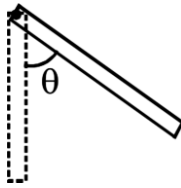


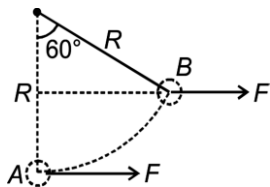


6. A stick of mass  $m$  and length  $l$  is pivoted at one end and is displaced through an angle  $\theta$ . The increase in potential energy is



- (1)  $mg\frac{1}{2}(1 - \cos\theta)$       (2)  $mg\frac{1}{2}(1 + \cos\theta)$   
 (3)  $mg\frac{1}{2}(1 - \sin\theta)$       (4)  $mg\frac{1}{2}(1 + \sin\theta)$

7. A block of mass  $m$  is pulled along a circular arc by means of a constant horizontal force  $F$  as shown. Work done by this force in pulling the block from A to B is



- (1)  $FR/2$       (2)  $FR$   
 (3)  $\frac{\sqrt{3}}{2}FR$       (4)  $mgR$

8. Two balls (initially one of the ball at rest) of equal masses  $m$  each undergo oblique collision. If collision is perfectly elastic, then angle between their velocities after collision is

- (1)  $\pi/4$       (2)  $\pi/3$   
 (3)  $\pi/6$       (4)  $\pi/2$

9. A body of mass  $m$  moving with a constant velocity collides head on with another stationary body of same mass. If the coefficient of restitution between the bodies is  $1/2$  then ratio of velocities of two bodies after collision will be

- (1)  $1/3$       (2)  $1/2$   
 (3)  $1/4$       (4)  $1$

10. Potential energy of a particle at position  $x$  is given by  $U = x^2 - 5x$ . Which of the following is equilibrium position of the particle?

- (1)  $x = 0$       (2)  $x = 5$   
 (3)  $x = 2.5$       (4)  $x = 7.5$

11. A body of mass  $m$  is displaced from point A(3, 1, 3) m to point B(1, 2, 1) m under the effect of a force  $\vec{F} = (5\hat{i} + 2\hat{j} - 4\hat{k})$ , calculate work done by the force.

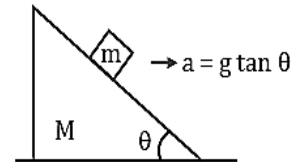
- (1) 57 J      (2) 11 J  
 (3) 0 J      (4) 22 J

12. Find work done by friction for displacement 'S'?



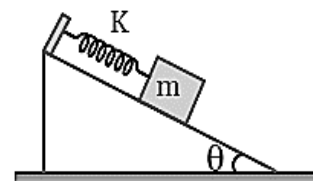
- (1)  $\mu_k(mg + F \sin \theta)S$   
 (2)  $-\mu_k(mg + F \sin \theta)S$   
 (3)  $\mu_k(mg - F \sin \theta)S$   
 (4)  $-\mu_k(mg - F \sin \theta)S$

13. The whole wedge and block system is moving as shown in the figure. Block of mass  $m$  is not slipping on the wedge. Then which of the following statement is correct (surface between M and m is rough)



- (1) Work done by normal force on block is zero  
 (2) Work done by friction force on block is not zero  
 (3) Work done by normal force on block is not zero  
 (4) None of these

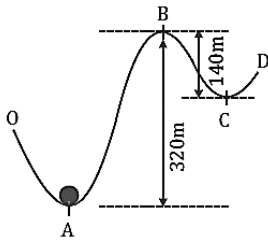
14. A system of smooth inclined plane and block is shown in figure block is released when the spring in its natural length. Maximum elongation in the spring will be



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

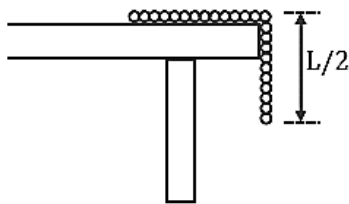
15. Track OABCD (as shown is figure) is smooth and fixed in vertical plane. What minimum speed has to be given to a particle lying at

point A, so that it can reach point C?



- (1) 60 m/s (2) 100 m/s  
(3) 70 m/s (4) 80 m/s

16. A uniform chain (mass  $M$ , length  $L$ ) is released from rest from a smooth horizontal surface as shown in the figure. Velocity of the chain at the instant it completely comes out of the table will be



- (1)  $V = \sqrt{gL}$  (2)  $V = \sqrt{\frac{3gL}{4}}$   
(3)  $V = \frac{1}{2}\sqrt{5gL}$  (4)  $V = \frac{1}{2}\sqrt{gL}$

17. If  $F = 2x^2 - 3x - 2$ , then choose correct option

- (1)  $x = -\frac{1}{2}$  is position of stable equilibrium  
(2)  $x = 2$  is position of stable equilibrium  
(3)  $x = -\frac{1}{2}$  is position of unstable equilibrium  
(4)  $x = 4$  is position of unstable equilibrium

18. Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of the input energy. How much power is generated by the turbine? ( $g = 10 \text{ m/s}^2$ )

- (1) 10.2 kW (2) 8.1 kW  
(3) 12.3 kW (4) 7.0 kW

19. A ball is dropped from height  $h$  on the ground level. If the coefficient of restitution is  $e$  then the height upto which the ball will go after  $n^{\text{th}}$  jump will be

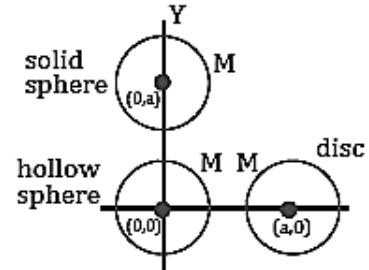
- (1)  $h/e^{2n}$  (2)  $e^{2n}/h$   
(3)  $he^n$  (4)  $he^{2n}$

20. A particle of mass  $m$  moving with speed  $v$  towards east strikes another particle of same mass moving with same speed  $v$  towards north. After striking, the two particles fuse

together. With what speed this new particle of mass  $2m$  will move in north-east direction?

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

21. The coordinate of the centre of mass of a system as shown in figure

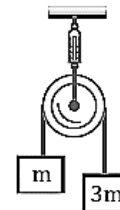


- (1)  $(\frac{a}{3}, 0)$  (2)  $(\frac{a}{2}, \frac{a}{2})$   
(3)  $(\frac{a}{3}, \frac{a}{3})$  (4)  $(0, \frac{a}{3})$

22. The centre of mass of a system of three particles of masses 1 g, 2 g and 3 g is taken as the origin of a coordinate system. The position vector of a fourth particle of mass 4 g such that the centre of mass of the four particle system lies at the point  $(1, 2, 3)$  is  $\alpha(\hat{i} + 2\hat{j} + 3\hat{k})$ , where  $\alpha$  is a constant. The value of  $\alpha$  is

- (1) 10/3 (2) 5/2  
(3) 1/2 (4) 2/5

23. If the system is released, then the acceleration of the centre of mass of the system



- (1)  $g/4$  (2)  $g/2$   
(3)  $g$  (4)  $2g$

24. Two objects of masses 200 gram and 500 gram possess velocities  $10\hat{i} \text{ m/s}$  and  $3\hat{i} + 5\hat{j} \text{ m/s}$  respectively. The velocity of their centre of mass in m/s is

- (1)  $5\hat{i} - 25\hat{j}$  (2)  $\frac{5}{7}\hat{i} - 25\hat{j}$   
(3)  $5\hat{i} + \frac{25}{7}\hat{j}$  (4)  $25\hat{i} - \frac{5}{7}\hat{j}$

25. A 3kg bomb initially at rest explodes by itself into three equal mass fragments. The velocities of two fragments are  $(3\hat{i} + 2\hat{j}) \text{ m/s}$  and  $(-\hat{i} - 4\hat{j}) \text{ m/s}$ . The kinetic energy of the third fragment is (in J)

- (1) 5 J (2) 2 J  
(3) 4 J (4) 0 J

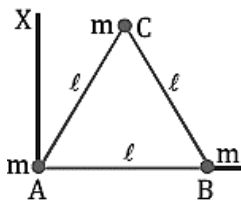
26. The moment of inertia of a solid cylinder about its own axis is the same as its moment of inertia about an axis passing through its centre of gravity and perpendicular to its length. The relation between its length  $L$  and radius  $R$  is

