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LACHIT-35 SCHOLARSHIP TEST : Test – 3 (Objective)
 (for PCST - 2023)

Time : 1 Hr.



LACHIT-35 SCHOLARSHIP TEST

Instructions :

- (i) **WRITE YOUR NAME AND PHONE NUMBER IN THE ANSWER SHEET** and Use Blue/Black ball point pen only to WRITE THE CORRECT OPTIONS.
- (ii) Attempt **only 8 questions from PHYSICS AND CHEMISTRY & 9 questions from BIOLOGY**
- (iii) Rough work must not be done on the Answer sheet and do not use **white-fluid** or any other **rubbing material** on Answer sheet.
- (vi) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from total score.

PHYSICS

Choose the correct answer :

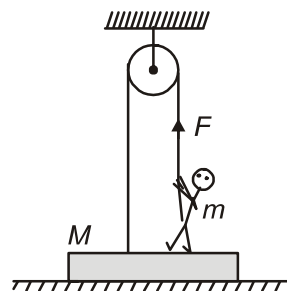
1. A uranium-238 nucleus, initially at rest, emits an $\alpha({}_2^4\text{He})$ particle with energy E . The recoil speed of residual nucleus thorium-234 is (Masses are same as their mass number)
2. A man of mass m is standing on a board and pulling the board of mass m up with force F by the pulley system as shown. Normal reaction between man and board is

(1) $\frac{\sqrt{2E}}{234}$

(2) $\frac{\sqrt{E}}{234}$

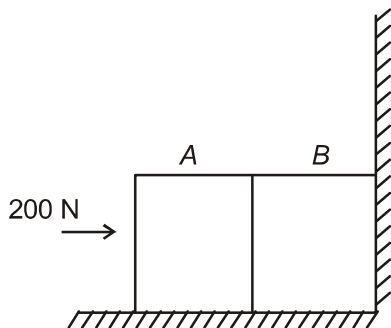
(3) $\frac{\sqrt{2E}}{117}$

(4) $\frac{\sqrt{E}}{117}$

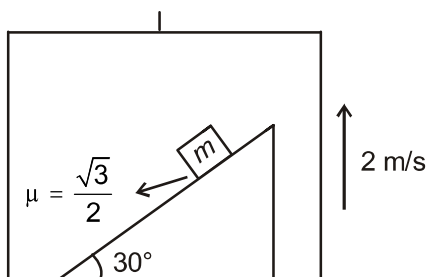


- (1) $mg - F$
- (2) $mg + F$
- (3) $(m + M)g + F$
- (4) $(m - M)g - F$

3. Two bodies A and B of mass 5 kg and 10 kg in contact with each other rest on a table against a rigid wall. The coefficient of friction between the bodies and the table is 0.2, when the force of 200 N is applied horizontally on A. Which of the following is correct?



- (1) The reaction of wall is 200 N
 (2) The action reaction force between A and B is more than reaction of wall
 (3) The action reaction force between A and B is less than reaction of wall
 (4) Both (1) and (3) are correct
4. In a tug of war contest, two groups of people pull on a horizontal rope from the two ends. (Assume mass-less rope)
- (1) The winning group will be one which exerts greater force on the rope
 (2) The winning group will be one which exerts greater force on the ground
 (3) The winning group will be one which exerts a force on rope, greater than its breaking strength
 (4) The tension in the rope will be more on the side of winning group
5. Three forces are acting on a particle that moves with a constant velocity $\vec{v} = 2\hat{i} - 7\hat{j}$ (m/s). Two of the forces are $\vec{F}_1 = 2\hat{i} + 3\hat{j} - 2\hat{k}$ and $\vec{F}_2 = -5\hat{i} + 8\hat{j} - 2\hat{k}$. What is the third force?
- (1) $-3\hat{i} + 11\hat{j} - 4\hat{k}$ (2) $3\hat{i} - 11\hat{j} + 4\hat{k}$
 (3) $8\hat{i} - 11\hat{j} + 14\hat{k}$ (4) $3\hat{i} - 11\hat{j} - 4\hat{k}$
6. A block of mass 1 kg is placed on a rough wedge which is fixed on an elevator moving upward with constant velocity 2 m/s. The block m is at rest w.r.t. wedge. Net reaction force on the block is

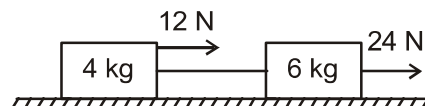


- (1) 5 N (2) 10 N
 (3) 7.5 N (4) 12 N

7. A block of mass 4 kg is placed on a rough horizontal plane. A time dependent horizontal force $F = 2t$ (N) acts on the block. The frictional force between the block and plane at time $t = 2$ s is ($\mu = 0.2$)

- (1) 4 N (2) 8 N
 (3) 10 N (4) 12 N

8. 4 kg block and 6 kg block are connected by a string of negligible mass. If the forces of 12 N and 24 N act on 4 kg and 6 kg blocks respectively in same direction, then the tension in the string is



- (1) Zero (2) 2.4 N
 (3) 3.6 N (4) 1.8 N

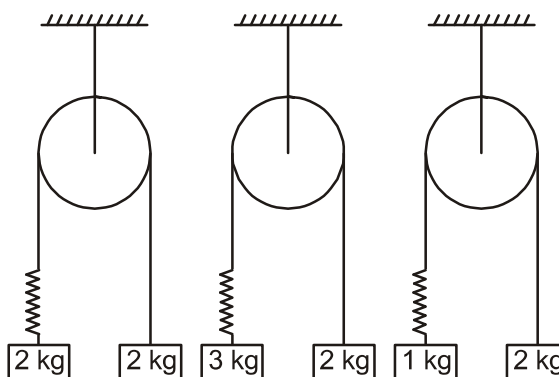
9. A force gives an object of m_1 an acceleration of 12 m/s^2 and an object of mass m_2 an acceleration of 10 m/s^2 . The ratio of accelerations the force would give to an object of mass $m_2 - m_1$ and $m_2 + m_1$.

