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MM : 720

NCERT Booster Test Series-RM(P1)2324-T03A

Time : 200 Min.

Topics Covered:

Physics : System of Particles and Rotational Motion, Gravitation, Mechanical Properties of Solids, Mechanical Properties of Fluids

Chemistry : Thermodynamics, Equilibrium, Redox Reactions, Electrochemistry

Botany : Anatomy of Flowering Plants, Plant Kingdom

Zoology : Excretory Products & their Elimination, Locomotion & Movement, Neural Control & Coordination

General Instructions :

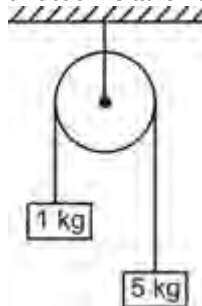
1. There are two sections in each subject, i.e. **Section-A & Section-B**. You have to attempt all **35 questions** from Section-A & only **10 questions** from Section-B out of 15.
2. Each question carries **+4 marks**. For every wrong response, **-1 mark** shall be deducted from the total score. Unanswered/unattempted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

PHYSICS**SECTION-A**

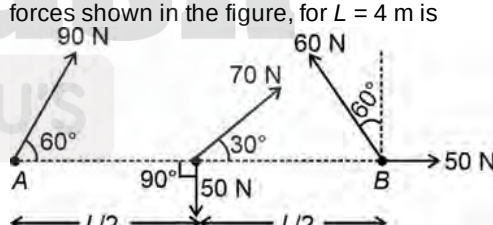
1. Moment of inertia of a body does not depend on
 - (1) Linear velocity
 - (2) Angular velocity
 - (3) Nature of distribution of mass
 - (4) Both (1) and (2)
2. Two particles A and B of mass 1 kg and 4 kg respectively approach each other due to their mutual gravitational force only. Then the ratio of acceleration of A to B at any instant is
 - (1) 4 : 1
 - (2) 2 : 1
 - (3) 1 : 2
 - (4) 1 : 4
3. The radius of gyration of a hollow sphere of radius r , about a certain axis is r . The distance of this axis from the centre of sphere is
 - (1) $\sqrt{\frac{61}{19}} r$
 - (2) $\sqrt{12} r$
 - (3) $\sqrt{5} r$
 - (4) $\frac{r}{\sqrt{3}}$
4. A vessel of water is placed on the floor of an elevator. How does the pressure at the bottom of the vessel change if the elevator moves up with uniform acceleration a ?
 - (1) Increase by hpa
 - (2) Decrease by hpa
 - (3) Increase by $hpa + hpa$
 - (4) Decrease by $hpa + hpa$

5. The change in potential energy when a body of mass m is raised to a height $3R$ from the surface of earth will be (R -radius of earth)
- $\frac{3}{2}mgR$
 - $3mgR$
 - $\frac{3}{4}mgR$
 - $\frac{9}{5}mgR$
6. The fractional change in volume of a glass slab, when subjected to a hydraulic pressure of 1000 bar is approximately (given $B_{\text{glass}} = 35 \times 10^9 \text{ N/m}^2$)
- 0.03
 - 0.013
 - 0.003
 - 0.025
7. A rigid body has translational as well as rotational motion. If a force couple is applied on the object then, which of the following quantities remains unchanged due to the force couple?
- Rotational kinetic energy
 - Translation kinetic energy
 - Total kinetic energy
 - Angular momentum about centre of mass
8. Which of the following relation(s) is correct :
 $\vec{\alpha}$: Angular acceleration, $\vec{\tau}$: torque,
 \vec{F} : force, \vec{r} : position vector
- $\vec{\tau} \cdot \vec{F} = 0$
 - $\vec{\tau} \cdot \vec{\alpha} > 0$
 - $\vec{\tau} \times \vec{\alpha} = 0$
 - All of these
9. The centre of mass of system of particles is at the origin. It follows that
- The number of particles to right of origin is equal to number of particles to the left
 - Total mass of the particles to right of origin is equal to total mass to the left of origin
 - The number of particles on X axis should be equal to number of particles on Y -axis
 - Sum of mass moments of all particles about origin must be zero

10. The acceleration of centre of mass of system with respect to the 5 kg block (Assume pulley and strings are ideal and the upward direction is taken to be positive)



- Zero
 - g
 - $\frac{2g}{9}$
 - $-\frac{2g}{3}$
11. A particle of mass m is moving with velocity \vec{v} along a line $y = x + 4$ then angular momentum of particle about origin O is
- $2mv(-\hat{j})$
 - $2\sqrt{2}mv(-\hat{k})$
 - $\sqrt{2}mv(\hat{j})$
 - $\frac{1}{2\sqrt{2}}mv(\hat{i})$
12. Two soap bubbles of radii 3 cm and 4 cm are kept in touch with each other. What is radius of curvature of interface?
- 5 cm
 - 7 cm
 - 12 cm
 - 2 cm
13. If the load of a wire is increases such that its stress is twice as that of previous, then the new value of Young's modulus is
- Increases
 - Remain same
 - Decreases
 - May increases or decreases
14. The terminal velocity of a sphere moving through a viscous liquid is
- Directly proportional to radius of the sphere
 - Directly proportional to square of radius of the sphere
 - Inversely proportional to radius of the sphere
 - Inversely proportional to square of radius of the sphere

15. Which of the following is not the application of Pascal's law?
 (1) Hydraulic lift
 (2) Hydraulic brakes
 (3) Hydraulic machine
 (4) Venturimeter
16. A rigid body can be hinged about any point on the x-axis. When it is hinged such that the hinge is at x, the moment of inertia is given by $I = x^2 - 24x + 48$. The x-coordinate of centre of mass is
 (1) 6
 (2) 12
 (3) 24
 (4) 4
17. A wire can be broken by suspending a load of 200 kg-wt. The force required to break the wire of same material and of twice the radius of cross-section is
 (1) 200 kg-wt
 (2) 400 kg-wt
 (3) 800 kg-wt
 (4) 100 kg-wt
18. If potential at surface of earth is taken as zero, find potential at centre of earth. (Symbols have usual meanings)
 (1) $-\frac{GM}{2R}$
 (2) $\frac{3}{2} \frac{GM}{R}$
 (3) $-\frac{3}{2} \frac{GM}{R}$
 (4) $\frac{GM}{2R}$
19. Water flows at a pressure of 4×10^4 Pa with a velocity of 2 m s^{-1} through a horizontal pipe of an area of cross-section 0.02 m^2 . At another point of the same pipe, the area of cross-section is 0.01 m^2 , the pressure at this point is
 (1) 4.6×10^4 Pa
 (2) 39,994 Pa
 (3) 3.4×10^4 Pa
 (4) 40,006 Pa
20. Elastic potential energy density of a stretched wire is proportional to
 (1) (Stress)²
 (2) (Strain)
 (3) (Stress)
 (4) (Strain)⁻¹
21. To what depth below the surface of sea should a rubber ball is taken so as to decrease its volume by 0.2%? (Bulk modulus of rubber is $9.8 \times 10^8 \text{ N/m}^2$ and $g = 9.8 \text{ m/s}^2$)
 (1) 100 m
 (2) 150 m
 (3) 200 m
 (4) 50 m
22. Assume that force of gravitation varies as $F \propto \frac{1}{r}$. Then orbital speed of a satellite in a circular orbit of radius "r" is proportional to
 (1) r^0
 (2) $\frac{1}{\sqrt{r}}$
 (3) $\frac{1}{r}$
 (4) \sqrt{r}
23. A wire of length l is stretched by a force F to cause an extension x. Another wire of same material and same volume but 50% larger in length than the first wire, the force required for the same extension will be
 (1) $\frac{4}{9} F$
 (2) $\frac{9}{4} F$
 (3) $\frac{2}{3} F$
 (4) $\frac{3}{2} F$
24. The net torque about pivot A provided by the forces shown in the figure, for $L = 4 \text{ m}$ is