- (1)  $L = \sqrt{2}R$                       (2)  $L = \sqrt{3}R$   
 (3)  $L = 3R$                         (4)  $L = R$

27. The M.I. of a thin rod of length  $l$  about the perpendicular axis through its centre is  $I$ . The M.I. of the square structure made by four such rods about a perpendicular axis to the plane and through the centre will be

- (1)  $4I$                                 (2)  $8I$   
 (3)  $12I$                               (4)  $16I$

28. Three particles, each of mass  $m$  are situated at the vertices of an equilateral triangle  $ABC$  of side  $l$  (as shown in the figure). The moment of inertia of the system about a line  $AX$  perpendicular to  $AB$  and in the plane of  $ABC$ , will be



- (1)  $2ml^2$                               (2)  $5/4 ml^2$   
 (3)  $3/2 ml^2$                         (4)  $3/4 ml^2$

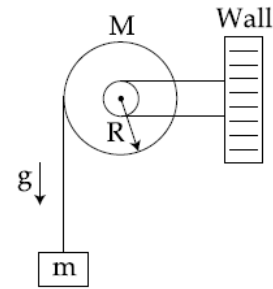
29. Two bodies have their moments of inertia  $I$  and  $2I$  respectively about their axis of rotation. If their kinetic energies of rotation are equal, their angular momentum will be in the ratio

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

30. A thin circular ring of mass  $M$  and radius  $r$  is rotating about its axis with a constant angular velocity  $\omega$ . Four objects each of mass  $m$ , are kept gently to the opposite ends of two perpendicular diameters of the ring. The angular velocity of the ring will be

- (1)  $\frac{M\omega}{4m}$                               (2)  $\frac{M\omega}{M+4m}$   
 (3)  $\frac{(M+4m)\omega}{M}$                               (4)  $\frac{(M+4m)\omega}{M+4m}$

31. A uniform disc of radius  $R$  and mass  $M$  is free to rotate only about its axis. A string is wrapped over its rim and a body of mass  $m$  is tied to the free end of the string as shown in figure. The body is released from rest. Then the acceleration of the body is



- (1)  $\frac{2mg}{2m+M}$                         (2)  $\frac{2Mg}{2m+M}$   
 (3)  $\frac{2Mg}{2M+m}$                         (4)  $\frac{2mg}{2M+m}$

32. The rotational kinetic energy of a body is  $E$ . In the absence of external torque, if mass of the body is halved and radius of gyration doubled, then its rotational kinetic energy will be

- (1)  $0.5 E$                               (2)  $0.25 E$   
 (3)  $E$                                     (4)  $2 E$

33. A solid sphere of mass  $M$  and radius  $R$  rolls on a horizontal surface without slipping. The ratio of rotational K.E. to total K.E. is

- (1)  $\frac{1}{2}$                                     (2)  $\frac{3}{7}$   
 (3)  $\frac{2}{7}$                                     (4)  $\frac{2}{10}$

34. A disc rolls down a plane of length  $L$  and inclined at angle  $\theta$ , without slipping. Its velocity on reaching the bottom will be

- (1)  $\sqrt{\frac{4gL\sin\theta}{3}}$                         (2)  $\sqrt{\frac{2gL\sin\theta}{3}}$   
 (3)  $\sqrt{\frac{10gL\sin\theta}{7}}$                         (4)  $\sqrt{4gL\sin\theta}$

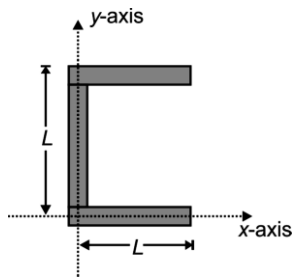
35. A body of mass  $m$  slides down an incline and reaches the bottom with a velocity  $v$ . If the same mass were in the form of a ring which rolls down this incline, the velocity of the ring at the bottom would have been

- (1)  $v$                                     (2)  $v\sqrt{2}$   
 (3)  $v/\sqrt{2}$                         (4)  $\left(\sqrt{\frac{2}{5}}\right)v$

36. Two discs have moments of inertia  $I_1$  and  $I_2$  about their respective axes perpendicular to the plane and passing through the centre. They are rotating with angular speeds,  $\omega_1$  and  $\omega_2$  respectively and are brought into contact face to face with their axes of rotation coaxial. The loss in kinetic energy of the system in the process is given by

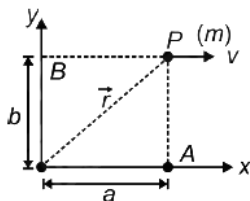
(1)  $\frac{I_1 I_2}{(I_1 + I_2)} (\omega_1 - \omega_2)^2$       (2)  $\frac{(\omega_1 - \omega_2)^2}{2(I_1 + I_2)}$   
 (3)  $\frac{I_1 I_2}{2(I_1 + I_2)} (\omega_1 - \omega_2)^2$       (4)  $\frac{(I_1 - I_2)^2 \omega_1 \omega_2}{2(I_1 + I_2)}$

37. Locate the centre of mass of arrangement shown in figure. The three rods are identical in mass and length



(1)  $(\frac{L}{2}, \frac{L}{2})$       (2)  $(\frac{L}{3}, 0)$   
 (3)  $(\frac{L}{3}, \frac{L}{2})$       (4)  $(0, \frac{L}{3})$

38. A particle is moving along a straight line parallel to x-axis with constant velocity. Find angular momentum about the origin in vector form

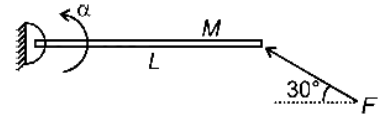


(1)  $+mv^2 b \hat{k}$       (2)  $-mvb \hat{k}$   
 (3)  $-2mvb \hat{k}$       (4)  $-mvb \hat{j}$

39. Two discs having masses in the ratio 1: 2 and radii in the ratio 1: 8 roll down without slipping one by one from an inclined plane of height h. The ratio of their linear velocities on reaching the ground is

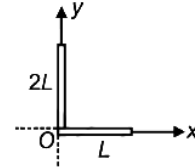
(1) 1 : 16      (2) 1 : 128  
 (3) 1 : 84      (4) 1 : 1

40. The thin rod shown below has mass  $M$  and length  $L$ . A force  $F$  acts at one end as shown and the rod is free to rotate about the other end in the plane of force. Initial angular acceleration of the rod (in gravity free space) is



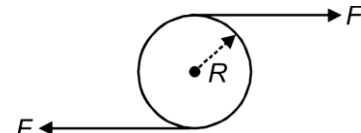
(1)  $\frac{3F}{2ML}$       (2)  $\frac{2F}{3ML}$   
 (3)  $\frac{F}{ML}$       (4)  $\frac{F}{2ML}$

41. Figure shows a composite system of two uniform rods of lengths as indicated. Then the coordinates of the centre of mass of the system of rods are



(1)  $(\frac{L}{2}, \frac{2L}{3})$       (2)  $(\frac{L}{4}, \frac{2L}{3})$   
 (3)  $(\frac{L}{6}, \frac{2L}{3})$       (4)  $(\frac{L}{6}, \frac{L}{3})$

42. Two equal and opposite forces are applied tangentially to a uniform disc of mass  $M$  and radius  $R$  as shown in the figure. If the disc is pivoted at its centre and free to rotate in its plane, the angular acceleration of the disc is

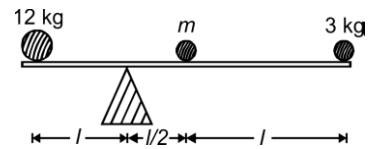


(1)  $\frac{F}{MR}$       (2)  $\frac{2F}{3MR}$   
 (3)  $\frac{4F}{MR}$       (4) zero

43. A wheel having moment of inertia  $4 \text{ kg m}^2$  about its symmetrical axis, rotates at rate of 240 rpm about it. The torque which can stop the rotation of the wheel in one minute is

(1)  $5\pi/7 \text{ N-m}$       (2)  $8\pi/15 \text{ N-m}$   
 (3)  $2\pi/9 \text{ N-m}$       (4)  $3\pi/7 \text{ N-m}$