- (1) 4 : 1 (2) 2 : 1
 (3) 10 : 1 (4) 11 : 1

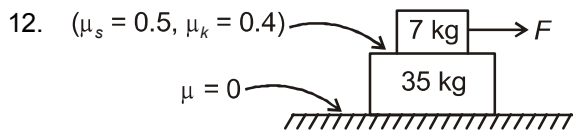
10. A batsman deflects a ball by an angle of 60° without changing its initial speed which is equal to 108 km h^{-1} . Find the impulse imparted to the ball. (mass of ball = 100 g)

- (1) $2\sqrt{3} \text{ kg ms}^{-1}$ (2) $3\sqrt{3} \text{ kg ms}^{-1}$
 (3) $4\sqrt{3} \text{ kg ms}^{-1}$ (4) $\sqrt{3} \text{ kg ms}^{-1}$

11. Same spring is attached with 2 kg, 3 kg and 1 kg blocks in three different cases. If x_1 , x_2 , x_3 be the extensions in the three cases, then



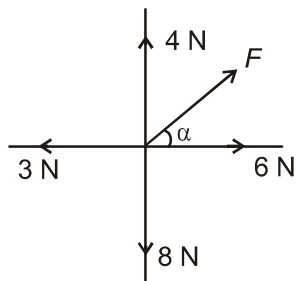
- (1) $x_1 > x_2 > x_3$ (2) $x_2 > x_1 > x_3$
 (3) $x_3 > x_2 > x_1$ (4) $x_1 = 0, x_3 > x_2$



If a force F of 100 N is applied to block of mass 7 kg, then acceleration of 35 kg mass will be

- (1) 2.4 ms^{-2} (2) 1 ms^{-2}
 (3) 0.4 ms^{-2} (4) 0.8 ms^{-2}

13. Five concurrent forces are acting on a body. For the body to remain in equilibrium under these five forces, which of the following is correct?

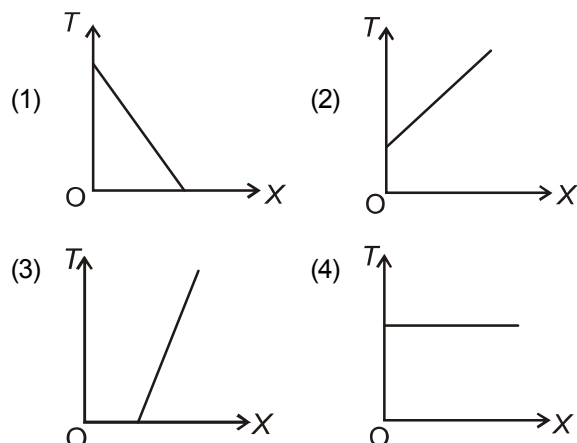
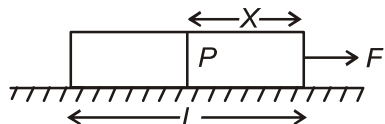


- (1) $F = 10 \text{ N}, 90^\circ < \alpha < 180^\circ$
 (2) $F = 10 \text{ N}, 180^\circ < \alpha < 270^\circ$
 (3) $F = 5 \text{ N}, 90^\circ < \alpha < 180^\circ$
 (4) $F = 5 \text{ N}, 180^\circ < \alpha < 270^\circ$

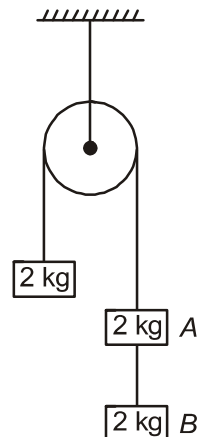
14. An open carriage in a goods train is moving with a uniform velocity of 10 ms^{-1} . If the rain adds water with zero velocity at the rate of 5 kg s^{-1} , then the additional force applied by the engine to maintain the same velocity of the train is

- (1) 0.5 N (2) 2 N
 (3) 50 N (4) 25 N

15. A uniform rod of mass M pulled by force F on smooth surface. The value of tension T in the rod varies with the distance X from the force end is according to the graph



16. Three equal weights of mass 2 kg each are hanging on a string passing over a fixed frictionless pulley. The tension in the string AB is nearly

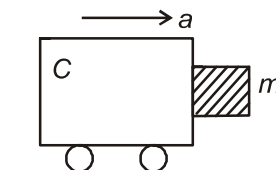


- (1) Zero (2) 13 N
 (3) 15 N (4) 20 N

17. A car is moving in a circular horizontal track of radius 10 m with a constant speed of 10 m/s. A bob is suspended from the roof of the car by string of length 1m. The angle made by the string with the vertical is

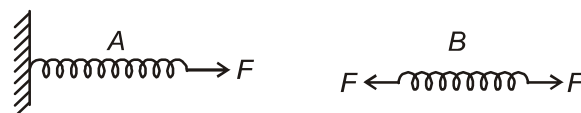
- (1) Zero (2) 30°
 (3) 45° (4) 60°

18. A block of mass m is in contact with the cart. The coefficient of static friction between the block and the cart is μ . The acceleration a of the cart that prevent the block from falling will be



- (1) $a > \frac{mg}{\mu}$
 (2) $a > \frac{g}{\mu m}$
 (3) $a \geq \frac{g}{\mu}$
 (4) $a < \frac{g}{\mu}$

19. Find the ratio of the extension shown by massless identical springs A and B in two given conditions.

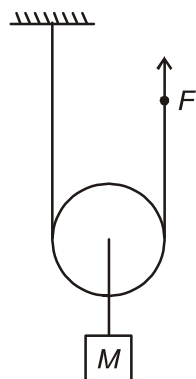


- (1) $\frac{1}{2}$ (2) 2
 (3) 1 (4) Infinity

20. A frame of reference which moves with constant velocity with respect to a stationary frame of reference is called

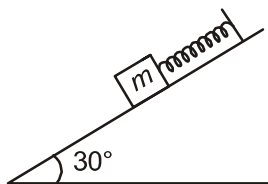
- (1) Inertial frame of reference
- (2) Non-inertial frame of reference
- (3) Ideal frame of reference
- (4) Absolute frame of reference

21. The force F needed to keep the block at equilibrium in given figure is (pulley and string are massless)



- (1) $\frac{Mg}{5}$
- (2) $\frac{Mg}{4}$
- (3) $\frac{Mg}{2}$
- (4) $\frac{Mg}{3}$

22. A block of mass 2 kg is attached to a spring of stiffness constant 5 N/cm. The system is placed on a smooth incline of angle 30° . Find maximum extension in spring if the block is released from rest such that initially spring is in natural length.



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

23. A particle of mass 500 g is moving in a circle of radius 1 m with speed v (m/s) $= 4t^2$. The rate of work done on the particle at $t = 2$ s is

- (1) Zero
- (2) 128 J/s
- (3) 64 J/s
- (4) 32 J/s

24. A sand bag of mass M is suspended by rope. A bullet of mass m is fired at it with speed v and the bullet gets embedded in it. The loss of kinetic energy in the collision is

- (1) $\frac{Mmv^2}{2(M+m)}$
- (2) $\frac{Mv^2}{2(M+m)}$
- (3) $\frac{m^2v^2}{2(M+m)}$
- (4) $\frac{1}{2}(M+m)v^2$

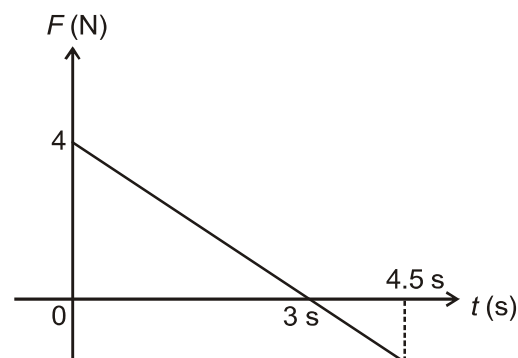
25. A bullet of mass 10 g travelling at a speed of 500 ms^{-1} strikes a block of mass 2 kg, which is suspended by a string of length 5 m. The centre of gravity of the block is found to rise a vertical distance of 0.2 m. What is the speed of the bullet after it emerges from the block?