 (1) 90 Nm
 (2) 180 Nm
 (3) 270 Nm
 (4) 750 Nm
25. A wooden block weighs 10 N in air and 8 N when immersed in a liquid. The force of buoyancy (in N) is
 (1) $\frac{4}{5}$
 (2) 2
 (3) 18
 (4) 1

26. In a uniform solid sphere of mass M and radius R , a spherical cavity is created such that the center of the cavity does not coincide with the center of the original solid sphere. The gravitational field inside the cavity will be

(1) Uniform in magnitude
(2) Uniform in direction
(3) Zero
(4) Both (1) and (2)

27. A stick is thrown in air and lands on the ground at some distance from the thrower. The centre of mass of the stick will move along a parabolic path (neglect air resistance)

(1) In all cases
(2) Only if stick is uniform
(3) Only if stick has linear motion but no rotational
(4) Only if stick has shape such that centre of mass is located at some point on it

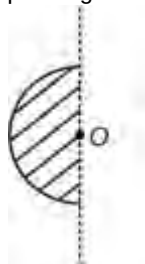
28. A force F makes the length of wire, 1.001 times the original length of wire of cross-section A . The Young's modulus of material of wire is

(1) $\frac{F}{A}$
(2) $\frac{1000F}{A}$
(3) $\frac{500F}{A}$
(4) $\frac{100F}{A}$

29. The ratio of time taken to completely empty and half empty of a tank filled with a liquid is

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

30. The moment of inertia of the given half disc of mass m and radius r about an axis passing through centre O and in its plane is



(1) mr^2
(2) $\frac{mr^2}{4}$
(3) $\frac{mr^2}{8}$
(4) $\frac{mr^2}{2}$

31. A point mass (m) is located at $(0, a)$ along y -axis. Where should the $2m$ mass be kept, so that centre of mass lies at origin.

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

32. A force $\vec{F} = 4\hat{i} - 5\hat{j} + 3\hat{k}$ is acting at point $\vec{r}_1 = \hat{i} + 2\hat{j} + 3\hat{k}$. Then, the torque of force \vec{F} about point $\vec{r}_2 = 3\hat{i} - 2\hat{j} - 3\hat{k}$ is

(1) Zero
(2) $42\hat{i} + 30\hat{j} + 6\hat{k}$
(3) $42\hat{i} + 30\hat{j} - 6\hat{k}$
(4) $42\hat{i} - 30\hat{j} + 6\hat{k}$

33. The moment of inertia of a thin uniform rod of mass M and length L about an axis perpendicular to its length is $\frac{ML^2}{10}$. The distance of the axis from the centre of the rod is

(1) $\frac{L}{2}$
(2) $\frac{L}{\sqrt{3}}$
(3) $\frac{L}{2\sqrt{15}}$
(4) $\frac{L}{\sqrt{15}}$

34. Two objects of masses m & $2m$ are at rest at an infinite distance. They move towards each other under mutual gravitational attraction. Then at separation r , velocity of mass m is

- (1) $\sqrt{\frac{8Gm}{3r}}$
- (2) $\sqrt{\frac{32Gm}{5r}}$
- (3) $\sqrt{\frac{2Gm}{3r}}$
- (4) $\sqrt{\frac{Gm}{3r}}$

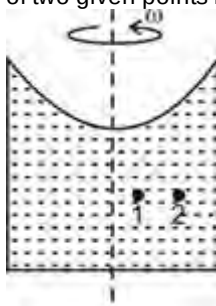
35. Compressibility of a substance is reciprocal to

- (1) Poisson's ratio
- (2) Young's modulus
- (3) Modulus of rigidity
- (4) Bulk modulus



SECTION-B

36. Select the correct option, regarding pressure of two given points in diagram.



- (1) $P_1 > P_2$
- (2) $P_1 < P_2$
- (3) $P_1 = P_2$
- (4) It will depend on sense of rotation of beaker

37. If W_1 is the weight of a solid ball in air and W_2 is its weight inside water then relative density of the solid material is

- (1) $\frac{W_2}{W_1}$
- (2) $\frac{W_1}{W_1 - W_2}$
- (3) $\frac{W_1}{W_2}$
- (4) $\frac{W_2}{W_1 - W_2}$

38. The equation of continuity of an ideal fluid flow in a tube is based on

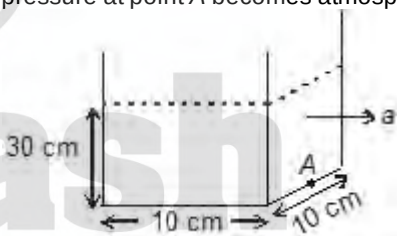
- (1) Law of conservation of mass
- (2) Law of conservation of area
- (3) Law of conservation of energy
- (4) Law of conservation of momentum

39. If the gravitational force varies inversely as the 4th power of distance, then the time period of a planet in circular orbit of radius r around the sun will be proportional to

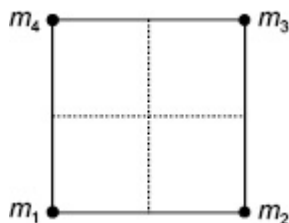
- (1) r^2
- (2) $\frac{1}{r}$
- (3) $r^{5/2}$
- (4) $r^{3/2}$

40. If a boy standing on a stationary boat in a pond, moves on the boat to his right, then the

- (1) Boat also moves to his right
- (2) Boat remains stationary
- (3) Centre of mass of the system (boat + boy) moves to his left
- (4) Centre of mass of the system (boat + boy) remains stationary

41. A wheel initially at rest is rotated with uniform angular acceleration. The wheel rotates through angle θ_1 in first 10 seconds and through additional angle of θ_2 in next 10 seconds. The ratio $\left(\frac{\theta_2}{\theta_1}\right)$ is
- 4 : 1
 - 3 : 1
 - 4 : 3
 - 16 : 1
42. Two point objects of masses 2 kg and 4 kg are separated by some distance r . Keeping the distance fixed, how much mass should be transferred from 4 kg to 2 kg, so that gravitational force between them becomes maximum?
- 0.5 kg
 - 1 kg
 - 1.5 kg
 - 2 kg
43. Three identical spheres each of mass ' m ' and radius R are placed touching each other so that their centres A , B and C lie on a straight line. The position of their centre of mass from centre of A is
- $2R$
 - $3R$
 - $\frac{5R}{3}$
 - $\frac{2R}{3}$
44. A glass capillary tube closed from top and of inner diameter 0.28 mm is lowered vertically into water in a vessel. The pressure to be applied on the water in the capillary tube so that water level in the tube is same as that in the vessel in N/m^2 is [surface tension of water = 0.07 N/m , atm. Pressure = 10^5 N/m^2]
- 10
 - 99×10^3
 - 100×10^3
 - 101×10^3
45. Gases possess
- Only bulk modulus
 - Only bulk modulus and Young's modulus
 - Only Young's modulus and modulus of rigidity
 - Only bulk modulus and modulus of rigidity
46. A glass slab is subjected to an excess pressure of 10 atm. The fractional change in its volume is (Bulk modulus of glass = $37 \times 10^9 \text{ Nm}^{-2}$, 1 atm = $1 \times 10^5 \text{ Nm}^{-2}$)
- 2.7×10^{-2}
 - 2.7×10^{-3}
 - 2.7×10^{-4}
 - 2.7×10^{-5}
47. Assertion : When external torque on a body is zero then it must be in rotational equilibrium
Reason : When net force acting on a body is zero then its angular momentum must remain constant
- Both A and R are true and R is the correct explanation of A
 - Both A and R are true but R is not the correct explanation of A
 - A is true but R is false
 - Both A and R are false
48. A container of square base of dimension (10 cm \times 10 cm) and of sufficiently long height contains a liquid upto a height 30 cm as shown in figure. The minimum horizontal acceleration of the container such that the pressure at point A becomes atmospheric is
- 
- 10 g
 - 6 g
 - 4 g
 - 2 g

49. Four particles of masses $m_1 = 2m$, $m_2 = 4m$, $m_3 = m$ and m_4 are placed at four corners of a square. What should be the value of m_4 so that the centre of mass of all the four particles are exactly at the centre of the square?