44. For equilibrium of the system, value of mass  $m$  should be



(1) 9 kg      (2) 15 kg  
 (3) 21 kg      (4) 1 kg

45. Two particles of the same mass  $m$  are moving in circular orbits because of force, given by  $F = -16/r - r^3$ . The first particle is at a distance  $r = 1$ , and the second, at  $r = 4$ . The best estimate for the ratio of kinetic energies of the first and the second particle is closed to

(1)  $6 \times 10^{-2}$       (2)  $10^{-1}$   
 (3)  $3 \times 10^{-5}$       (4)  $6 \times 10^2$

## CHEMISTRY

46. In the following reversible reaction,  
 $2\text{SO}_2 + \text{O}_2 \rightleftharpoons 2\text{SO}_3 + Q$  cal  
 Most suitable condition for the higher production of  $\text{SO}_3$  is  
 (1) Low temperature and high pressure  
 (2) Low temperature and low pressure  
 (3) High temperature and high pressure  
 (4) High temperature and low pressure
47. The pH of a 0.1 M solution of  $\text{NH}_4\text{OH}$  (having  $K_b = 1.0 \times 10^{-5}$ ) is equal to  
 (1) 10 (2) 6  
 (3) 11 (4) 12
48. Solubility product constant [ $K_{sp}$ ] of salts of types  $\text{MX}$ ,  $\text{MX}_2$  and  $\text{M}_3\text{X}$  at temperature 'T' are  $4.0 \times 10^{-8}$ ,  $3.2 \times 10^{-14}$  and  $2.7 \times 10^{-15}$  respectively. Solubilities (mol,  $\text{dm}^{-3}$ ) of the salts at temperature 'T' are in the order  
 (1)  $\text{MX} > \text{MX}_2 > \text{M}_3\text{X}$   
 (2)  $\text{M}_3\text{X} > \text{MX}_2 > \text{MX}$   
 (3)  $\text{MX}_2 > \text{M}_3\text{X} > \text{MX}$   
 (4)  $\text{MX} > \text{M}_3\text{X} > \text{MX}_2$
49. 0.1 mole of  $\text{N}_2\text{O}_4(\text{g})$  was sealed in a tube under one atmospheric conditions at  $25^\circ\text{C}$ . Calculate the number of moles of  $\text{NO}_2(\text{g})$  present, if the equilibrium  $\text{N}_2\text{O}_4(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$  ( $K_p = 0.14$ ) is reached after some time  
 (1) 0.036 (2) 36.00  
 (3) 360.0 (4) 3.600
50. Which of the following is most soluble in water?  
 (1)  $\text{MnS}$  ( $K_{sp} = 8 \times 10^{-37}$ )  
 (2)  $\text{ZnS}$  ( $K_{sp} = 7 \times 10^{-16}$ )  
 (3)  $\text{Bi}_2\text{S}_3$  ( $K_{sp} = 1 \times 10^{-70}$ )  
 (4)  $\text{Ag}_2\text{S}$  ( $K_{sp} = 6 \times 10^{-51}$ )
51.  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightleftharpoons 2\text{NH}_3(\text{g})$   
 In the reaction given above, the addition of small amount of an inert gas at constant pressure will shift the equilibrium towards which side?  
 (1) LHS (2) RHS  
 (3) Neither side (4) Either side
52. When 20g of  $\text{CaCO}_3$  were put into 10 litre flask and heated to  $800^\circ\text{C}$ , 35% of  $\text{CaCO}_3$  remained unreacted at equilibrium.  $K_p$  for decomposition of  $\text{CaCO}_3$  is :  
 (1) 1.145 atm (2) 0.145 atm  
 (3) 2.145 atm (4) 3.145 atm
53. For the reaction equilibrium,  
 $2\text{NOBr}(\text{g}) \rightleftharpoons 2\text{NO}(\text{g}) + \text{Br}_2(\text{g})$ , if  $P_{\text{Br}_2} = \frac{P}{9}$  at equilibrium and  $P$  is total pressure. The ratio  $K_p/P$  is equal to:  
 (1) 1/9 (2) 1/81  
 (3) 1/27 (4) 1/3
54.  $K_{sp} = 1.2 \times 10^{-5}$  of  $\text{M}_2\text{SO}_4$  ( $M^+$  is monovalent metal ion) at 298 K. The maximum concentration of  $M^+$  ions that could be attained in a saturated solution of this solid at 298 K is:  
 (1)  $3.46 \times 10^{-3} M$  (2)  $7.0 \times 10^{-3} M$   
 (3)  $2.88 \times 10^{-2} M$  (4)  $14.4 \times 10^{-3} M$
55. The solubility of  $\text{AgCl}$  is  $1 \times 10^{-5}$  mol/L. Its solubility in 0.1 molar sodium chloride solution is  
 (1)  $1 \times 10^{-10}$  (2)  $1 \times 10^{-5}$   
 (3)  $1 \times 10^{-9}$  (4)  $1 \times 10^{-4}$
56. The equilibrium constant for the reaction,  $\text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}(\text{g})$  is  $4 \times 10^{-4}$  at 2000 K. In presence of a catalyst the equilibrium is attained ten times faster. Therefore, the equilibrium constant, in presence of the catalyst, at 2000 K is:  
 (1)  $40 \times 10^{-4}$   
 (2)  $4 \times 10^{-4}$   
 (3)  $4 \times 10^{-3}$   
 (4) Difficult to compute without more data
57. 100 mL of 0.015 M  $\text{HCl}$  solution is mixed with 100 mL of 0.005 M  $\text{HCl}$ . What is the pH of the resultant solution?  
 (1) 2.5 (2) 1.5  
 (3) 2 (4) 1
58. Liquid ammonia ionises to a slight extent. At  $-50^\circ\text{C}$ , its self ionisation constant,  $K_{\text{NH}_3} = [\text{NH}_4^+][\text{NH}_2^-] = 10^{-30}$ . How many amide ions, are present per  $\text{cm}^3$  of pure liquid ammonia? (Assume  $N = 6.0 \times 10^{23}$ )

- (1)  $6 \times 10^6$  ions                      (2)  $6 \times 10^5$  ions  
 (3)  $6 \times 10^{-5}$  ions                      (4)  $6 \times 10^{-6}$  ions
59. At  $600^\circ\text{C}$ ,  $K_p$  for the following reaction is 1 atm.  

