you are provided with root-tips of onion in your class and are asked to count the chromosomes, which of the following stages can you most conveniently look into ?
 (A) Metaphase (B) Telophase
 (C) Anaphase (D) Prophase
150. A plant cell has 12 chromosomes at the end of mitosis. How many chromosomes would it have in the G_2 – phase of its next cell cycle ?
 (A) 6 (B) 8
 (C) 12 (D) 24
151. Meiosis in a plant occurs when there is a change
 (A) from gametophyte to sporophyte
 (B) from sporophyte to gametophyte
 (C) from gametophyte to gametophyte
 (D) from sporophyte to sporophyte
152. 56 cells are produced in meiosis where first division is
 (A) equal (B) reduction
 (C) mitosis (D) None of these
153. Longest phase of meiosis, is
 (A) prophase-I (B) prophase-II
 (C) anaphase-I (D) metaphase-II
154. Select the matched ones.
 I. S-phase - DNA replication
 II. Zygotene - Synapsis
 III. Diplotene - Crossing over
 IV. Meiosis - Both haploid and diploid cells
 V. G_2 – phase - Quiescent stage
 (A) I and II only (B) III and IV only
 (C) III and V only (D) I, III and V only
155. During meiosis, the alleles of the parental pair separate or segregated from each other. How many allele(s) is/ are then transmitted to gamete ?
 (A) Four (B) Two
 (C) Six (D) One
156. Synapsis occurs between
 (A) a male and a female gamete
 (B) mRNA and ribosomes
 (C) spindle fibres and centromere
 (D) two homologous chromosome
157. Crossing over occurs at
 (A) single strand stage
 (B) two strand stage
 (C) four strand stage
 (D) eight strand stage
158. The proteins involved in the movement of chromosomes towards the poles during cell division are
 (A) actin (B) myosin
 (C) tubulin (D) elastin
159. In meiosis, chromosome number becomes
 (A) half of its parent chromosome
 (B) same as that of parent chromosome
 (C) one fourth of its parent chromosome
 (D) None of above
160. Crossing over that results in genetic recombination in higher organisms occurs between
 (A) sister chromatids of bivalent
 (B) non-sister chromatids of a bivalent
 (C) two daughter nuclei
 (D) two different bivalents
161. There are three genes a, b, c with percentage of crossing over between a and b is 20%, b and c is 28% and a and c is 8%. What is the sequence of genes on chromosome ?
 (A) b,a,c (B) a,b,c
 (C) a,c,b (D) None of these

Space for Rough Work

162. Characteristic of meiosis is
 (A) two nuclear and two chromosome divisions
 (B) two nuclear and one chromosome division
 (C) one nuclear and two chromosome divisions
 (D) one nuclear and one chromosome division
163. If we ignore the effect of crossing over, how many different haploid cells arise by meiosis in a diploid cell having $2n = 12$?
 (A) 8 (B) 16
 (C) 32 (D) 64
164. Genetic recombination is due to
 (A) fertilization and meiosis
 (B) mitosis and meiosis
 (C) fertilization and mitosis
 (D) None of these
165. The number of chromosomes becomes half in
 (A) anaphase-I (B) anaphase-II
 (C) telophase-I (D) telophase-II
166. Meiosis can be observed in
 (A) tapetal cells (B) megaspores
 (C) micropores (D) spore mother cells
167. Among the following, which one is longest phase in prophase of meiosis ?
 (A) Leptotene (B) Zygotene
 (C) Pachytene (D) Diplotene
168. Arrange the following events of meiosis in the correct sequence.
 1. Terminalization 2. Crossing over
 3. Synapsis 4. Disjunction of genomes
 (A) 4,3,2,1 (B) 3,2,1,4
 (C) 2,1,4,3 (D) 1,4,3,2
169. During cell division, chromosome attaches with spindles
 (A) kinetochore (B) centrosome
 (C) centriole (D) secondary constriction
170. In meiosis, division is
 (A) I reductional and II equational
 (B) I equational and II reductional
 (C) Both reductional
 (D) Both equational
171. Which type of chromosomes segregate when a cell undergoes meiosis ?
 (A) Homologous chromosomes
 (B) Non-homologous chromosomes
 (C) Both (A) and (B)
 (D) Centric and acentric chromosomes
172. The second meiotic division leads to
 (A) separation of sex chromosomes
 (B) fresh DNA synthesis
 (C) separation of chromatids and centromere
 (D) separation of homologous chromosomes
173. Term 'meiosis' was proposed by
 (A) Farmer and Moore (B) Flemming
 (C) Strasburger (D) Darlington
174. Synapsis occurs in phase of meiosis.
 (A) zygotene (B) diplotene
 (C) pachytene (D) leptotene
175. When number of chromosomes is already reduced to half in the first reductional division of meiosis, what is the necessity of second meiotic division ?
 (A) The division is required for the formation of four gametes
 (B) Division ensures equal distribution of haploid chromosomes
 (C) Division ensures equal distribution of genes on chromosomes
 (D) Division is required for segregation of replicated chromosomes
176. What is the function of centromere ?
 (A) Cell division (B) Cell plate formation
 (C) Cell differentiation (D) Cell wall formation
177. Chiasma shows the sites of
 (A) spindle formation (B) synapsis
 (C) crossing over (D) None of these
178. Meiosis in AbBb will produce gametes
 (A) AB, aB, Ab, ab (B) AB, ab
 (C) Aa, bb (D) Aa, Bb
179. During which stage of meiosis, do tetrads line up at the equator ?
 (A) Prophase-I (B) Telophase-I
 (C) Metaphase-I (D) Anaphase-I
180. Phenomenon of crossing over in diploid organism is responsible for
 (A) linkages between genes
 (B) recombination between linked genes
 (C) segregation between genes
 (D) dominance of gene



Space for Rough Work



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