- (1) $2m$
 (2) $8m$
 (3) $6m$
 (4) Not possible for any value of m_4
50. If g be the acceleration due to gravity at the surface of earth, then what will be its value at depth 64 km below the surface of earth? (Radius of earth = 6400 km)

- (1) $\left(\frac{99}{100}\right)g$
 (2) $\left(\frac{9}{10}\right)g$
 (3) $\frac{g}{10}$
 (4) $\left(\frac{100}{9}\right)g$



SECTION-A

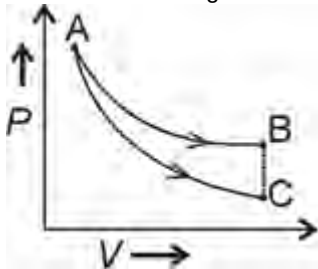
51. 100 ml 10^{-4} M HCl is mixed with 200 ml 10^{-4} M NaOH and the volume is made upto 1 litre. The pH of the final solution will be
- (1) 9
 (2) 5
 (3) 8
 (4) 7
52. Reaction for which $K_p > K_c$ at 27°C temperature is
- (1) $\text{H}_2(\text{g}) + \text{I}_2(\text{g}) \rightleftharpoons 2\text{HI}(\text{g})$
 (2) $2\text{NH}_3(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 3\text{H}_2(\text{g})$
 (3) $2\text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$
 (4) $\text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}) \rightleftharpoons \text{PCl}_5(\text{g})$

53. If the equilibrium constant for the reaction $\text{N}_2 + 3 \text{H}_2 \rightleftharpoons 2 \text{NH}_3$ is K , then the equilibrium constant for the reaction $\text{NH}_3 \rightleftharpoons \frac{1}{2} \text{N}_2 + \frac{3}{2} \text{H}_2$ is
- K
 - \sqrt{K}
 - $\frac{1}{\sqrt{K}}$
 - K^2
54. The ratio of salt to base is 10 : 1 for a basic buffer. If the pK_b of base is 5, then the pOH of buffer solution is
- 5
 - 6
 - 8
 - 9
55. At equilibrium, $\text{PCl}_5(\text{g}) \rightleftharpoons \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g})$, the observed molecular weight of PCl_5 is 124 g mol^{-1} at 250°C . The degree of dissociation of PCl_5 at 250°C will be (Molar mass of $\text{PCl}_5 = 208.5 \text{ g mol}^{-1}$)
- 46%
 - 68%
 - 54%
 - 42%
56. CaF_2 has solubility $1.56 \times 10^{-3} \text{ g}$ per 100 mL of solution at 25°C . Its solubility product is (Atomic mass $\text{Ca} = 40$, $\text{F} = 19$)
- 2×10^{-4}
 - 3.2×10^{-11}
 - 8×10^{-12}
 - 6.24×10^{-9}
57. 20 g CaCO_3 is taken in a 10L container at 827°C . For the equilibrium $\text{CaCO}_3(\text{s}) \rightleftharpoons \text{CaO}(\text{s}) + \text{CO}_2(\text{g})$, $K_p = 1.1$ at 827°C . Find the percentage of CaCO_3 that remains unreacted. (Given $R = 0.08 \text{ L atm K}^{-1} \text{ mol}^{-1}$)
- 28%
 - 37.5%
 - 12.5%
 - 27.5%
58. For the following equilibrium $\text{NH}_2\text{CO}_2\text{NH}_4(\text{s}) \rightleftharpoons 2\text{NH}_3(\text{g}) + \text{CO}_2(\text{g})$ K_p is found to be 1.185 at 400 K. Hence, partial pressure of NH_3 and CO_2 at equilibrium are respectively
- 2.0, 1.5 atm
 - 1.0, 2.0 atm
 - 1.33, 0.66 atm
 - 0.66, 1.33 atm
59. If at 25°C , $K_a(\text{HX})$ is 1×10^{-5} , then the hydrolysis constant of NaX will be
- 5×10^{-7}
 - 1×10^{-9}
 - 5×10^{-8}
 - 4×10^{-5}
60. Select the incorrect statement at equilibrium.
- Equilibrium is possible in closed system only
 - Both the opposing processes occur at the same rate
 - Concentration of reactants always become equal to the concentration of products
 - All measurable properties of the system remain constant
61. If internal energy of an ideal gas decreases by same amount as work done by the system, the process is
- Cyclic
 - Isothermal
 - Adiabatic
 - Isolated
62. The amount of heat required to raise the temperature of 21 g of aluminium from 250 K to 350 K is (Specific heat of aluminium is $0.9 \text{ J } (^\circ\text{C})^{-1} \text{ g}^{-1}$)
- 1590 J
 - 2010 J
 - 1890 J
 - 2400 J
63. The enthalpy of atomisation of CCl_4 is 450 kJ/mol and enthalpy of atomisation of COCl_2 is 600 kJ/mol. The bond energy of $\text{C} = \text{O}$ bond is
- 125 kJ
 - 375 kJ
 - 225 kJ
 - 300 kJ
64. Which among the following is an exothermic process?
- Melting of ice
 - Sublimation of camphor
 - Condensation of steam
 - Vapourisation of water

65. Under isothermal condition, a gas at 50°C expands from 2.5 L to 3.5 L against a constant external pressure of 4 atm. The work done by the gas is

(1) -603.4 J
 (2) -312.6 J
 (3) -820 J
 (4) -405.2 J

66. Consider the following reversible changes AB (Isothermal) and AC (Adiabatic) for monoatomic ideal gas



Then the incorrect statement among the following is

- (1) For same final volume, $|W|_{\text{adia}} < |W|_{\text{iso}}$
 (2) $T_A = T_B$ and $T_B > T_C$
 (3) Molar heat capacity for path AB < molar heat capacity for path AC
 (4) $\Delta U_{AB} > \Delta U_{AC}$ and $Q_{AB} > Q_{AC}$

67. Select the correct option(s) among the following.

(1) Magnitude of $W_{\text{reversible}} > W_{\text{irreversible}}$ for expansion
 (2) Work done in free expansion of gas is always zero
 (3) Slope of reversible P-V curve : Adiabatic process > Isothermal process
 (4) All of these

68. Enthalpy of neutralisation of four acids A, B, C and D with NaOH are -10.5 , -13.7 , -5.9 and $-12.7\text{ kcal eq}^{-1}$ respectively. Out of A, B, C and D strongest acid is

(1) C
 (2) A
 (3) D
 (4) B

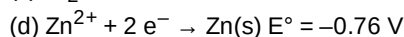
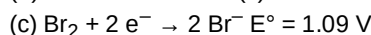
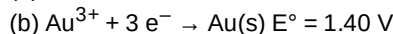
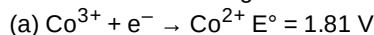
69. Which among the following is a path function?