$$X(g) \rightleftharpoons Y(g) + Z(g)$$
 At equilibrium, 50% of  $X(g)$  is dissociated. The total pressure of the equilibrium system is  $p$  atm. What is the partial pressure (in atm) of  $X(g)$  at equilibrium?  
 (1) 1    (2) 4  
 (3) 2    (4) 0.5
60. For which of the following sparingly soluble salt, the solubility ( $s$ ) and solubility product ( $K_{sp}$ ) are related by the expression  $s = (K_{sp}/4)^{1/3}$ ?  
 (1)  $\text{BaSO}_4$                                       (2)  $\text{Ca}_3(\text{PO}_4)_2$   
 (3)  $\text{Hg}_2\text{Cl}_2$                                       (4)  $\text{Ag}_3\text{PO}_4$
61. If  $\text{H}-\text{X}$  bond length is  $2.00 \text{ \AA}$  and  $\text{H}-\text{X}$  bond has dipole moment  $5.12 \times 10^{-30} \text{ C-m}$ , the percentage of ionic character in the molecule will be  
 (1) 10%    (2) 16%  
 (3) 18%    (4) 20%
62. The maximum possible number of hydrogen bonds is a  $\text{H}_2\text{O}$  molecule can participate is  
 (1) 1    (2) 2  
 (3) 3    (4) 4
63. If the ionic radii of  $\text{K}^+$  and  $\text{F}^-$  are about  $1.34 \text{ \AA}$  each, then the expected values of atomic radii of K and F should be respectively:  
 (1)  $1.34$  and  $1.34 \text{ \AA}$                       (2)  $2.31$  and  $0.64 \text{ \AA}$   
 (3)  $0.64$  and  $2.31 \text{ \AA}$                       (4)  $2.31$  and  $1.34 \text{ \AA}$
64. According to MO theory, which of the following lists ranks the nitrogen species in terms of increasing bond order?  
 (1)  $\text{N}_2^- < \text{N}_2^{2-} < \text{N}_2$                       (2)  $\text{N}_2^- < \text{N}_2 < \text{N}_2^{2-}$   
 (3)  $\text{N}_2^{2-} < \text{N}_2^- < \text{N}_2$                       (4)  $\text{N}_2 < \text{N}_2^{2-} < \text{N}_2^-$
65.  $\text{H}_2\text{O}$  boils at higher temperature than  $\text{H}_2\text{S}$  because it is capable of forming:  
 (1) Ionic bonds  
 (2) Covalent bonds  
 (3) Hydrogen bonds  
 (4) Metallic bonds
66. The correct increasing covalent nature is:  
 (1)  $\text{NaCl} < \text{LiCl} < \text{BeCl}_2$   
 (2)  $\text{BeCl}_2 < \text{NaCl} < \text{LiCl}$   
 (3)  $\text{BeCl}_2 < \text{LiCl} < \text{NaCl}$   
 (4)  $\text{LiCl} < \text{NaCl} < \text{BeCl}_2$
67. Some of the properties of the two species,  $\text{NO}_3^-$  and  $\text{H}_3\text{O}^+$  are described below. Which one of them is correct?  
 (1) Dissimilar in hybridization for the central atom with different structure  
 (2) Isostructural with same hybridization for the central atom  
 (3) Isostructural with different hybridization for the central atom  
 (4) Similar is hybridization for the central atom with different structure
68. Which one of the following orders is not in according with the property stated against it?  
 (1)  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$  : Electronegativity  
 (2)  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$  : Bond dissociation energy  
 (3)  $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$  : Oxidising power  
 (4)  $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$  : Acidic property in water
69. In which of the following molecules are all the bonds not equal?  
 (1)  $\text{AlF}_3$     (2)  $\text{NF}_3$   
 (3)  $\text{ClF}_3$     (4)  $\text{BF}_3$
70. The correct order of bond angles is:  
 (1)  $\text{PF}_3 < \text{PCl}_3 < \text{PBr}_3 < \text{PI}_3$   
 (2)  $\text{PF}_3 < \text{PBr}_3 < \text{PCl}_3 < \text{PI}_3$   
 (3)  $\text{PI}_3 < \text{PBr}_3 < \text{PCl}_3 < \text{PF}_3$   
 (4)  $\text{PF}_3 > \text{PCl}_3 < \text{PBr}_3 < \text{PI}_3$
71. The molecule having permanent dipole moment is:  
 (1)  $\text{SF}_4$     (2)  $\text{XeF}_4$   
 (3)  $\text{SiF}_4$     (4)  $\text{BF}_3$
72. The correct ionic radii order is:  
 (1)  $\text{N}^{3-} > \text{O}^{2-} > \text{F}^- > \text{Na}^+ > \text{Mg}^{2+} > \text{Al}^{3+}$   
 (2)  $\text{N}^{3-} > \text{Na}^+ > \text{O}^{2-} > \text{F}^- > \text{Mg}^{2+} > \text{Al}^{3+}$   
 (3)  $\text{Na}^+ > \text{O}^{2-} > \text{N}^{3-} > \text{F}^- > \text{Mg}^{2+} > \text{Al}^{3+}$   
 (4)  $\text{O}^{2-} > \text{F}^- > \text{Na}^+ > \text{N}^{3-} > \text{Mg}^{2+} > \text{Al}^{3+}$

73. Which of the following two are isostructural?  
 (1)  $\text{XeF}_2, \text{IF}_2^-$  (2)  $\text{NH}_3, \text{BF}_3$   
 (3)  $\text{CO}_3^{2-}, \text{SO}_3^{2-}$  (4)  $\text{PCl}_5, \text{ICl}_5$
74. Molecular size of  $\text{ICl}$  and  $\text{Br}_2$  is nearly same, but boiling point of  $\text{ICl}$  is about  $40^\circ\text{C}$  higher than  $\text{Br}_2$ . This might be due to:  
 (1)  $\text{I}-\text{Cl}$  bond is stronger than  $\text{Br}-\text{Br}$  bond  
 (2) Ionisation energy of  $\text{I} <$  ionisation energy of  $\text{Br}$   
 (3)  $\text{ICl}$  is polar where as  $\text{Br}_2$  is non-polar  
 (4) The size of  $\text{I} >$  size of  $\text{Br}$
75.  $\text{NH}_3$  has a net dipole moment, but boron trifluoride ( $\text{BF}_3$ ) has zero dipole moment, because:  
 (1)  $\text{B}$  is less electronegative than  $\text{N}$   
 (2)  $\text{F}$  is more electronegative than  $\text{H}$   
 (3)  $\text{BF}_3$  is pyramidal while  $\text{NH}_3$  is planar  
 (4)  $\text{NH}_3$  is pyramidal while  $\text{BF}_3$  is trigonal planar
76. Which is not the correct order for the stated property?  
 (1)  $\text{Ba} > \text{Sr} > \text{Mg}$  ; atomic radius  
 (2)  $\text{F} > \text{O} > \text{N}$  ; first ionisation enthalpy  
 (3)  $\text{Cl} > \text{F} > \text{I}$ ; electron affinity  
 (4)  $\text{O} > \text{Se} > \text{Te}$ ; electronegativity
77. According to IUPAC nomenclature, a newly discovered element has been named as Uun. The atomic number of the element is  
 (1) 111 (2) 112  
 (3) 109 (4) 110
78. Diagonal relationship is for  
 (1)  $\text{Li}-\text{Na}$  (2)  $\text{Be}-\text{Mg}$   
 (3)  $\text{Si}-\text{C}$  (4)  $\text{B}-\text{Si}$
79. Which one of the following is an amphoteric oxide?  
 (1)  $\text{ZnO}$  (2)  $\text{Na}_2\text{O}$   
 (3)  $\text{SO}_2$  (4)  $\text{B}_2\text{O}_3$
80. Which of the following is least ionic?  
 (1)  $\text{CaF}_2$  (2)  $\text{CaBr}_2$   
 (3)  $\text{CaI}_2$  (4)  $\text{CaCl}_2$
81. Which of the following oxides is not expected to react with sodium hydroxide?  
 (1)  $\text{BeO}$  (2)  $\text{B}_2\text{O}_3$   
 (3)  $\text{CaO}$  (4)  $\text{SiO}_2$
82.  $I^{\text{st}}$  and  $II^{\text{nd}}$  IE of  $\text{Mg}$  are 7.646 and 15.035 eV respectively. The amount of energy needed to convert all the atoms of magnesium into  $\text{Mg}^{2+}$  ions present in 12 mg of magnesium vapours is [Given,  $1\text{eV} = 96.5 \text{ kJ mol}^{-1}$ ]  
 (1) 1.5 (2) 2.0  
 (3) 1.1 (4) 0.5
83. The first four ionisation energy values of an element are 191, 578, 872 and 5962 kcal. The number of valence electrons in the element is  
 (1) 1 (2) 2  
 (3) 3 (4) 4
84. Oxygen is divalent, but sulphur exhibits variable valency of 2,4 and 6, because:  
 (1) Sulphur is less electronegative than oxygen  
 (2) Sulphur is bigger atom than oxygen  
 (3) Ionisation potential of sulphur is more than oxygen  
 (4) Of the presence of d-orbitals in sulphur
85. The ionisation energy of nitrogen is larger than that of oxygen because of  
 (1) Of greater attraction of electrons by the nucleus  
 (2) Of the size of nitrogen atom being smaller  
 (3) The half-filled p-orbitals possess extra stability  
 (4) Of greater penetration effect
86. Which is the property of non-metal?  
 (1) Electronegative  
 (2) Basic nature of oxide  
 (3) Reducing property  
 (4) Low ionisation potential
87. Number of elements presents in the fifth period of periodic table is  
 (1) 32 (2) 10  
 (3) 18 (4) 8
88. Which of the following pairs show reverse properties on moving along a period from left to right and from top to down in a group?  
 (1) Nuclear charge and electron affinity  
 (2) Ionisation energy and electron affinity  
 (3) Atomic radius and electron affinity  
 (4) None of the above
89. When the first ionisation energies are plotted against atomic number, the peaks are occupied by  
 (1) Alkali metals (2) Halogens  
 (3) Transition metals (4) Rare gases
90. The electronic configuration of transition elements is exhibited by  
 (1)  $(n-1)d^{1-10}, ns^2$  (2)  $ns^2(n-1)d^{10}$   
 (3)  $ns^1$  (4)  $ns^2, np^5$

## BOTANY

91. The bract is reduced A found at the base of Pedicel. "A" stands / represents  
 (1) Flower (2) Leaf  
 (3) Stem (4) Calyx
92. The flower of Maize, Mustard and Solanum are  
 (1) Trimerous, Pentamerous and Tetramerous respectively  
 (2) Pentamerous, tetramerous and trimerous respectively  
 (3) Bimerous, trimerous and tetramerous respectively  
 (4) Trimerous, tetramerous and pentamerous respectively
93. Match the following Column-I with Column-II, choose the correct combination.