- (1) 100 m/s
- (2) 150 m/s
- (3) 50 m/s
- (4) 250 m/s

26. A particle of mass 100 g is thrown vertically upwards with a speed of 5 ms^{-1} . The work done by the force of gravity during the time the particle goes up is

- (1) 0.5 J
- (2) -0.5 J
- (3) -1.25 J
- (4) 1.25 J

27. A block of mass 4.5 kg is free to move along the x-axis. It is at rest at $t = 0$. If the force on the particle varies with time, then its kinetic energy at $t = 4.5$ s is

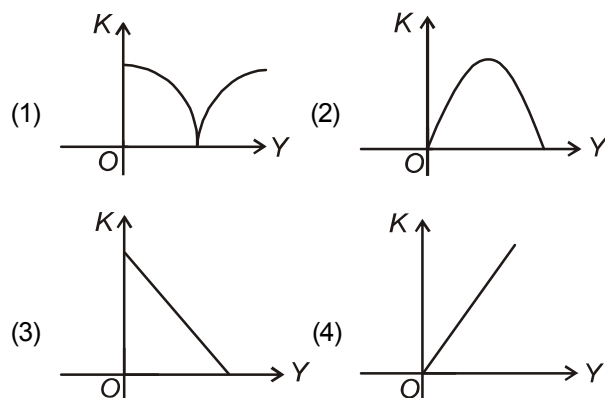


- (1) 2.25 J
- (2) 1.25 J
- (3) 5 J
- (4) Zero

28. A running man has the same kinetic energy as that of a boy of half his mass. The man speeds up by 2 ms^{-1} and the boy changes his speed by $x \text{ ms}^{-1}$ so that the kinetic energies of the boy and the man are again equal. Then x in ms^{-1} is

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

29. A ball of mass m thrown from the ground with speed u at angle θ with horizontal. Kinetic energy K of the ball varies with height Y according to the graph.



30. A body of mass m starts from rest with a constant power. If velocity of the body at displacements s is v , then the correct relation is

- (1) $s \propto v$
(2) $s \propto v^2$
(3) $s \propto v^3$
(4) $s \propto v^4$

31. A uniform chain of mass 4 kg and length 2 m. Overhangs a smooth table with its one third part lying on the table. Find the speed of the chain as it completely slips off the table.

- (1) $\frac{10}{3} \text{ m/s}$ (2) 2 m/s
(3) $\frac{2}{3} \text{ m/s}$ (4) $\frac{4}{3} \text{ m/s}$

32. A gas molecule of mass m moves towards a piston of large mass with speed v along the normal to the piston. The speed of piston is u towards the molecule. The speed of the molecule after an elastic collision with the piston is

- (1) $u + v$
(2) $u - v$
(3) $2u + v$
(4) $v - 2u$

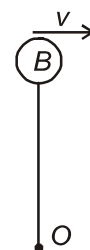
33. A pendulum bob has been pulled aside from the equilibrium position through an angle θ and then released. If l is the length of the pendulum, then the bob will reach the equilibrium position with a speed of

- (1) $\sqrt{2gl}$ (2) $\sqrt{2gl \cos \theta}$
(3) $\sqrt{2gl(1 - \cos \theta)}$ (4) $\sqrt{2gl(1 - \sin \theta)}$

34. Two springs A and B ($K_A = 2K_B$) are stretched by applying force of equal magnitudes. If the energy stored in A is E , then energy stored in B is

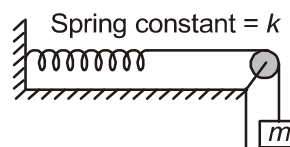
- (1) $\frac{E}{2}$ (2) $2E$
(3) E (4) $\frac{E}{4}$

35. A small bob B of mass m is attached to a light inextensible string of length l , hinged at other end at O. What minimum horizontal velocity should be given to bob in the highest position shown in figure such that the trajectory of particle is circle?



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

36. Initially the spring is relaxed. If the mass m is slowly released, then the elongation produced in the spring is

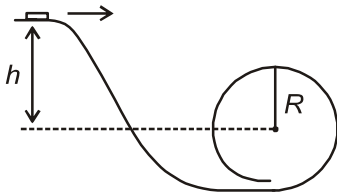


- (1) $\frac{mg}{k}$ (2) $\frac{mg}{2k}$
(3) $\frac{2mg}{k}$ (4) $\frac{mg}{4k}$

37. A water pump lifts water from a level 10 m below the ground. Water is pumped at a rate of 30 kg/minute with negligible velocity. What should be the power (in h.p.) of engine to do this?

- (1) 6.7×10^{-3} (2) 6.7×10^{-2}
(3) 2.3×10^{-1} (4) 3.2×10^{-2}

38. A toy car C starts from a platform at a height h from the centre of loop of radius R . Find the minimum value of h for successful looping in the vertical circle of radius R as shown in figure. (Neglect friction)



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

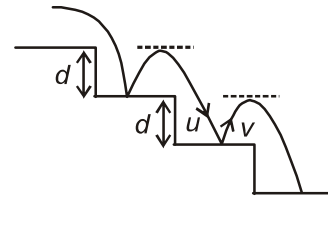
39. A point mass is bound to a fixed point at a distance r from the centre of the force. The potential energy of the point mass is given by $U = \frac{a}{r^2} - \frac{b}{r}$ (a, b are positive constants). Find the value of r at which the particle is in the state of unstable equilibrium.

- (1) $\frac{2a}{b}$
 (2) $\frac{b}{2a}$
 (3) $\frac{b}{a}$
 (4) Value doesn't exist

40. A particle moves under an attractive force $F = -\frac{k}{r^2}$ in a circle of radius r . The total energy of revolving particle is

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

41. A tennis ball bounces down a flight of stairs, striking each step in turn and rebounding to the height of the step above. If the height of each step is d , the coefficient of restitution is



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

42. If the kinetic energy of a body is increased by 69 %, then its momentum increased by

- (1) 35 % (2) 34.5 %
 (3) 30 % (4) 40 %

43. A ball hits the floor and rebounds after an inelastic collision. In this case.

- (1) The momentum of the ball just after the collision is the same as that just before the collision.
 (2) The mechanical energy of the ball remain the same in the collision.
 (3) The total momentum of the ball and the earth is conserved.
 (4) The mechanical energy of the ball and the earth is conserved.