(1) U
 (2) $U+PV$
 (3) $H-TS$
 (4) W

70. Third law of thermodynamics states that

(1) The entropy of any pure crystalline substance approaches zero at absolute zero temperature
 (2) For an isolated system, entropy will increase in the direction of spontaneity
 (3) If a reaction takes place in several steps then its standard reaction enthalpy is the sum of the standard enthalpies of the intermediate steps
 (4) The energy of an isolated system is constant

71. Consider the following half cell reactions



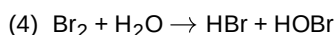
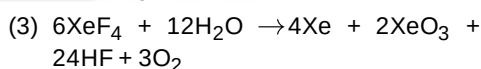
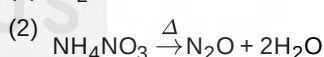
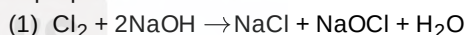
The strongest oxidising and reducing species respectively are

(1) Co^{2+} and Zn^{2+}
 (2) Co^{3+} and Zn
 (3) Br^{-} and Zn
 (4) Au and Co^{2+}

72. Electrolysis of acidified water using platinum electrodes gives

(1) H_2O_2
 (2) $\text{O}_2(\text{g})$
 (3) $\text{H}_2(\text{g})$
 (4) Both (2) and (3)

73. Select the reaction which is not a disproportionation reaction?



74. Oxidation states of S in $\text{Na}_2\text{S}_2\text{O}_3$, SF_6 and SO_2 are respectively

(1) +3, +6, +2
 (2) +2, +6, +3
 (3) +2, +6, +4
 (4) +3, +6, +4

75. For the balanced redox reaction

$$a\text{MnO}_4^{-} + b\text{I}^{-} + c\text{H}^{+} \rightarrow x\text{Mn}^{2+} + y\text{I}_2 + z\text{H}_2\text{O}$$

a, b and z respectively are

(1) 5, 4 and 3
 (2) 16, 5 and 8
 (3) 2, 10 and 8
 (4) 2, 10 and 6

76. A : Cu_2O can act both as an oxidant and a reductant.
 R : $\text{Cu}^+(\text{aq})$ cannot undergo disproportionation to form $\text{Cu}^{2+}(\text{aq})$ and Cu .
 (1) If both Assertion & Reason are true and the reason is the correct explanation of the assertion, then mark (1)
 (2) If both Assertion & Reason are true but the reason is not the correct explanation of the assertion, then mark (2)
 (3) If Assertion is true statement but Reason is false, then mark (3)
 (4) If both Assertion and Reason are false statements, then mark (4)
77. Equivalent weight of KMnO_4 (Molar mass = M) in acidic medium is
 (1) $\frac{M}{5}$
 (2) $\frac{M}{3}$
 (3) $\frac{M}{1}$
 (4) $\frac{M}{6}$
78. For strong electrolytes NaCl , NaOH and BaCl_2 , the molar conductivities at infinite dilution (in $\text{S m}^2 \text{mol}^{-1}$) are x, y and z respectively. The molar conductivity of Ba(OH)_2 at infinite dilution (in $\text{S m}^2 \text{mol}^{-1}$) will be
 (1) $z - 2y + 2x$
 (2) $2z - x + y$
 (3) $z - 2x + 2y$
 (4) $z - 2x - 2y$
79. For strong electrolyte, variations of molar conductivity with concentration is given by equation
 (1) $\lambda_m = \lambda_m^o + A\sqrt{C}$
 (2) $\lambda_m^o = \lambda_m + A\sqrt{C}$
 (3) $\lambda_m = \lambda_m^o + A\sqrt[3]{C}$
 (4) $\lambda_m^o = \lambda_m + A\sqrt[3]{C}$
80. The Λ_m^o value for Mg(OH)_2 is
 (Given : $\lambda_{\text{Mg}^{2+}}^o = 106 \text{ S cm}^2 \text{mol}^{-1}$)
 $\lambda_{\text{OH}^-}^o = 199.1 \text{ S cm}^2 \text{mol}^{-1}$)
 (1) $504.2 \text{ S cm}^2 \text{mol}^{-1}$
 (2) $292.2 \text{ S cm}^2 \text{mol}^{-1}$
 (3) $305.1 \text{ S cm}^2 \text{mol}^{-1}$
 (4) $610.2 \text{ S cm}^2 \text{mol}^{-1}$
81. If $0.01 \text{ M CH}_3\text{COOH}$ has molar conductance $19.5 \text{ ohm cm}^2 \text{mol}^{-1}$ then its degree of dissociation will be [Given: $\lambda_m^o(\text{H}^+)$ and $\lambda^o(\text{CH}_3\text{COO}^-)$ as 349.1 and $40.9 \text{ S cm}^2 \text{mol}^{-1}$ respectively]
 (1) 0.05
 (2) 0.08
 (3) 0.02
 (4) 0.1
82. A : In a Daniel cell, if concentrations of Cu^{2+} and Zn^{2+} ions are doubled, the emf of the cell will be doubled.
 R : Emf of the cell is directly proportional to the concentration of ions.
 (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Both Assertion and Reason are false statements
83. What is the product of electrolysis of $\text{KNO}_3(\text{aq})$ using Pt electrodes?
 (1) K, NO_2
 (2) H_2, NO_2
 (3) K, O_2
 (4) H_2, O_2
84. Mass of silver deposited at cathode by passage of 9.65 A current for 1000 sec is ($\text{Ag} = 108 \text{ u}$)
 (1) 27
 (2) 54
 (3) 10.8 g
 (4) 216 g
85. Three faradays of electricity were passed through $\text{AgNO}_3(\text{l})$, $\text{CuSO}_4(\text{l})$ and $\text{AlCl}_3(\text{l})$ kept in three different vessels using Pt electrodes. The ratio of the moles of Ag, Cu and Al deposited will be
 (1) 2 : 3 : 6
 (2) 6 : 3 : 2
 (3) 1 : 2 : 3
 (4) 3 : 2 : 1