	Column-I Type of Feature		Column-II A Pair of Example
a.	Basal placentation	(i)	Merigold & Sunflower
b.	Apocarpous flower	(ii)	Salvia and Mustard
c.	Papilionaceous aestivation	(iii)	Lotus and Rose
d.	Heterostemony	(iv)	Bean and Pea

Correct one is :

- (1) a(i) b(iv) c(iii) d(ii) (2) a(i) b(iii) c(iv) d(ii)  
 (3) a(iv) b(iii) c(ii) d(i) (4) a(i) b(ii) c(iii) d(iv)
94. Select the correct option:  
**Statement-I** : Endosperm and embryo are formed as a result of triple fusion  
**Statement-II** : Maize embryo is large and situated in the groove at one end of the endosperm.  
 (1) Both Statements are correct  
 (2) Both Statements are incorrect  
 (3) Statement I is correct & Statement II is incorrect  
 (4) Statement II is incorrect & Statement I is correct
95. Among the following characteristics like  
 (a) Phloem located only on the inner side of Xylem in conjoint vascular bundles

- (b) Cambium posses the ability to form secondary Xylem and Phloem tissues  
 (c) Radial vascular bundles are present in roots of all flowering plants  
 (d) 8 vascular bundles 4 Xylem bundles & 4 Phloem bundles are present in dicotyledonous root.

How many are **wrong** statement?

- (1) (a) & (d) (2) (b) & (d)  
 (3) Only (a) (4) Only (d)
96. Thin walled parenchymatous cells with conspicuous intercellular spaces are present in  
 (1) Cortical layers and pith of dicot stem  
 (2) Cortex of dicot root  
 (3) Hypodermis of monocot root  
 (4) Both (1) & (2)
97. Ground tissue consists of all except  
 (1) Parenchyma & Sclerenchyma  
 (2) Parenchyma, Collenchyma & Sclerenchyma  
 (3) Chloroplast containing cells called mesophyll  
 (4) Bundle Sheath cells & bulliform cells
98. Palisade mesophyll of dicot leaf is  
 (1) Abaxially placed  
 (2) Arranged vertically & parallel to each other  
 (3) Made of oval or round cells  
 (4) Mainly for storage of food materials
99. In wheat plant, root system is  
 (1) Nodulated (2) Tap  
 (3) Fibrous (4) Prop
100. The tap roots get modified to store food in  
 (1) Carrot (2) Onion  
 (3) Ginger (4) Sweet potato
101. The region or part of root that increases the surface area for water absorption is  
 (1) Root cap  
 (2) Zone of elongation  
 (3) Meristematic zone  
 (4) Root hair
102. In *Rhizophora*, roots are modified to form  
 (1) Tuberos roots  
 (2) Pneumatophores  
 (3) Stilt roots  
 (4) Storage roots

**103. Assertion (A) :** Anatomy of dicot leaf reveals the presence of vascular bundles of different size.

**Reason (R) :** The Veins vary in thickness in the reticulate venation.

- (1) Both (A) and (R) are true and (R) correctly explains (A)
- (2) (A) is true but (R) is false
- (3) Both (A) and (R) are true but (R) does not explain (A) correctly
- (4) Both (A) and (R) are false

**104.** \_\_\_\_\_ protect Bougainvillea from grazing animals.

- (1) Tendrils
- (2) Suckers
- (3) Offsets
- (4) Thorns

**105.** Swollen leaf base found in leguminous plants is called

- (1) Leaf blade
- (2) Petiole
- (3) Stipules
- (4) Pulvinus

**106.** The petiole expand and become green to synthesize food in

- (1) *Solanum*
- (2) *Pisum sativum*
- (3) Venus-fly trap
- (4) Australian *Acacia*

**107.** Mark the incorrect statement

- (1) Flower is a modified shoot
- (2) In cymose inflorescence, the main axis terminates in a flower
- (3) Flowers are borne on successive internodes on the stems and roots
- (4) When a shoot tip transforms into a flower, the flower is always solitary


**108.** Which of the following plant has epigynous flower?




- (1) Cucumber, Guava
- (2) Brinjal, Rose
- (3) Mustard, Lily
- (4) Peach, Plum

**109.** The ray florets of sunflower has

- (1) Superior ovary
- (2) Half inferior ovary
- (3) Half superior ovary
- (4) Inferior ovary

**110.** Match the Column-I with Column-II w.r.t. aestivation.

	Column-I		Column-II
a.		(i)	Valvate

b.		(ii)	Vexillary
c.		(iii)	Twisted
d.		(iv)	Imbricate

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

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

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

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

**111.** The stony hard part of the mango represents

- (1) Mesocarp
- (2) Epicarp
- (3) Endosperm
- (4) Endocarp

**112.** Which of the following plant has endospermic seed?

- (1) Bean, Watermelon
- (2) Gram, Petunia
- (3) Pea, Sunflower
- (4) Castor, Maize

**113.** Mark the following statements as **true (T)** or **false (F)** and select the correct option.

A. In *Salvia*, filaments of stamens are of variable lengths.

B. Epiphyllous statements are found in the flowers of tomato.

C. A sterile stamen is called staminode.

(1) A-(T), B-(F), C-(F)

(2) A-(T), B-(T), C-(F)

(3) A-(T), B-(F), C-(T)

(4) A-(F), B-(T), C-(F)

**114. Assertion (A) :** In grasses, the guard cells are dumb bell shaped.

**Reason (R) :** The thickening of cellulose is limited to middle part of the guard cells.

(1) Both (A) and (R) are true and (R) correctly explains (A)

(2) (A) is true but (R) is false

(3) Both (A) and (R) are true but (R) does not explain (A) correctly

(4) Both (A) and (R) are false

**115.** Identify the **incorrect** match.

(1) Orchid- Non endospermic seeds

(2) Aleurone layer- Protein rich

(3) Scutellum- Cotyledons of dicot seeds

(4) Maize-Seed coat fused with fruit wall

**116.** Select the incorrect statement(s) w.r.t. 'racemose inflorescence' and mark the correct option

- (A) Main axis continues to grow
  - (B) Main axis has limited growth
  - (C) Flowers are borne laterally in an acropetal succession
  - (D) Flower are borne in basipetal order.
- (1) Both (A) and (C)      (2) Both (B) and (D)  
 (3) Only (D)                      (4) Only (C)

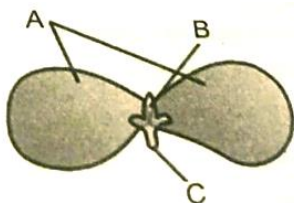
**117.** Lateral roots

- (1) Develop from pericycle
- (2) Are endogenous in origin
- (3) Are formed by dicots only
- (4) Both (1) and (2)

**118.** Cells are found to be very small among which of the given region of root-tip?

- (1) Region of maturation
- (2) Region of elongation
- (3) Region of meristematic activity
- (4) Region of root hair

**119.** Refer the given diagram and select the correct statement w.r.t. labelled parts A, B and C.



- (1) 'B' 'B' is radicle
- (2) 'C' represents plumule
- (3) B develops into root system on germination of seed
- (4) 'A' is often fleshy and full of reserve food materials

**120.** The scar on the seed coat through which the developing seeds were attached to the fruit is called

- (1) Hilum                              (2) Micropyle
- (3) Testa                              (4) Tegmen

**121.** In maize seed, the outer covering of endosperm separates the embryo by a proteinaceous layer, called

- (1) Scutellum                      (2) Aleurone layer
- (3) Plumule                              (4) Radicle