44. A gardener waters plants by a pipe of cross section 1 mm^2 . The water comes out at the rate of 100 cc/s . The reactionary force exerted on the hand of the gardener is

- (1) 10 N (2) 100 N
 (3) 1000 N (4) 500 N

45. In a conical pendulum, the length of string is l and θ is the angle of string with horizontal. The time period of revolution is proportional to

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

CHEMISTRY

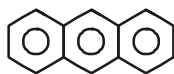
46. Match the column :

Column I	Column II
Species	Hybridisation
a. XeOF_2	(i) sp^3d
b. XeO_4	(ii) sp^3
c. XeF_6	(iii) sp^3d^3

Choose the correct match :

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

47. The total number of π and σ -bonds present in the following compound respectively is



- (1) 9 and 18 (2) 8 and 22
 (3) 7 and 26 (4) 8 and 24

48. Identify the pair of compounds having similar shape

- (1) XeF_4 & CH_4 (2) SOF_2 & NH_3
 (3) SF_6 & XeF_6 (4) CO_2 & SiO_2

49. Select the correct set of elements containing only metalloids

- (1) Ge, As, Sn (2) Sb, Ga, C
 (3) Ge, As, Sb (4) B, Po, Bi

50. $d\pi$ - $p\pi$ -bond absent in

- (1) CO_3^{2-} (2) ClO_3^-
 (3) SO_2 (4) XeO_3

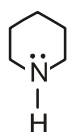
51. Identify the isostructural pairs of the chemical species

- (1) N_3^- and NO_2^+ (2) CN_2^{2-} and NO_2^-
 (3) NO_3^- and SO_3^{2-} (4) XeO_3 and CO_3^{2-}

52. The non-polar molecule is

- (1) PF_3Br_2 (2) NF_3
 (3) SF_4 (4) SF_6

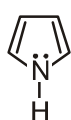
53. Hybridisation of nitrogen in the following chemical species is respectively



(I)



(II)



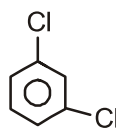
(III)

- (1) sp^3 , sp^2 , sp^2 (2) sp , sp^2 , sp^3
 (3) sp^3 , sp , sp^3 (4) sp^2 , sp , sp^3

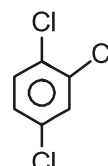
54. Choose the correct statement(s)

- (1) NF_3 is more polar than NH_3
 (2) CO_2 is gas but SiO_2 is solid at room temperature
 (3) I_3^- is linear but XeF_2 is bent
 (4) All are correct

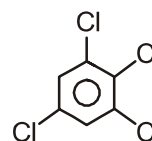
55. Dipole moment of is approximately equal to



(I)



(II)



(III)

- (1) II only (2) I & II only
 (3) II & III only (4) I, II & III

56. Total possible number of square planes in SF_6 is

- (1) 2 (2) 3
 (3) 4 (4) Infinite

57. The molecule which does not exist under normal condition is

- (1) PH_5 (2) PCl_5
 (3) PF_3 (4) PH_3

58. Identify the paramagnetic chemical species

- (1) H_2O_2 (2) KO_2
 (3) Na_2O (4) All of these

59. Number of P-O single bond in P_4O_{10} is

- (1) 12 (2) 6
 (3) 4 (4) 10

60. Choose the incorrect match.

- (1) XeF_4 : Planar shape
 (2) BF_3 : Back bonding
 (3) NO_2^- : Diamagnetic
 (4) O_3 : Paramagnetic

61. The correct order of covalent character is

- (1) $\text{NaN}_3 > \text{Mg}_3\text{N}_2 > \text{AlN}$
 (2) $\text{Na}_2\text{O} < \text{MgO} < \text{Al}_2\text{O}_3$
 (3) $\text{NaF} > \text{NaCl} > \text{NaBr}$
 (4) All are correct

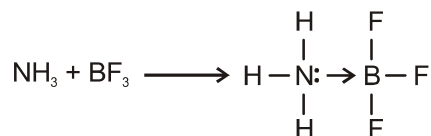
62. Consider the following statements

- I. BeCl_2 in vapour phase is electron deficient molecule
- II. Hydration energy of $\text{Be}^{2(+)}$ is more than that of $\text{Li}^{(+)}$
- III. PCl_5 does not exist but NCl_5 exist

Select the correct statement(s)

- (1) I & II only
- (2) II only
- (3) I, II & III
- (4) II & III only

63. Consider the following chemical reaction



Choose the correct statement

- (1) Hybridisation of N-changes from sp^2 to sp^3
- (2) Shape of BF_3 is non-planar
- (3) Hybridisation of boron changes from sp^2 to sp^3
- (4) All are correct

64. Choose the incorrect statement :

- (1) Nitrogen gas is highly inert in nature
- (2) π -bond is weaker than σ -bond
- (3) All P-Cl bonds are equal in PCl_5
- (4) XeF_4 has planar shape

65. The pair of chemical species having fractional bond order according to molecular orbital theory is

- (1) NO
- (2) CO
- (3) $\text{CN}^{(-)}$
- (4) O_2

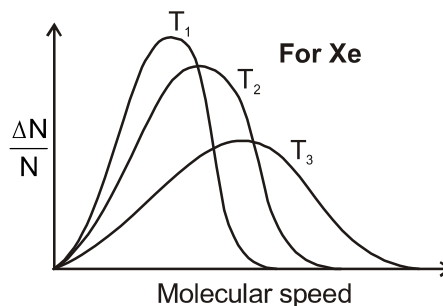
66. If the ratio of the rates of diffusion of the two gases X & Y is 9 : 1, the ratio of their densities is

- (1) 3 : 1
- (2) 81 : 1
- (3) 1 : 81
- (4) 1 : 3

67. The ratio of molecular speed of a gas molecules at 27°C to that at 927°C is

- (1) 3 : 4
- (2) 1 : 4
- (3) 1 : 2
- (4) 2 : 3

68.



Choose the correct order :

- (1) $T_1 > T_2 > T_3$
- (2) $T_3 > T_2 > T_1$
- (3) $T_1 = T_2 = T_3$
- (4) $T_1 \times T_2 = T_2 \times T_3$

69. Choose the correct relation

- (1) $T_c = \frac{8a}{27b^2}$
- (2) $P_c = \frac{a}{27Rb}$
- (3) $V_c = 3b$
- (4) All are correct

70. The pressure of a mixture of equal weight of two gases of mol. wt. 4 and 40 is 1.1 atm. The partial pressure of the lighter gas in this mixture is

- (1) 0.55 atm
- (2) 0.11 atm
- (3) 1 atm
- (4) 0.1 atm

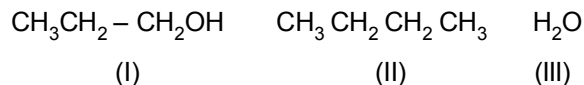
71. O_2 molecule is paramagnetic because of

- (1) Its bond order is 2
- (2) Bonding electrons are more than the antibonding electrons
- (3) Two electrons in π -MO
- (4) Two unpaired electrons in antibonding MO.