SECTION-B

86. For the cell reaction
 $\text{Ni(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Ni}^{2+}(\text{aq}) + 2\text{Ag(s)}$
 $E_{\text{cell}} = 1.05 \text{ V}$ at 298 K. The standard Gibbs energy ($\Delta_r G^\circ$) of the cell reaction is [Given that Faraday Constant (F) = 96500 C mol⁻¹]
 (1) -101.32 kJ mol⁻¹
 (2) 101.32 kJ mol⁻¹
 (3) 202.65 kJ mol⁻¹
 (4) -202.65 kJ mol⁻¹
87. The correct relation between E_{cell}^0 and K_{eq} is
 (1) $\log K_{\text{eq}} = \frac{nE_{\text{cell}}^0}{0.0591}$
 (2) $\log K_{\text{eq}} = \frac{0.0591E_{\text{cell}}^0}{n}$
 (3) $\log K_{\text{eq}} = 0.0591nE_{\text{cell}}^0$
 (4) $K_{\text{eq}} = \frac{0.0591E_{\text{cell}}^0}{n}$
88. In mercury cells, cathode used is
 (1) Paste of HgO and carbon
 (2) Paste of KOH and ZnO
 (3) Pb
 (4) PbO₂
89. In H₂-O₂ fuel cell, the overall cell reaction is
 (1) $\text{H}_2\text{O(l)} \rightarrow \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$
 (2) $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O(l)}$
 (3) $2\text{H}_2\text{O(l)} \rightarrow 2\text{H}_2(\text{g}) + \text{O}_2(\text{g})$
 (4) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O(l)}$
90. If equilibrium constant of a reaction is 1000 at 27°C, then the standard Gibbs energy change for the reaction will be
 (1) -15.2 kJ
 (2) -25.5 kJ
 (3) +15.2 kJ
 (4) -17.2 kJ
91. At 27°C latent heat of fusion of compound is 3000 J g⁻¹. Entropy change during fusion is
 (1) 10 J g⁻¹K⁻¹
 (2) 10 kJ g⁻¹K⁻¹
 (3) 11.1 J g⁻¹K⁻¹
 (4) 111.1 J g⁻¹K⁻¹
92. The correct relation between $\Delta S_{\text{surrounding}}$ and ΔH_{system} for a reversible process is
 (1) $\Delta S_{\text{surr}} = \frac{\Delta H_{\text{sys}}}{T}$
 (2) $\Delta S_{\text{surr}} = \Delta H_{\text{sys}} + T$
 (3) $\Delta S_{\text{surr}} = \Delta H_{\text{sys}} - T$
 (4) $\Delta S_{\text{surr}} = \frac{-\Delta H_{\text{sys}}}{T}$
93. **Assertion (A):** For an adiabatic expansion process, work done by the system is equal to the change in internal energy.
Reason (R): In adiabatic process, there is no heat exchange between system and surrounding.
 (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
 (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
 (3) Assertion is true statement but Reason is false
 (4) Both Assertion and Reason are false statements
94. $\text{C(s)} + \text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + X \text{ kJ}$
 $2\text{CO(g)} + \text{O}_2(\text{g}) \rightarrow 2\text{CO}_2(\text{g}) + Y \text{ kJ}$
 The enthalpy of formation of CO is
 (1) $X - Y$
 (2) $2X - Y$
 (3) $X - \frac{Y}{2}$
 (4) $\frac{Y}{2} - X$
95. For the redox reaction,
 $x\text{Fe}^{2+} + y\text{Cr}_2\text{O}_7^{2-} + z\text{H}^+ \rightarrow \text{Fe}^{3+} + \text{Cr}^{3+} + \text{H}_2\text{O}$,
 x, y, z are respectively
 (1) 3, 1, 4
 (2) 6, 1, 7
 (3) 6, 2, 14
 (4) 6, 1, 14
96. The oxidation state of Mn in MnO_4^{2-} is
 (1) +8
 (2) +6
 (3) +7
 (4) +5

97. A : AlCl_3 acts as a Lewis acid.
R : In AlCl_3 molecule central atom has incomplete octet.
- (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
 - (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
 - (3) Assertion is true statement but Reason is false
 - (4) Both Assertion and Reason are false statements
98. Which one of the following pairs of solution will not act as an acidic buffer?
- (1) H_2CO_3 and Na_2CO_3
 - (2) H_2SO_4 and Na_2SO_4
 - (3) CH_3COOH and CH_3COONa
 - (4) HCN and NaCN
99. pH of saturated solution of Ca(OH)_2 is (K_{sp} of $\text{Ca(OH)}_2 = 4 \times 10^{-6}$)
- (1) 12.3
 - (2) 11.9
 - (3) 10.7
 - (4) 13.3
100. Which of the following is an example of homogeneous equilibrium?
- (1) $\text{H}_2\text{O}_{(l)} \rightleftharpoons \text{H}_2\text{O}_{(g)}$
 - (2) $\text{CaCO}_{3(s)} \rightleftharpoons \text{CaO}_{(s)} + \text{CO}_{2(g)}$
 - (3) $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2\text{HI}_{(g)}$
 - (4) $2\text{CO}_{(g)} \rightleftharpoons \text{CO}_{2(g)} + \text{C}_{(s)}$

BOTANY

SECTION-A

101. Find the **mismatched** pair.
- (1) Vessels : Not found in most of the gymnosperms
 - (2) Tracheids : Dead and without protoplasm
 - (3) Xylem fibre : Living and thin walled
 - (4) Xylem parenchyma : Stores tannins
102. The meristem, which occurs between mature tissues
- (1) Is known as intercalary meristem
 - (2) Is found in all plants
 - (3) Is always secondary in origin
 - (4) Is not responsible for the elongation of plant organs
103. Choose the **correct** option to fill the blank. 'In grasses, the guard cells are ____ shaped'.
- (1) Round
 - (2) Bean
 - (3) Kidney
 - (4) Dumb-bell
104. Select the **correct** statement.
- (1) Large, empty and colourless cells present along the abaxial epidermis of dicot leaf are called bulliform cells
 - (2) The parenchymatous cells which lie between the vascular bundles of dicot stem are called conjunctive tissues
 - (3) Light coloured peripheral region of wood involved in the conduction of water and minerals is sapwood
 - (4) Thick walled non-chlorophyll containing cells of leaf are called mesophyll
105. Which of the following is **incorrectly** matched?
- (1) Dedifferentiated medullary cells – Interfascicular cambium
 - (2) Heart wood – Highly lignified walls and non-conductive
 - (3) Vascular cambium in dicot root – Partly primary in origin
 - (4) Lenticels – Lens shaped openings for gaseous exchange

106. Read the following statements Assertion and Reason and select the **correct** option.

Assertion (A) : The growth of roots and stems in length with the help of apical meristem is called primary growth.

Reason (R) : Increase in girth by secondary growth is not found in roots.

- (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
- (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
- (3) Assertion is true statement but Reason is false
- (4) Both Assertion and Reason are false statements

107. State **true (T)** or **false (F)** to the following statements and select the **correct** option.

A. When bulliform cells are flaccid, they make the leaves curl inwards to minimize water loss.

B. In dicot leaves, the size of the vascular bundles is dependent on the size of the veins.

C. The adaxial epidermis bears more stomata than the abaxial epidermis in dicot leaves.

A B C

- (1) T F T
- (2) F F T
- (3) T T F
- (4) F T T
- (1) (1)
- (2) (2)
- (3) (3)
- (4) (4)

108. Root hairs arise from

- (1) Epiblema
- (2) Pericycle
- (3) Endodermis
- (4) Cambium ring

109. Suberin deposited barrel shaped cells are found in

- (1) Epidermis of leaf
- (2) Endodermis of root
- (3) Pericycle
- (4) Hypodermis of stem

110. Tracheids differ from vessels in

- (1) Having lignified wall
- (2) Being water conducting
- (3) Being imperforated
- (4) Lacking protoplasm

111. Read the following statements about dicot stem and choose the **correct** option.

- (a) Vascular bundles are arranged in a ring
- (b) Vascular bundles are conjoint, collateral and open type
- (c) Endarch type of arrangement of secondary xylem
- (1) Only (b) is correct
- (2) Only (c) is incorrect
- (3) Both (a) and (b) are incorrect
- (4) All (a), (b) and (c) are correct

112. Read the following statements and choose the **correct** option.

Statement A : In roots, protoxylem lies towards periphery.

Statement B : The cork is impervious to water due to suberin deposition in the cell wall.