**122.** Stele is

- (1) All tissues on the inner side of the endodermis

- (2) All tissue layers outside the vascular cambium
- (3) A region which includes pericycle, vascular bundles and pith (if present)
- (4) Both (1) and (3)

**123.** The features of monocot leaves are

- (a) Mesophyll is not differentiated
  - (b) Vascular bundles are conjoint and closed
  - (c) Stomata are present on both surfaces
- (1) Only (a) & (b)                      (2) Only (b) & (c)  
 (3) Only (a) & (c)                      (4) All (a), (b) & (c)

**124.** Centripetal and centrifugal xylem are the important features of

- (1) Root and stem respectively
- (2) Exarch and endarch respectively
- (3) Endarch and exarch respectively
- (4) Both (1) & (2)

**125.** Open vascular bundle is a feature of

- (1) Dicot leaf                              (2) Dicot stem
- (3) Monocot stem                      (4) Monocot leaf

**126.** What is wrong about trichomes?

- (1) They may be secretory in some plants
- (2) Mainly help in preventing the water loss due to transpiration
- (3) They are usually multicellular
- (4) They help in gaseous exchange

**127.** Initiation of lateral roots and vascular cambium during secondary growth takes place in cells of

- (1) Pericycle                              (2) Epiblema
- (3) Cortex                              (4) Endodermis

**128.** Stomata are the component of

- (1) Epidermal tissue system
- (2) Ground tissue system
- (3) Conducting tissue system
- (4) Vascular tissue system

**129.** The specialized epidermal cells present in the vicinity of guard cells are called

- (1) Bulliform cells                      (2) Companion cells
- (3) Subsidiary cells                      (4) Endodermal cells

**130.** Root hairs are the

- (1) Multicellular elongations of epidermal cells
- (2) A cellular elongations of epidermal cells
- (3) Unicellular elongations of epidermal cells
- (4) Multicellular elongations of endodermal cells

**131.** Which of the following is true for endarch type of primary xylem?

- (1) Protoxylem lies towards the periphery of the organ
- (2) Metaxylem lies towards the periphery of the organ
- (3) Metaxylem lies towards the pith of the organ
- (4) Protophloem lies towards the pith of the organ

**132.** Which of the following is absent in most of the monocotyledons?

- (1) Phloem parenchyma
- (2) Tracheids
- (3) Vessels
- (4) Xylem parenchyma

**133.** Which of the following is not true for the vascular bundles of monocotyledonous stems?

- (1) Scattered in the ground tissue
- (2) Possess water-containing cavities

- (3) 'Ring' arrangement
- (4) Conjoint and closed

**134.** Vascular bundles surrounded by a sclerenchymatous bundle sheath is a feature of

- (1) Dicot root
- (2) Monocot root
- (3) Dicot stem
- (4) Monocot stem

**135.** Read the following statements w.r.t. pericycle and choose the suitable option

- (a) It is the outermost portion of stele, that may be parenchymatous or sclerenchymatous.
  - (b) It is absent in monocot stems.
  - (c) It is always single layered.
- (1) Only (a) is correct
  - (2) Only (b) is incorrect
  - (3) Only (c) is incorrect
  - (4) Both (a) and (b) are incorrect

## ZOOLOGY

136. Fill in the blanks.

1. A is utilized by the organism to indirectly breakdown nutrient molecule like glucose to derive B for performing various activities.

2. For catabolism, C has to be continuously provided to the cells and D produced by cells have to be released out

(1) A - energy, B - O<sub>2</sub> C - O<sub>2</sub> D - CO<sub>2</sub>

(2) A - O<sub>2</sub> B - O<sub>2</sub> C - CO<sub>2</sub> D - CO<sub>2</sub>

(3) A-energy, B - O<sub>2</sub> C - CO<sub>2</sub> D - CO<sub>2</sub>

(4) A - O<sub>2</sub> B-energy, C - O<sub>2</sub> D - CO<sub>2</sub>

137. The typical osmolarity of human blood is approximately

(1) 30 m Osmol L<sup>-1</sup>

(2) 100 m Osmol L<sup>-1</sup>

(3) 300 m Osmol L<sup>-1</sup>

(4) 500 m Osmol L<sup>-1</sup>

138. Arrange the given steps of expiration in the sequence of event occurring first.

I. Relaxation of diaphragm and sternum

II. Reduction of the pulmonary volume

III. Expulsion of air from the lungs

IV. Increase of intrapulmonary pressure

Choose the correct option.

(1) I-II-III - IV (2) I-II-IV - III

(3) IV - III - II - I (4) IV-II-III - I

139. Which of the following holds true for emphysema?

I. It is abnormal distension of bronchioles or alveolar sacs.

II. It occurs due to an allergic reaction to foreign substances.

III. It causes irreversible distension and loss of elasticity of alveoli.

IV. The surface area for gas exchange is greatly reduced.

V. The disease is completely curable.

(1) I, II and III (2) II, III and IV

(3) III, IV and V (4) I, III and IV

140. Choose the right sequential phenomena among the following during the delivery of O<sub>2</sub> from blood to tissues.

P: Absorption of CO<sub>2</sub> by the blood.

Q: Reaction of absorbed CO<sub>2</sub> with H<sub>2</sub>O to form H<sub>2</sub>CO<sub>3</sub> within RBC and its conversion into H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup> ions.

R: Reaction of absorbed CO<sub>2</sub> with H<sub>2</sub>O in plasma to form H<sub>2</sub>CO<sub>3</sub> and its conversion into H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup> ions.

S: Combination of H<sup>+</sup> with heme portion of HbO<sub>2</sub> to release O<sub>2</sub>

T: Combination of HCO<sub>3</sub><sup>-</sup> with heme portion HbO<sub>2</sub> to form reduced hemoglobin and release of O<sub>2</sub>

(1) P, Q, T

(2) P, R, S

(3) P, Q, S

(4) P, R, T

141. 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) Formation of oxyhemoglobin occurs on alveolar surface.

(ii) During gaseous exchange, the gases diffuse from high partial pressure to low partial pressure.

(iii) Carbon dioxide cannot be transported with hemoglobin.

(iv) Earthworm respire through parapodia.

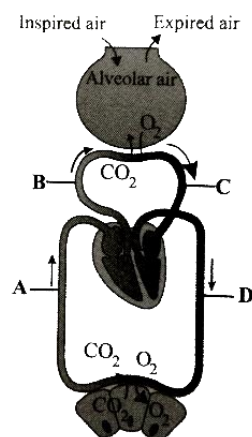
(1) (i)-T, (ii)-F, (iii)-T, (iv)-F

(2) (i)-F, (ii)-F, (iii)-T, (iv)-F

(3) (i)-F, (ii)-T, (iii)-F, (iv)-T

(4) (i)-T, (ii)-T, (iii)-F, (iv)-F

142. The given figure shows diagrammatic representation of exchange of gases at the alveolus and the body tissues with blood and transport of oxygen and carbon dioxide. Identify the blood vessels A to D.



	A	B	C	D
(1)	Systemic vein	Pulmonary artery	Pulmonary vein	Systemic artery
(2)	Systemic artery	Pulmonary artery	Pulmonary vein	Systemic vein
(3)	Pulmonary artery	Systemic vein	Pulmonary vein	Systemic artery
(4)	Systemic vein	Pulmonary vein	Pulmonary artery	Systemic artery

**143.** Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL respectively. What will be his expiratory capacity if the residual volume is 1200 mL?