72. Two litre of gas are maintained at 25°C and two atmospheric pressure. If the pressure is doubled and absolute temperature is halved, the gas will now occupy

- (1) 2.0 L
- (2) 4.0 L
- (3) 0.5 L
- (4) 1.0 L

73. Consider the following compounds :



What is the correct order of boiling point?

- (1) $\text{I} > \text{II} > \text{III}$
- (2) $\text{III} > \text{II} > \text{I}$
- (3) $\text{III} > \text{I} > \text{II}$
- (4) $\text{I} > \text{III} > \text{II}$

74. The formal charge on P atom in orthophosphoric acid molecule is

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

75. The ratio between root mean square velocity of H_2 at 50 K and that of O_2 at 800 K is
- (1) 4 : 1 (2) 2 : 3
(3) 1 : 1 (4) 1 : 4
76. Air contains 79% N_2 and 21% O_2 by volume. The percentage by mass of nitrogen gas in the air
- (1) 76.6%
(2) 24%
(3) 29%
(4) 48%
77. Which of the following orbital in F_2 would have maximum energy?
- (1) σ^*2s (2) σ^*2p_z
(3) π^*2p_x (4) $\sigma 2p_z$
78. The relation put forwarded by Moseley showing that, atomic number(Z) the more fundamental property of an element than atomic weight is
- (1) $\sqrt{v} = a(z - b)$
(2) $v = a(z - b)^2$
(3) $\sqrt{v} = a^2(z - b)$
(4) $v = a^2(z^2 + b)$
79. The group number and block of the element, Ac(Z = 89) is
- (1) 3 and d
(2) 4 and f
(3) 13 and d
(4) 14 and f
80. If an element having the following valence shell configuration : $4s^2 4p^3$, then choose the correct statement :
- (1) The element belong to p-block
(2) The group number of the element is 5.
(3) The next inert gas to the element is Xe.
(4) All are correct
81. Which of the following element would have largest **atomic radius**?
- (1) K (2) Kr
(3) Ca (4) Br
82. The correct order of atomic size is
- (1) $N < P < Si$ (2) $Cs > Ba > Tl$
(3) $Na < K < Rb$ (4) All are correct
83. The element having maximum electron affinity of the 5th period is
- (1) F (2) Cl
(3) Br (4) I
84. Most electronegative element of group 16.
- (1) Oxygen (2) Sulphur
(3) Selenium (4) Tellurium
85. Choose the incorrect match.
- (1) As_2O_5 : Acidic (2) BeO : Amphoteric
(3) N_2O : Neutral (4) P_4O_{10} : Basic
86. There is diagonal relationship between
- (1) Li-Al (2) Be-Al
(3) Be-Mg (4) C-N
87. The correct order of negative electron gain enthalpy is
- (1) $S > Br > O > I$ (2) $Br > I > S > O$
(3) $S > O > Br > I$ (4) $Br > S > I > O$
88. The element having maximum value for its 3rd ionisation enthalpy is
- (1) Be (2) Li
(3) N (4) B
89. The number of elements present in 6th period of the periodic table is
- (1) 18 (2) 30
(3) 32 (4) 36
90. The filling of electron in transition element takes place in
- (1) nd orbitals
(2) (n-1)d orbitals
(3) (n-1)d, ns, np orbitals
(4) ns, nd orbitals

BOTANY

91. The algae which reproduce asexually by non-motile spores and sexually by non-motile gametes are
- (1) *Spirogyra* and *Volvox*
 - (2) *Polysiphonia* and *Gelidium*
 - (3) *Ulothrix* and *Laminaria*
 - (4) *Fucus* and *Chara*
92. *Sphagnum*, *Riccia* and *Marchantia* plants
- (1) Belong to liverworts
 - (2) Show haplo-diplontic life cycle
 - (3) Are vegetatively reproducing by secondary protonema
 - (4) Make elaters for the spore dispersal
93. How many chromosomes are present in endosperm of *Pinus* if microspores contain 16 chromosomes?
- (1) 8
 - (2) 48
 - (3) 16
 - (4) 24
94. Which of the following sequence of steps involved in life cycle of liverworts?
- [A - Meiosis, B - Gametogenesis, C - Gametophyte, D - Syngamy, E - Zygote, F - Sporophyte, G - Spore]
- (1) F → A → G → D → B → C → E
 - (2) F → A → G → C → E → B → D
 - (3) C → D → E → G → F → A → G
 - (4) C → B → D → E → F → A → G
95. What is common in *Chara*, *Polytrichum* and *Cedrus*?
- (1) Independent gametophyte
 - (2) Non-vascular tissue
 - (3) Jacketed sex organ
 - (4) Independent sporophyte
96. Match the following
- | Column I | Column II |
|-----------------------|-----------------|
| a. <i>Dryopteris</i> | (i) Macrophyll |
| b. <i>Equisetum</i> | (ii) Rhizophore |
| c. <i>Selaginella</i> | (iii) Strobilus |
| d. <i>Adiantum</i> | (iv) Sori |
- (1) a(iv), b(iii), c(ii), d(i)
 - (2) a(iv), b(ii), c(i), d(iii)
 - (3) a(iii), b(ii), c(i), d(iv)
 - (4) a(iii), b(iv), c(ii), d(i)
97. Which one of the following system of classification assumes that organisms belonging to the same taxa have a common ancestor?
- (1) Early system
 - (2) Natural system
 - (3) Phylogenetic system
 - (4) Artificial system
98. Match the following
- | Column I | Column II |
|---------------------|-------------------------------|
| a. Chilgoza | (i) <i>Cycas revoluta</i> |
| b. Sago | (ii) <i>Abies</i> sp. |
| c. Canada balsam | (iii) <i>Pinus gerardiana</i> |
| d. Anti-cancer drug | (iv) <i>Taxus</i> sp. |
- (1) a(ii), b(iii), c(i), d(iv)
 - (2) a(iii), b(i), c(ii), d(iv)
 - (3) a(iii), b(iv), c(ii), d(i)
 - (4) a(ii), b(iii), c(iv), d(i)
99. Find set of features related to *Dryopteris*
- | | |
|----------------|-------------------|
| (a) Rhizome | (b) Microphyll |
| (c) True roots | (d) Heterosporous |
| (e) Prothallus | (f) Sporophyll |
- (1) (a), (c), (d), (f)
 - (2) (b), (c), (d), (f)
 - (3) (a), (b), (e), (f)
 - (4) (a), (c), (e), (f)
100. Isogamous sexual reproduction with flagellated gametes is found in the life cycle of
- (1) *Polysiphonia*
 - (2) *Ulothrix*
 - (3) *Spirogyra*
 - (4) More than one option is correct
101. PEN is formed during fertilization in
- (1) *Cycas*, *Ginkgo*, *Pinus*
 - (2) *Wolffia*, *Eucalyptus*, *Pinus*
 - (3) Sunflower, *Wolffia*, *Eucalyptus*
 - (4) *Ginkgo*, *Wolffia*, *Cycas*
102. The gametophyte is multicellular, dominant, conspicuous and photosynthetic in the life cycle of
- (1) Bryophytes
 - (2) Angiosperms
 - (3) Pteridophytes
 - (4) Gymnosperms
103. Select the incorrect match
- (1) Covered seed - *Cedrus*
 - (2) Tallest gymnosperm - *Sequoia*
 - (3) Branched stem - *Pinus*
 - (4) Pinnate leaves - *Cycas*
104. Read the following statements
- a. In oogamous type of reproduction, male gamete is also non-motile
 - b. Discoid chloroplast is found in *Chlorella*.
 - c. Pyrenoids are food storage bodies in kelps
- (1) Only b is correct
 - (2) Both a & b are correct
 - (3) Both a & b are incorrect
 - (4) Only b is incorrect