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

113. Match the following columns and select the **correct** option.

Column I	Column II
(a) Sieve tube elements	(i) Store resins, tannins, mucilage, latex etc.
(b) Companion cells	(ii) Help in maintaining pressure gradient
(c) Phloem fibres	(iii) Possess a peripheral cytoplasm but lack a nucleus
(d) Phloem parenchyma	(iv) Have pointed, needle-like apices
(1) a(ii), b(iv), c(i), d(iii)	
(2) a(iii), b(iv), c(ii), d(i)	
(3) a(iii), b(ii), c(iv), d(i)	
(4) a(ii), b(i), c(iii), d(iv)	

114. Complex post-fertilization development occurs in

- (1) *Ulothrix*
- (2) *Chlamydomonas*
- (3) *Gracilaria*
- (4) *Volvox*

115. Cycas, a gymnosperm is

- (1) Monoecious and having unbranched stem
- (2) Dioecious and having unbranched stem
- (3) Dioecious and having branched stem
- (4) Monoecious and having branched stem

116. Cytotaxonomy is based on all of the following, **except**.

- (1) Chromosome number
- (2) DNA sequencing
- (3) Chromosome structure
- (4) Chromosome behaviour

117. A structure that is absent in gymnosperms is

- (1) Seed
- (2) Embryo
- (3) Archegonia
- (4) Fruit

118. Choose the **odd** one w.r.t. haplodiplontic life cycle pattern.

- (1) *Fucus*
- (2) *Ectocarpus*
- (3) Bryophytes
- (4) Pteridophytes

119. Strobili or cones are found in

- (1) *Selaginella*, *Equisetum*
- (2) *Selaginella*, *Funaria*
- (3) *Equisetum*, *Funaria*
- (4) *Selaginella*, *Sphagnum*

120. Which classification system was given by George Bentham and Joseph Dalton Hooker to classify flowering plants?

- (1) Phylogenetic system of classification
- (2) Natural system of classification
- (3) Sexual system of classification
- (4) Artificial system of classification

121. Identify the organism which is **not** a moss.

- (1) *Funaria*
- (2) *Polytrichum*
- (3) *Sphagnum*
- (4) *Sargassum*

122. Vegetative propagation in *Funaria* occurs through

- (1) Fission
- (2) Fragmentation in secondary protonema
- (3) Zoospores
- (4) Flagellated spores

123. The spread of living pteridophytes is limited and restricted to narrow geographical regions because

- (1) Gametophytes are dependent on sporophytes
- (2) Sporophytes require cool, damp places to produce gametes
- (3) Gametophytes require cool, damp and shady places to grow.
- (4) They do not need water for fertilisation

124. How many of the given plants produce seeds and also have archegonia?

- a. *Pinus*
- b. *Funaria*
- c. *Selaginella*
- d. Mustard
- e. *Porphyra*
- f. *Cycas*
- (1) Two
- (2) Three
- (3) Four
- (4) Five

125. Select the **correct** option to fill in the given blanks

Classes	Major Pigments	Stored food
<u>A</u>	Fucoxanthin	<u>B</u>
Rhodophyceae	<u>C</u>	Floridean starch

- (1) A - Chlorophyceae, B - Starch
- (2) B - Laminarin, C - Chlorophyll a and b
- (3) B - Mannitol, C - Chlorophyll a and d
- (4) A - Phaeophyceae, B - Starch

126. Match the following columns and select the **correct** option.

	Column I		Column II
a.	<i>Selaginella</i>	(i)	Coralloid roots
b.	<i>Dryopteris</i>	(ii)	Microphylls
c.	<i>Cycas</i>	(iii)	Mycorrhiza
d.	<i>Pinus</i>	(iv)	Homosporous

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

127. Consider the following statements and mark them as true (T) or false (F) and choose the **correct** option.

A. *Fucus* has air bladders in the fronds.

B. In *Ulothrix* the vegetative cells have a cellulosic wall usually covered on the outside by gelatinous coating.

C. Red algae usually reproduce vegetatively by fragmentation.

	A	B	C
(1)	F	F	T
(2)	F	T	T
(3)	T	T	F
(4)	T	F	T

(1) (1)

(2) (2)

(3) (3)

(4) (4)

128. Mosses are different from most liverworts as the former

(1) Has gametophyte as predominant stage of their life cycle

(2) Has unicellular, unbranched rhizoids

(3) Has an elaborate mechanism of spore dispersal

(4) Are first embryophytes

129. Select the option having **correct** set of statements

A. According to phylogenetic system of classification, organisms that belong to same taxa are assumed to have a common ancestor.

B. Chemotaxonomy is based on chemical constituents of plants for taxonomic studies.

C. Sexual system proposed by Linnaeus is artificial system of classification.

D. Numerical taxonomy is based only on evolutionary history.

(1) B & D only

(2) A & B only

(3) A, B & C only

(4) A, B, C & D

130. Select the **incorrect** statement w.r.t. embryo sac in angiosperms.

(1) Embryo-sac formation is preceded by meiosis

(2) It has a three-celled egg apparatus

(3) Each of the cells of an embryo-sac is diploid

(4) It has two polar nuclei

131. Read the following statements and select the **correct** option.

Assertion (A) : Being photosynthetic, algae increase the level of dissolved oxygen in their immediate environment.

Reason (R) : Algae are the primary producers of energy rich compounds which form the basis of food cycles of all aquatic animals.

(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Both Assertion and Reason are false statements

132. Read the following statements and select the **correct** option.

Assertion (A) : Agar is used to grow microbes.

Reason (R) : Agar is used in preparation of ice-creams and jellies.

(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion

(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion

(3) Assertion is true statement but Reason is false

(4) Both Assertion and Reason are false statements

133. Spores in pteridophytes germinate to give rise to

(1) Inconspicuous, multicellular, free-living prothallus

(2) Conspicuous, multicellular, mostly non-photosynthetic gametophytes

(3) Large, multicellular, free-living, photosynthetic sporophyte

(4) Small, unicellular, photosynthetic prothallus

134. The giant red wood tree is
- (1) *Sequoia*, a gymnosperm
 - (2) *Ficus*, an angiosperm
 - (3) *Taxus*, an angiosperm
 - (4) *Selaginella*, a pteridophyte
135. How many of the given statement(s) is/are **incorrect**?
- a. At least half of the total carbon dioxide fixation on earth is carried out by algae through photosynthesis.
 - b. Mosses generally are of little ecological importance.
 - c. *Chlorella* is used as food supplement by space travellers.
 - d. Plant body of bryophytes is more differentiated than that of algae.
- (1) One
 - (2) Two
 - (3) Three
 - (4) Four

SECTION-B

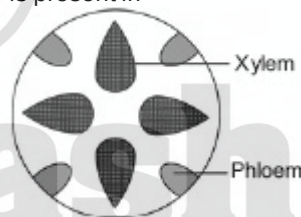
136. Juvenile stage of moss is

- (1) Protonema
- (2) Capsule
- (3) Prothallus
- (4) Seta

137. Phellogen, phellem and phelloderm are collectively known as

- (1) Heart wood
- (2) Sap wood
- (3) Periderm
- (4) Late wood

141. The vascular bundle shown in the diagram is present in



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

138. Bark consists of

- (1) Primary xylem and primary phloem
- (2) Secondary phloem only
- (3) All the tissues excluding pith
- (4) All the tissues outside the vascular cambium

142. Sclerenchyma differs from collenchyma in being

- (1) Mechanical in nature
- (2) Thick walled
- (3) Simple tissue
- (4) Dead at maturity

139. Which of the following is **not** a part of stele?

- (1) Pith
- (2) Xylem
- (3) Phloem
- (4) Cortex

140. A tissue is a group of cells that are

- (1) Different in origin
- (2) Common in function
- (3) Always similar in structure
- (4) Only meristematic in activity

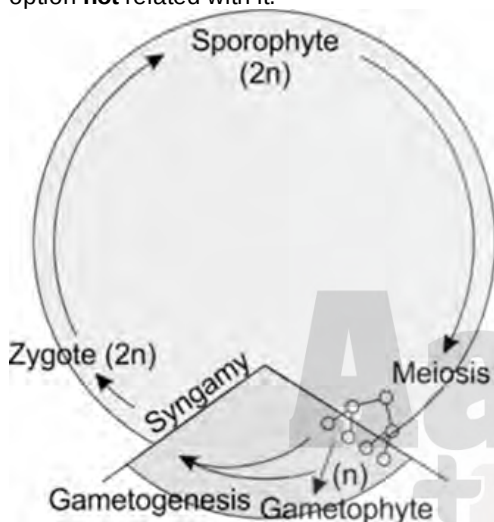
143. Read the following statements and choose the **correct** option.