- (1) 2700 mL                      (2) 1500 mL  
(3) 1700 mL                      (4) 2200 mL

**144.** Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively?

- (1) Inflammation of bronchioles; Decreased respiratory surface  
(2) Increased number of bronchioles; increased respiratory surface  
(3) Increased respiratory surface; Inflammation of bronchioles  
(4) Decreased respiratory surface; Inflammation of bronchioles

**145.** Fill in the blanks:

- (a) Breathing involves two stages: ...1.. during which atmospheric air is drawn in and .....2.... by which alveolar air is released out.  
(b) The movement of air into and out of the lungs is carried out by...3.. gradient between the lungs and the atmosphere.  
(c) Inspiration can occur if the pressure within lungs is ...4... than the atmosphere pressure i.e., there is a ...5... pressure in the lungs with respect to atmospheric pressure.  
(d) Expiration takes place when the intra-pulmonary pressure is ...6... than atmospheric pressure.
- (1) 1-expiration, 2-inspiration, 3-concentration, 4-lower, 5-positive, 6-higher  
(2) 1-inspiration, 2-expiration, 3-pressure, 4-higher, 5-positive, 6-lower  
(3) 1-inspiration, 2-expiration, 3-pressure, 4-higher, 5-negative, 6-lower  
(4) 1-inspiration 2-expiration, 3-pressure, 4-lower, 5-negative, 6-higher

**146.** Read the following statements and find out the incorrect statement.

- (a) The binding of CO<sub>2</sub> with hemoglobin is related to the partial pressure of CO<sub>2</sub>, PO<sub>2</sub> is a major factor which could affect this binding.  
(b) When PCO<sub>2</sub> is low and PO<sub>2</sub> is high as in the alveoli, more binding of CO<sub>2</sub> occurs, whereas when the PCO<sub>2</sub> is high and PO<sub>2</sub> low as in the tissues, dissolution of overline CO<sub>2</sub> from carbamino-hemoglobin takes place.  
(c) At the tissue site where partial pressure of CO<sub>2</sub> is high due to catabolism, CO<sub>2</sub> diffuses into blood (RBCs and plasma) and forms HCO<sub>3</sub><sup>-</sup> and H<sup>+</sup>. At the alveolar site where PCO<sub>2</sub> is low, the reaction proceeds in the opposite direction leading to the formation of CO<sub>2</sub> and H<sub>2</sub>O  
(d) Oxygen dissociation curve is highly useful in studying the effect of factor like PCO<sub>2</sub>, H<sup>+</sup> concentration, etc., on binding of O<sub>2</sub> with hemoglobin.

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

**147. Assertion (A):** Tidal Volume (TV) is the volume of air inspired or expired with each normal breath.

**Reason (R):** Adult person contains 500 mL expired or inspired volume of air with each normal breath.

- (1) Both (A) and (R) are true and (R) correctly explains (A)  
(2) (A) is true but (R) is false  
(3) Both (A) and (R) are true but (R) does not explain (A) correctly  
(4) Both (A) and (R) are false

**148. Assertion (A) :** The role of oxygen in the regulation of respiratory rhythm is quite insignificant.

**Reason (R) :** Increased pCO<sub>2</sub> and H<sup>+</sup> concentration inputs from chemoreceptors can activate respiratory rhythm centre to make necessary adjustments.

- (1) Both (A) and (R) are true and (R) correctly explains (A)  
(2) (A) is true but (R) is false  
(3) Both (A) and (R) are true but (R) does not explain (A) correctly  
(4) Both (A) and (R) are false

149. Read the following statements:

- (i) Plasma contain small amounts of minerals like  $\text{Na}^+$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{HCO}_3^-$  and  $\text{Cl}^-$ .
- (ii) Plasma contain 6-8% protein
- (iii) Blood does not clot in the blood vessels due to the presence of heparin.
- (iv) Plasma without clotting factors is called serum.
- (v) Increase in breathing rate as well as RBCs production occurs when a person dwelling in plain moves to high altitudes.

How many of the above statements are correct?

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

150. Read the following statements:

- (i) Monocytes are non-phagocytic
- (ii) Eosinophils have antihistaminic properties
- (iii) The number of eosinophils decrease during hay fever
- (iv) Heparin secreted by basophils is blood coagulant
- (v) Neutrophils can engulf and digest bacteria

Which of the above statements are correct?

- (1) (i), (ii) (2) (ii), (v)
- (3) (iii), (iv), (v) (4) (i), (ii), (iii)

151. Read the following statements:

- (i) Erythroblastosis fetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery first Rh +ve child
- (ii) Human RBC is non-nucleated, biconcave, circular or oval
- (iii) Prothrombin is synthesized in the liver in the presence of  $\text{Ca}^{2+}$ .
- (iv) RBCs are the least abundant blood cells in humans.
- (v) The descending order of percentage share of WBCs in human blood is Neutrophils → Lymphocytes → Monocytes → Eosinophils → Basophils

Which of the above statements are correct?

- (1) (i), (ii), (iii) (2) (i), (v)
- (3) (i), (iv), (v) (4) (ii), (iii)

152. Arrange the steps of mechanism of blood coagulation in sequence.

- I. Conversion of prothrombin into thrombin
- II. Coagulum formation
- III. Thrombokinase formation
- IV. Site of injury release tissue thromboplastins

V. Conversion of fibrinogen into fibrin

- (1) I → IV → III → II → V
- (2) III → IV → V → I → II
- (3) IV → III → I → V → II
- (4) IV → III → V → I → II

153. Assertion (A) : Thrombocytes are cell fragments produced from megakaryocytes.

Reason (R) : Platelets release a variety of substances, few of which are involved in blood coagulation.

- (1) Both (A) and (R) are true and (R) correctly explains (A)
- (2) (A) is true but (R) is false
- (3) Both (A) and (R) are true but (R) does not explain (A) correctly
- (4) Both (A) and (R) are false

154. Read the following statements w.r.t. heart and circulatory system:

- (i) Birds, mammals and crocodiles have a four chambered heart
- (ii) In amphibians and reptiles the left atrium receives deoxygenated blood
- (iii) Annelids have an open circulatory system
- (iv) In amphibians oxygenated and deoxygenated blood may get mixed in the ventricle but usually do not mix
- (v) Closed circulatory system is more advantageous than open one as the flow of fluid can be more precisely regulated

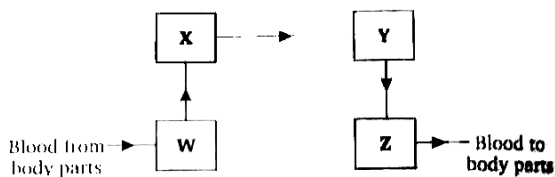
Which of the above statements are correct?

- (1) (i), (ii), (iii) (2) (ii), (iii)
- (3) (i), (v) (4) (iii), (iv), (v)

155. Arrange the following steps of cardiac cycle sequence:

- I. SA node generates action potential
  - II. Ventricular systole
  - III. Ventricular diastole
  - IV. Atrial systole
  - V. All four chambers of heart in relaxed state, Le joint diastole
- (1) I → II → III → IV → V
  - (2) V → IV → I → III → II
  - (3) IV → V → III → II → I
  - (4) V → I → IV → II → III

156. Identify right auricle (RA), left auricle (LA), right ventricle (RV) and left ventricle (LV) in the schematic plan of blood circulation show below



Options	W	X	Y	Z
(1)	RA	LA	RV	LV
(2)	RA	RV	LA	LV
(3)	RV	RA	LV	LA
(4)	LV	LA	RA	RV

157. The flow of oxygenated blood from the ascending aorta to the heart muscles and the return of deoxygenated blood from the heart muscles to the right atrium is called A. From the ascending aorta the right and left B supply oxygenated blood to the heart muscles. The deoxygenated blood from the heart wall is carried by the coronary veins to form C which carry deoxygenated blood to D.

	A	B	C	D
(1)	Pulmonary circulation	Coronary veins	Coronary sinus	Left atrium
(2)	Coronary circulation	Coronary arteries	Coronary sinus	Right atrium
(3)	Coronary circulation	Coronary sinus	Coronary arteries	Left atrium
(4)	Systemic	Coronary arteries	Coronary veins	Right atrium

158. Read the following statements:

- Adrenaline has no role in increasing the cardiac output
- A special neural centre in the medulla oblongata can moderate the cardiac function through ANS
- Neural signals through the sympathetic nerves can increase the rate of heart beat
- Parasympathetic neural signals decrease the rate of heart beat

(v) Parasympathetic nerve endings release acetylcholine that increases the cardiac output

Which of the above statements are correct?

- (i), (v)
- (ii), (iv), (v)
- (ii), (iii), (iv)
- (i), (ii)

159. What would be the cardiac output of a person having 70 heart beats per minute and a stroke volume of 60 ml?

- 360 mL
- 4200 mL
- 7200 mL
- 5000 mL

160. Given below are four statements (A-D) regarding human blood circulatory system

- Arteries are thick walled and have narrow lumen as compared to veins.
- Angina is acute chest pain when the blood circulation to the brain is reduced.
- Persons with blood group-AB can donate blood to any person with any blood group under ABO system.
- Calcium ions play a very important role in blood clotting.