105. In pteridophytes
- (1) Sieve cells are absent
 - (2) Leaves possess well differentiated tissue
 - (3) The spores are produced after mitosis
 - (4) Antheridia are multicellular and non-jacketed
106. Consider the following statements w.r.t mosses and select the right choice
- a. The sporophyte is less elaborate than that of liverworts.
 - b. Zygote develops into green filamentous structure.
 - c. Sex organs are produced at the apex of the leafy shoots.
 - d. Leafy stage is developed from secondary protonema.
- (1) a, b & c are correct (2) Only a is incorrect
 - (3) c and d are correct (4) Only d is correct
107. How many given statements are wrong w.r.t bryophytes?
- a. They lack true leaves.
 - b. The main plant is diploid.
 - c. The sex organs are unicellular.
 - d. The sporophyte is not free-living.
 - e. They reproduce sexually by non-motile gametes.
- (1) Two (2) Three
 - (3) One (4) Four
108. A and B are unicellular algae rich in protein and used as food supplements even by space travellers.
- (1) A – *Chlamydomonas*, B – *Ulva*
 - (2) A – *Chlorella*, B – *Spirulina*
 - (3) A – *Chlorella*, B – *Porphyra*
 - (4) B – *Spirulina*, B – *Laminaria*
109. Select the incorrect statement w.r.t organisms having haplo-diplontic life cycle.
- (1) Independent, dominant sporophyte in pteridophytes
 - (2) Short lived haploid gametophyte in bryophytes
 - (3) Sporophyte totally or partially dependent on the gametophyte in bryophytes
 - (4) Sporophytic plant body possesses vascular tissue in pteridophytes
110. Which of the following structures is present only in angiosperms?
- (1) Microsporangium (2) Secondary nucleus
 - (3) Tap roots (4) Embryo
111. In gymnosperms, the pollen grains are produced in
- (1) Anther (2) Pollen chamber
 - (3) Microsporangium (4) Antheridium
112. The vascular cryptogams lack
- (1) Archegonium (2) Tracheids
 - (3) Sporophylls (4) Sieve tube
113. Seed habit is exhibited by a non-flowering plant which also possess
- (1) Rhizoids (2) Strobili
 - (3) Capsule (4) Pinnate leaves
114. Select the correct statement w.r.t algae.
- (1) They show only haplontic life-cycle
 - (2) They are mostly marine
 - (3) They are chlorophyll bearing, complex, and thalloid organisms
 - (4) They usually reproduce vegetatively by fragmentation
115. How many features are common in bryophytes and pteridophytes?
- a. True leaves
 - b. Diploid sporophyte
 - c. Jacketed sex organs
 - d. Motile male gametes
 - e. Haplo-diplontic life-cycle
- (1) Three (2) Four
 - (3) Two (4) One
116. In liverworts, gemmae are
- (1) Non-green, multicellular vegetative structure
 - (2) Green, unicellular, asexual bud
 - (3) Non-green, unicellular vegetative bud
 - (4) Green, multicellular asexual bud
117. The pinnate leaves are persistent for a few years in
- (1) *Selaginella* (2) *Pinus*
 - (3) *Cycas* (4) *Adiantum*
118. Female gametophyte is highly reduced and present within ovule in
- (1) Angiosperms (2) Gymnosperms
 - (3) Phanerogams (4) Vascular archegoniates
119. Which of the following is correct for numerical taxonomy?
- (1) It is based on sexual characteristics
 - (2) Number and codes are assigned to few characters
 - (3) It is based on all observable characteristics
 - (4) Both (2) & (3)
120. In *Pinus*
- (1) Root is symbiotically associated with a sac fungi
 - (2) Phloem lacks sieve cells and albuminous cells
 - (3) Transfusion tissue is present in the leaf
 - (4) Pollen grains are liberated at one-celled stage

121. Which of the following is not correct w.r.t *Spirogyra*?

- (1) Many pyrenoids are present in chloroplast
- (2) Chloroplast is spiral
- (3) Fertilization is external
- (4) Cytoplasmic strands hold the nucleus

122. Rootless pteridophytes with rhizoids are included in

- (1) Lycopsidea (2) Pteropsida
- (3) Sphenopsida (4) Psilopsida

123. Consider the characters of algae given below

- a. Fucoxanthin
- b. Two apical flagella
- c. Haplontic life-cycle
- d. Chlorophyll-a
- e. Sulphated phycocolloids in cell wall
- f. Air bladder
- g. Filamentous body

Which of the given set of characters belongs to *Ectocarpus*?

- (1) a, d and g (2) b, c and g
- (3) d, e and f (4) c, d and g

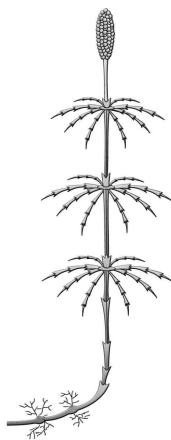
124. Which of the following brown algae have massive plant bodies?