Assertion : Natural systems of classification classify organisms on the basis of their natural affinities.

Reason : Fossils play important role in natural system of classification to elucidate evolutionary relationships among organisms.

- (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion.
- (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion.
- (3) Assertion is true statement but Reason is false.
- (4) Both Assertion and Reason are false statements.

144. Read the below given schematic representation of life cycle and choose the option **not** related with it.



- (1) Most of the algae show such type of life cycle
- (2) Plants exhibiting such type of life cycle have sporophytic dominant plant body
- (3) All seed bearing plants exhibit such type of life cycle
- (4) Gametophyte of such plants is short lived and dependent

145. Which of the following statements is **true** for *Chara*?

- (1) Chlorophyll *a* and Chlorophyll *b* are present
- (2) Cell wall has algin
- (3) Sexual reproduction is absent
- (4) Fucoxanthin is major pigment

146. *Selaginella*, *Dryopteris*, *Equisetum*, *Adiantum*, *Lycopodium*, *Pteris* belong to how many classes of pteridophytes?

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

147. Gemmae are

- (1) Asexual buds present in *Marsilea*
- (2) Sexual buds present in *Marsilea*
- (3) Asexual buds present in *Marchantia*
- (4) Sexual buds present in *Marchantia*

148. Which of the given is the smallest angiosperm?

- (1) *Acacia*
- (2) Pea
- (3) *Wolffia*
- (4) Wheat

149. Agar is obtained from

- (1) *Gracilaria*
- (2) *Gonyaulax*
- (3) *Gelidium*
- (4) Both (1) & (3)

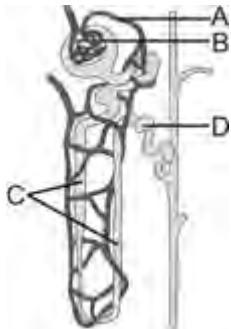
150. Which group of plants is known as "Amphibians of plant kingdom"?

- (1) Gymnosperms
- (2) Algae
- (3) Bryophytes
- (4) Angiosperms

ZOOLOGY

SECTION-A

151. Which of the following parts labelled A–D in the figure given below is **correctly** matched with its functions?



- (1) A–Afferent arteriole – Carries the blood away from the glomerulus towards renal vein
 (2) B–Bowman's capsule – Create minute spaces for the filtration of blood
 (3) C–Henle's loop – Maximum reabsorption of major substances from glomerular filtrate
 (4) D–DCT – Secretion of K^+ into the filtrate
152. Most toxic nitrogenous waste product among the following is
 (1) Ammonia
 (2) Urea
 (3) Uric acid
 (4) Amino acids
153. Part of nephron lined by simple cuboidal brush bordered epithelium is
 (1) Loop of Henle
 (2) Glomerulus
 (3) Proximal convoluted tubule
 (4) Collecting duct
154. The first step in urine formation within kidneys in human is
 (1) Synthesis of urea
 (2) Glomerular filtration
 (3) Selective reabsorption
 (4) Tubular secretion
155. Reabsorption of water occurs from the last part of nephron under the influence of which hormone?
 (1) ANF
 (2) Rennin
 (3) ADH
 (4) Epinephrine

156. Juxta glomerular apparatus in humans is formed by the cellular modifications in the

- (1) PCT and efferent arteriole at the location of their contact
 (2) DCT and efferent arteriole at the location of their contact
 (3) DCT and afferent arteriole at the location of their contact
 (4) PCT and afferent arteriole at the location of their contact

157. Select the set of ureotelic animals.

- (1) Bony fishes, aquatic amphibians, aquatic insects
 (2) Marine fishes, terrestrial amphibians, mammals
 (3) Mammals, land snails, insects
 (4) Reptiles, birds and mammals

158. Select the **incorrect** statement w.r.t. cortical nephrons.

- (1) Loop of Henle is short and extends only very little into the medulla.
 (2) They are the most abundant type of nephrons in kidneys.
 (3) Vasa recta is well developed in cortical nephrons.
 (4) Malpighian corpuscle, PCT and DCT of these nephrons are situated in outer cortex region of kidney.

159. Which of the following parts of nephron are helpful in the maintenance of ionic and acid base balance of the body fluids by selective secretion of H^+ and K^+ ?

- (1) PCT, Loop of Henle
 (2) DCT, Collecting duct
 (3) DCT, Loop of Henle
 (4) DCT, Bowman's capsule

160. The segment of a nephron that allows passage of small amounts of urea into the medullary interstitium to maintain the osmolarity is

- (1) PCT
 (2) DCT
 (3) Collecting duct
 (4) Henle's Loop

161. How many items given in the box below can be secreted in renal tubules under normal physiological conditions?

HCO_3^- , H^+ , K^+ , H_2O , Glucose, Amino acids, NaCl, Urea, Ammonia

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

- 162.** The capacity of concentrating the urine in humans is largely related to
- (1) Diameter of the blood vessels
 - (2) Thickness of the filtration membrane
 - (3) Permeability of the filtration membrane
 - (4) Length of the loop of Henle
- 163.** Presence of glucose and ketone bodies in urine is indicative of
- (1) Tetany
 - (2) Myasthenia gravis
 - (3) Addison's disease
 - (4) Diabetes mellitus
- 164.** In human kidneys, the cortex extends in between the medullary pyramids as renal column called
- (1) Duct of Bellini
 - (2) Column of Bertini
 - (3) Renal pelvis
 - (4) Hilum
- 165.** According to sliding filament theory of muscle contraction
- (1) Thick filaments slide over thin filaments
 - (2) Thin filaments slide over thick filaments
 - (3) Both the filaments slide towards the H-zone
 - (4) Contraction of only thick filament occurs
- 166.** Which of the following is not a characteristic of skeletal muscle fibres?
- (1) Excitability
 - (2) Autonomic regulation
 - (3) Contractility
 - (4) Extensibility
- 167.** Which one of the following is the **correct** description of the given parts of human skeleton?
- (1) The 9th and 10th pairs of ribs are called vertebrosteral ribs.
 - (2) First vertebra is atlas which articulates with the occipital condyles.
 - (3) Each pectoral girdle comprises of one clavicle and one scapula.
 - (4) The number of sacral vertebrae are five in both adult and foetus.
- 168.** Read the given statements.
- Statement I :** Each coxal bone in humans is formed by the fusion of three bones namely ilium, ischium and pubis.
- Statement II :** The two halves of the pelvic girdle meet dorsally to form the pubic symphysis containing elastic cartilage.
- Select the **correct** option.
- (1) Only statement II is correct
 - (2) Only statement I is correct
 - (3) Both statements I and II are correct
 - (4) Both statements I and II are incorrect
- 169.** Match the Column I with Column II and choose the **correct** option.
- | Column I | Column II |
|--------------------------|---|
| a. Gliding joint | (i) Between humerus and pectoral girdle |
| b. Hinge joint | (ii) Between the carpals |
| c. Pivot joint | (iii) Between femur and tibia |
| d. Ball and socket joint | (iv) Between atlas and axis |
- (1) a(i), b(ii), c(iii), d(iv)
 - (2) a(iii), b(iv), c(i), d(ii)
 - (3) a(iv), b(i), c(ii), d(iii)
 - (4) a(ii), b(iii), c(iv), d(i)
- 170.** Bone **not** associated with appendicular skeleton of human is
- (1) Fibula
 - (2) Patella
 - (3) Sternum
 - (4) Femur
- 171.** During the contraction of biceps, which one of the following does **not** occur?
- (1) The length of anisotropic band decreases
 - (2) The length of 'H' zone decreases
 - (3) The length of isotropic band reduces
 - (4) The distance between two successive 'Z' lines decreases
- 172.** All of the following regions of the human body are made up of same number of bones, **except**
- (1) Facial region
 - (2) Phalanges in each limb
 - (3) Number of tarsals in lower limbs
 - (4) Number of carpals in upper limbs