Which two of the above statements are correct?

- A and D
- A and B
- B and C
- C and D

161. **Assertion (A)** : Clotting of blood in man occurs as a cascade of reactions.

**Reason (R)** : The physiological processes that occur in the clotting of human blood are successive stages to produce culminating effect.

- Both (A) and (R) are true and (R) correctly explains (A)
- (A) is true but (R) is false
- Both (A) and (R) are true but (R) does not explain (A) correctly
- Both (A) and (R) are false

162. Identify the correct statement(s) regarding the human kidney

- It is responsible for the storage of nutrients such as glycogen
- It concentrates the urine by actively transporting water from the filtrate.
- It produces more dilute urine, when the collecting ducts become less permeable to water.
- The kidney gets rid of urea from the body by secreting it into the descending arm of the loop of Henle.
- It responds to antidiuretic hormone by increasing urine output

VI. It responds to atrial natriuretic factor by decreasing urinary excretion.

VII. Kidney functions are controlled by negative feedback circuits involving ADH, RAAS and ANF.

- (1) II, IV and V                      (2) V and VI  
 (3) I, IV and VI                      (4) III and VII

163. Human urine is usually acidic because

- (1) hydrogen ions are actively secreted into the filtrate  
 (2) The sodium transporter exchanges one hydrogen ion for each sodium ion, in peritubular capillaries  
 (3) Excreted plasma proteins are acidic  
 (4) Potassium and sodium exchange generates acidity

164. In ureotelic animals :

- (1) Urea is released into the blood which is filtered and excreted out by the kidneys  
 (2) Ammonia produced by metabolism is converted into uric acid paste  
 (3) Both (1) and (2)  
 (4) Some amount of urea may be retained in the kidney matrix as stored source of nitrogen food reserve

165. Read the statements given below and choose the correct option.

- I. *Amphioxus* possess flame cells as excretory structure.  
 II. Protonephridia are found in rotifers.

- (1) Both I and II are correct  
 (2) Both I and II are incorrect  
 (3) I is correct and II is incorrect  
 (4) I is incorrect and II is correct

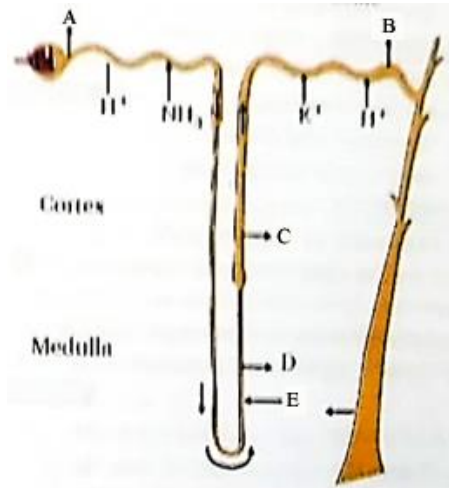
166. Life span of mammalian R.B.C. is

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

167. Which one of following is correct?

- (1) Filtration is selective process performed by glomerulus using the glomerular capillary blood pressure  
 (2) The Bowman's capsule encloses the glomerulus to form renal corpuscles  
 (3) Nitrogenous wastes are present in dialyzing fluid  
 (4) ANF cause vasoconstriction

168. Identify A, B, C, D and E w.r.t. reabsorption and secretion at different parts of nephron :



	A	B	C	D	E
(1)	HCO <sub>3</sub> <sup>-</sup>	Urea	NaCl	HCO <sub>3</sub> <sup>-</sup>	H <sub>2</sub> O
(2)	Urea	HCO <sub>3</sub> <sup>-</sup>	Urea	NH <sub>3</sub>	H <sub>2</sub> O
(3)	HCO <sub>3</sub> <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>	NaCl	NaCl	Urea
(4)	NaCl	Urea	HCO <sub>3</sub> <sup>-</sup>	HCO <sub>3</sub> <sup>-</sup>	NH <sub>3</sub>

169. Which of the following is correct?

- (1) The flow of filtrate in the two limbs of Henle's loop is in opposite directions thus forms a counter-current  
 (2) The flow of filtrate through the two limbs of vasa recta is in a counter-current pattern  
 (3) Both (1) and (2)  
 (4) The proximity between the Henle's loop and vasa recta, as well as the counter-current in them help in maintaining decreasing osmolarity towards inner medullary interstitium

170. Find out the correct sequence for the regulation of kidney function when there occurs an excessive loss of body fluid.

- I. ADH facilitates water reabsorption from distal tubule, thereby preventing diuresis  
 II. Release of ADH/vasopressin from neurohypophysis  
 III. Osmoreceptors get activated which stimulates hypothalamus

- (1) I → II → III                      (2) III → II → I  
 (3) III → I → II                      (4) II → III → I

171. Read the following statements:

- (i) Angiotensin-II, being a powerful vasoconstrictor increases the glomerular blood pressure and thereby GFR  
 (ii) About 1.5 litres of filtrate are formed with the release of 180 litres of urine per day by human kidneys

- (iii) Reabsorption is a non-selective process
- (iv) The tubular epithelial cells in different segments of nephron perform reabsorption only by active process
- (v) Tubular secretion helps in the maintenance of ionic and acid-base balance of body fluids

Which of the above statements are correct?

- (1) (i), (ii), (iii)                      (2) (ii), (iv)
- (3) (i), (v)                                (4) (iv), (v)

**172.** Read the following statements:

- (i) An individual who is fasting for a long time would excrete abnormal quantities of ketone bodies in urine
- (ii) Hemoglobin is normally not excreted in urine
- (iii) Excess of glucose secretion in urine is a condition called glycosuria
- (iv) In diuretic condition, excess volume of urine passes out
- (v) A human can survive even with one normal kidney if one of the kidney is surgically removed

How many of the above statements are correct?

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

**173.** Read the statements given below and choose the correct option.

- I. Atrial Natriuretic Factor (ANF) acts as a check on mechanism w.r.t. the renin-angiotensin regulation of kidney function.
- II. ADH is a vasodialator primarily.

- (1) Both I and II are correct
- (2) Both I and II are incorrect
- (3) I is correct and II is incorrect
- (4) I is incorrect and II is correct

**174. Assertion (A) :** During hemodialysis, cleared blood (urea free) is pumped back to the body through a vein after adding anti-heparin.

**Reason (R) :** Heparin is an anticoagulant.

- (1) Both (A) and (R) are true and (R) correctly explains (A)
- (2) (A) is true but (R) is false
- (3) Both (A) and (R) are true but (R) does not explain (A) correctly
- (4) Both (A) and (R) are false

**175.** How many statements are correct

- (a) Total volume of air a person can inspire after forceful expiration is inspiratory capacity
- (b) Volume of air remain in lungs after forceful expiration is functional residual capacity

- (c) Total volume of air accommodated in the lungs at the end of forced inspiration is total lung capacity

- (d) The maximum volume of air a person can breathe in after normal expiration is vital capacity

- (e) The volume of air involved in breathing movements can be estimated by using a respirometer which helps in clinical assessment of pulmonary functions

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

**176.** How many of them are ureotelic?

**Bony fishes, Aquatic amphibians, Aquatic insects, Mammals, Cartilaginous fishes, Reptiles, Bird, Snails**

- (1) – 5                                        (2) – 3
- (3) – 8                                        (4) 2

**177.** Arrange in decreasing order according to their percentage

- (1) Neutrophil > R.B.C. > Lymphocyte > Monocyte
- (2) R.B.C > Neutrophil > Lymphocyte > Monocyte
- (3) R.B.C > Blood platelets > Neutrophil > Lymphocyte
- (4) Lymphocyte > Neutrophil > Basophil > Audiophile

**178.** Antennal gland is excretory organ of

- (1) Crustacean                              (2) Insects
- (3) Millipede                                (4) Centipede

**179.** Match the following

	Column I		Column II
A	Interatrial spectrum	(i)	Thick walled
B	Atrio ventricular spectrum	(ii)	Thin muscular wall
C	Interventricular spectrum	(iii)	Thick fibrous tissue

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

**180.** A decrease in blood pressure volume will not cause the release of

- (1) Aldosterone                              (2) ADH
- (3) Renin                                        (4) ANF