- (1) *Laminaria*, *Ectocarpus* and *Cladophora*
- (2) *Sargassum*, *Laminaria* and *Ectocarpus*
- (3) *Macrocystis*, *Nereocystis* and *Laminaria*
- (4) *Dictyota*, *Fucus* and *Sargassum*

125. Select the incorrect match w.r.t microbial association.

- (1) *Pinus* - *Ectomycorrhiza*
- (2) *Cycas* - *Anabaena*
- (3) *Ginkgo* - Filamentous bacteria
- (4) *Azolla* - *Nostoc*

126. The plant, given in the following diagram, is not characterised by



- (1) Homosporous
- (2) Presence of intercalary meristem
- (3) Member of sphenopsida
- (4) Commonly called as aquatic horsetail.

127. The plant body is thalloid in

- (1) *Riccia*, *Marchantia* and *Funaria*
- (2) *Porphyra*, *Riccia* and *Marchantia*
- (3) *Spirogyra*, *Riccia* and *Sphagnum*
- (4) *Marchantia*, *Sphagnum* and *Porphyra*

128. Red algae are characterised by the presence of

- (1) c-phycoerythrin
- (2) Non-sulphated cell wall
- (3) c-phycocyanin and chlorophyll-d
- (4) Non-motile gametes.

129. Artificial system of classification given by Linnaeus

- (1) Was based upon few vegetative characters
- (2) Was based upon evolutionary relationship
- (3) Considered cell wall as main criteria
- (4) Was based upon androecium character

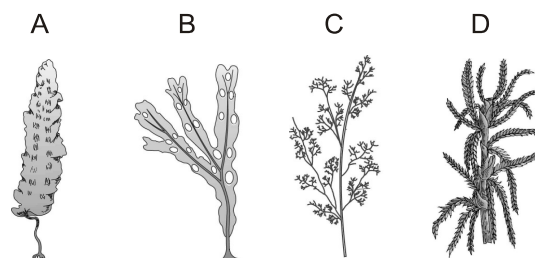
130. Sporophytic plant body is non-vascular in

- (1) Mosses and ferns
- (2) Liverworts and ferns
- (3) Pteridophytes and gymnosperms
- (4) Liverworts and mosses

131. Which of the following is not correct for gymnosperms?

- (1) Presence of tracheids
- (2) Secondary growth
- (3) Presence of companion cells
- (4) Diplontic life-cycle

132. Examine the figure A, B, C and D and identify them.



- | A | B | C | D |
|----------------------|------------------|---------------------|---------------------|
| (1) <i>Laminaria</i> | <i>Dictyota</i> | <i>Chara</i> | <i>Polytrichum</i> |
| (2) <i>Fucus</i> | <i>Dictyota</i> | <i>Chara</i> | <i>Funaria</i> |
| (3) <i>Laminaria</i> | <i>Fucus</i> | <i>Polysiphonia</i> | <i>Sphagnum</i> |
| (4) <i>Fucus</i> | <i>Laminaria</i> | <i>Sphagnum</i> | <i>Polysiphonia</i> |

133. Which of the following statement is correct for non-vascular amphibians of plant kingdom?
- Main plant body is concerned with sporangia & spores formation
 - Play an important role in soil formation
 - Dependent gametophyte
 - Archegonium with single NCC
134. The female gametophytes in which of the following are retained on the parent sporophytes for variable periods?
- First group of embryophytes
 - Non-embryophytes & autotrophs
 - Homosporous pteridophytes
 - Heterosporous pteridophytes
135. Consider the following statements and select correct for *Cycas*
- Unbranched stem
 - Monoecious plant
 - Leaves are simple, needle like
 - Protected nucellus by envelope
 - Pollen tube carries two functional male gametes
- a, b, c
 - b, c, e
 - a, c, d, e
 - a, d

ZOOLOGY

136. Which of the following is **not** a correct difference between chondrichthyes and osteichthyes?
- | | Chondrichthyes | Osteichthyes |
|-----------------|-----------------------|---------------------|
| (1) Operculum | Absent | Present |
| (2) Air bladder | Present | Absent |
| (3) Mouth | Ventral | Terminal |
| (4) Scales | Placoid | Cycloid |
137. There are four distinctive hallmarks of the phylum chordata, **except**
- Dorsal tubular, hollow nerve cord
 - A supportive notochord above the nerve cord
 - Pharyngeal gill slits for filter feeding
 - Post anal tail for propulsion
138. Choose the characteristics applicable to lampreys
- Suctorial mouth
 - Ectoparasitic mode of life
 - Catadromous migration in breeding season
 - 6 to 15 pairs of gill slits
 - Single median nostril
- (a), (b) & (c)
 - (a), (d) & (e)
 - (a), (b), (d) & (e)
 - (a), (c), (d) & (e)
139. In amphibians, alimentary canal, urinary and reproductive tracts open into common chamber called
- Ovisac
 - Brood pouch
 - Cloaca
 - Scrotum
140. Which of the following pairs of animals are similar to each other pertaining to the feature stated against them?
- Echidna* and *Macropus* – Presence of cloaca
 - Testudo* and *Alligator* – Four chambered heart
 - Hippocampus* and *Hyla* – Poikilothermal
 - Columba* and *Calotes* – Lungs with air sacs
141. Lateral line system for perceiving water current is found in
- Elasmobranchs
 - Teleosts
 - Larval amphibians
 - Aquatic reptiles
- (a) & (b)
 - (a), (b) & (c)
 - (a), (b), (c) & (d)
 - (a), (b) & (d)
142. Choose the option in which all the mentioned animals have totally cartilaginous endoskeleton
- Petromyzon*, *Catla*, *Ichthyophis*
 - Trygon*, *Myxine*, *Pristis*
 - Carcharodon*, *Scoliodon*, *Betta*
 - Labeo*, *Clarias*, *Torpedo*
143. Limbless vertebrate having body covered with scales and presence of poison glands is
- Ichthyophis*
 - Bungarus*
 - Python
 - Anguilla*
144. Respiration exclusively by lungs is characteristic of the following vertebrate classes.
- Lungfishes and reptiles
 - Reptiles and mammals
 - Aves and amphibia
 - Mammals and amphibians

145. Choose of option in which all animals are oviparous and endotherms

- (1) *Aptenodytes*, *Testudo*, *Psittacula*
- (2) *Ornithorhynchus*, *Chelone*, *Pavo*
- (3) *Ornithorhynchus*, *Neophron*, *Struthio*
- (4) *Pavo*, *Corvus*, *Clarias*

146. Which of the following comparative account of amphibians, reptiles and birds is **not** correct?

	Amphibia	Reptilia	Aves
(1)	Moist skin with no scales	Dry cornified scales on skin	Feathers and scales on legs
(2)	Urinary bladder present	Urinary bladder absent	Urinary bladder present
(3)	Heart is three chambered	Heart is three chambered	Heart is four chambered
(4)	Poikilo-thermal	Poikilo-thermal	Endothermal

147. The vertebrates lacking teeth are

- (1) Cartilage and bony fish
- (2) Bony fish and frogs
- (3) Turtles and birds
- (4) Lizards and birds