173. Red muscle fibres can be distinguished from white muscle fibres as the latter have
- (1) High myoglobin content
 - (2) Large number of mitochondria
 - (3) Large number of sarcoplasmic reticulum
 - (4) Depends on aerobic process for energy
174. Locomotion in human requires a perfect coordinated activity of which of the following systems?
- (a) Muscular
 - (b) Neural
 - (c) Skeletal
- (1) (a) and (b) only
 - (2) (a) only
 - (3) (a), (b) and (c)
 - (4) (c) only
175. Select the **odd** one among the following w.r.t paired skull bones.
- (1) Zygomatic
 - (2) Lacrimal
 - (3) Nasal
 - (4) Sphenoid
176. Complete the analogy by choosing a **correct** option w.r.t. locomotory structures.
Paramecium : Cilia :: *Hydra* : _____
- (1) Coelenteron
 - (2) Tentacles
 - (3) Flagella
 - (4) Buds
177. Activity that does **not** require skeletal muscles function for locomotion is
- (1) Finding reproductive mate
 - (2) Searching and building of shelter
 - (3) Movement of food through intestine
 - (4) Procurement of edibles
178. Which of the following is a store house of calcium ions in each skeletal muscle fibre?
- (1) Sarcolemma
 - (2) Sarcoplasm
 - (3) Sarcoplasmic reticulum
 - (4) Sarcosome
179. Which one of the following is **not** the part of brain stem?
- (1) Forebrain
 - (2) Midbrain
 - (3) Pons
 - (4) Medulla oblongata
180. A tract of nerve fibres that connects the left and right cerebral hemispheres is called
- (1) Corpus callosum
 - (2) Association area
 - (3) Synapse
 - (4) Corpora quadrigemina
181. Na^+/K^+ pump maintains the ionic gradient across membrane of resting neuron by
- (1) Pumping 3Na^+ inside the cell and 2K^+ outside the cell
 - (2) Pumping 4Na^+ inside the cell and 1K^+ outside the cell
 - (3) Pumping 3Na^+ outside the cell and 2K^+ inside the cell
 - (4) Pumping 3Na^+ outside the cell and 3K^+ inside the cell
182. Which of the following is not directly influenced by autonomic nervous system?
- (1) Secretion of sweat
 - (2) Peristaltic movements in intestine
 - (3) Blood pressure
 - (4) Contraction in biceps muscles
183. Human brain is covered by three cranial meninges.
- (a) Pia mater
 - (b) Arachnoid
 - (c) Dura mater
- Arrange them in their **correct** sequence from outer to inner side.
- (1) $a \rightarrow b \rightarrow c$
 - (2) $b \rightarrow a \rightarrow c$
 - (3) $c \rightarrow b \rightarrow a$
 - (4) $b \rightarrow c \rightarrow a$
184. Nerve impulse is also termed as
- (1) Chemical synapse
 - (2) Resting potential
 - (3) Electrical synapse
 - (4) Action potential
185. Hypothalamus has centres for all of the following, **except**
- (1) Hunger
 - (2) Thirst
 - (3) Gastric secretions
 - (4) Thermoregulation

SECTION-B

- 186.** Select the **mismatch** w.r.t. organisms and their excretory structures.
- (1) *Amphioxus* – Protonephridia
 - (2) *Pheretima* – Nephridia
 - (3) *Periplaneta* – Flame cells
 - (4) *Balanoglossus* – Proboscis gland
- 187.** Uremia is characterised by the accumulation
- (1) Uric acid in blood
 - (2) Ketone bodies in the blood
 - (3) Uric acid in joints
 - (4) Urea in the blood
- 188.** Which of the following hormones does **not** lead to reabsorption of Na^+ and water from the distal parts of the renal tubule?
- (1) ANF
 - (2) ADH
 - (3) Aldosterone
 - (4) Renin
- 189.** An important secretory constituent of sebaceous glands is/are
- (1) Sterols
 - (2) Urea
 - (3) Glucose
 - (4) Amino acids
- 190.** In humans, a comparison of the volume of the glomerular filtrate formed per day with that of the urine released per day suggest that approximately X % of the filtrate is reabsorbed by the renal tubules. Here 'X' is
- (1) 99
 - (2) 39
 - (3) 19
 - (4) 59
- 191.** Which one amongst the following may **not** be considered as the property of ascending limb of loop of Henle?
- (1) It is impermeable to water
 - (2) Filtrate becomes hypotonic
 - (3) It is permeable to electrolytes like Na^+ and Cl^-
 - (4) In this region, the filtrate becomes highly concentrated in comparison to blood plasma
- 192.** In humans, scapula is a triangular bone of pectoral girdle situated in the dorsal part of the thorax in between the
- (1) 2nd and 7th ribs
 - (2) 5th and 8th ribs
 - (3) 4th and 9th ribs
 - (4) 7th and 10th ribs
- 193.** Choose the **correct** option w.r.t. components of ribcage in humans.
- (1) Cervical vertebrae, ribs and sternum
 - (2) Thoracic vertebrae, ribs and sternum
 - (3) Hyoid, ribs and sternum
 - (4) Ribs, sternum and lumbar vertebrae
- 194.** Choose the **correct** pair w.r.t. disorders given and their corresponding features.
- (1) Tetany – Rapid spasms in muscles due to low Ca^{++} in body fluid
 - (2) Gout – Decreased level of estrogen
 - (3) Osteoporosis – Increased bone mass
 - (4) Muscular dystrophy – Degeneration of smooth muscles only
- 195.** The regulatory proteins helpful in muscle contraction are
- (1) Actin and tropomyosin
 - (2) Tropomyosin and myosin
 - (3) Actin and troponin
 - (4) Tropomyosin and troponin
- 196.** Nissl's granules are present in
- (1) Cyton of human bipolar neuron
 - (2) Axon of multipolar neuron
 - (3) Schwann cells of myelinated neuron
 - (4) Synaptic knob of pseudounipolar neuron
- 197.** Select the **correct** statement.
- (1) Axonal membrane is more permeable for K^+ than Na^+ during resting phase
 - (2) Olfactory nerve is associated with the hearing
 - (3) Presence of myelin sheath decreases the speed of conduction of nerve impulse
 - (4) Blind spot is the point of greatest visual acuity.

198. _____ and _____ are the specific receptors of the vestibular apparatus. Choose the option which **correctly** fills the blanks.

- (1) Organ of Corti, incus
- (2) Crista ampullaris, macula
- (3) Macula, tectorial membrane
- (4) Tectorial membrane, tympanic membrane

199. Component **lacking** in a knee-jerk reflex is

- (1) Receptor
- (2) Dorsal root ganglia
- (3) Efferent fibre
- (4) Interneuron

200. The **incorrect** statement w.r.t. rods of human eye is

- (1) They are responsible for scotopic vision
- (2) They contain photopigment visual purple
- (3) They are densely packed in fovea
- (4) Their photopigment contains a derivative of vitamin A