148. Which of the following protochordate retains notochord even in adult?

- (1) *Branchiostoma* (2) *Herdmania*
- (3) *Saccoglossus* (4) *Myxine*

149. The horny scales that cover the skin of reptiles prevent them from

- (1) Sustaining high levels of metabolic activity
- (2) Using thin skin as an organ of gas exchange
- (3) Laying their eggs in water
- (4) Flying

150. The mammals have all of the following characters, **except**

- (1) Mammary glands (2) Muscular diaphragm
- (3) Corpus callosum (4) Corpora allata

151. The outermost covering of *Ascidia* is

- (1) Mantle (2) Tunic
- (3) Telson (4) Skin

152. The eggs laid by birds are

- (1) Fertilized, non-cleidoic
- (2) Unfertilized, cleidoic
- (3) Fertilized, cleidoic
- (4) Unfertilized, non-cleidoic

153. Pelvic fins are modified into claspers meant for copulation in

- (1) *Pristis* (2) *Carcharodon*
- (3) *Scoliodon* (4) All of these

154. Choose the **incorrect** pair

- (1) Bats & whales – Echo location
- (2) *Salmon* & *Hilsa* – Anadromous migration
- (3) *Hippocampus* & *Pipa* – Parental care by males
- (4) Frog & Hyla – External fertilization

155. What is common between *Columba* (Pigeon) and *Struthio* (Ostrich)?

- (1) Body covered with feathers
- (2) Presence of preen gland at the base of the tail
- (3) Feet adapted for perching
- (4) Sternum with keel

156. The following are figures of representative reptiles with their characteristics. Choose the option which is **not** correct

- (1)  – It is tree lizard, with prehensile tail and is viviparous

- (2)  – It is a crocodile, having four chambered heart

- (3)  – It is tortoise with dorsal carapace and ventral plastron

- (4)  – It is a poisonous land snake with neurotoxic venom

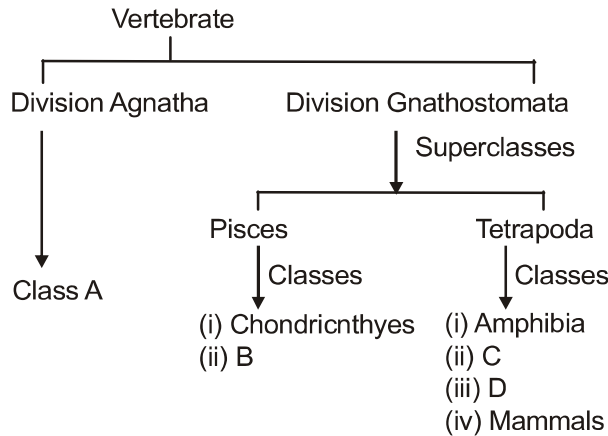
157. Choose the **correct** statement

- (1) Reptilian scales are formed largely of keratin and derived from epidermis
- (2) Reptilian scales are homologous to fish scales
- (3) In reptiles, fertilization occurs after shell has been formed
- (4) Nitrogenous wastes of reptiles are excreted as urea allowing water to be conserved

158. Which of the following set of animals belong to same class?

- (1) *Petromyzon* and *Exocoetus*
- (2) *Calotes* and *Columba*
- (3) *Struthio* and *Delphinus*
- (4) *Vipera* and *Testudo*

159. Given below is the classification chart of subphylum vertebrata



Which of the taxa include poikilothermic animals with bony endoskeleton and external fertilization?

- (1) A, B, C & D (2) A, B & C
(3) Only B (4) B & C
160. *Chimaera* or Rat fish is
- (1) Fresh water fish
(2) Marine fish
(3) Cartilaginous marine fish with operculated gills
(4) Connecting link between cartilage and bony fish due to presence of cycloid scales
161. The mammalian hair has all of the following functions, **except**
- (1) Hair traps body heat and prevents it from escaping
(2) It helps in thermal insulation
(3) Thick fur waterproofs the skin as in case of sea otters, polar bears
(4) The sebaceous glands at the base of hair follicles release pheromones which help in signalling
162. Mammals are divided into four trophic categories based on what they eat. Which of the following is not a category of mammals?
- (1) Insectivores (2) Herbivores
(3) Detritivores (4) Carnivores
163. Which statement best explains how circulatory system supports endothermy in mammals?
- (1) Oxygenated blood is separated from deoxygenated blood
(2) The heart has three chambers and is able to pump more blood
(3) This system moves oxygenated blood to the lungs
(4) This system moves oxygenated blood from heart to the body

164. Which of the following mammals is not a marsupial?

- (1) *Opossum*
(2) Kangaroo
(3) *Echidna*
(4) Bandicoot

165. Which statement describes the difference between invertebrate chordates and the rest of the phylum chordate?

- (1) Non-vertebrate chordates lack a backbone
(2) Non-vertebrate chordates lack a notochord
(3) Other members of the phylum lack a backbone
(4) Other members of the phylum lack a notochord

166. The type of coelom in *Amphioxus* is

- (1) Schizocoelom
(2) Enterocoelom
(3) Acoelom
(4) Pseudocoelom

167. Which row of information in the table contains correct information about the digestive system?

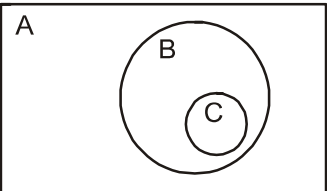
	Group	Some components of digestive system
(1)	Amphibians	Gizzard, stomach, intestines
(2)	Reptiles	Crop, large and small intestine
(3)	Birds	Crop, gizzard, intestine
(4)	Fishes	Swim bladder, stomach, intestines

168. The embryos of reptiles and birds are surrounded by a fluid filled cavity that prevents dehydration and cushions the embryo. This extra-embryonic membrane secreting the fluid is

- (1) Chorion
(2) Amnion
(3) Yolk sac
(4) Allantois

169. Choose the **incorrect** statement

- (1) Birds can generate their body heat internally
(2) Birds have light weight bones
(3) Birds generally have excellent vision
(4) Flightless birds lack feathers

170. Each of the following statements is false. Make the statements true by replacing the italicized word with the correct term
- The *atrium* is a chamber that receives the digestive wastes, urinary wastes and eggs or sperms before they leave the body
 - Amphibians have *tympanic membranes* to protect their eyes from drying out
 - Larval amphibians respire by *buccal cavity*
 - Maximum amphibian species are of *tailed* amphibians
- Rectum
 - Nictitating membrane
 - Lungs
 - Limbless
 - Cloaca
 - Nictitating membrane
 - Gills
 - Tail-less
 - Cloaca
 - Cunjunctiva
 - Gills
 - Tail-less
 - Rectum
 - Cunjunctiva
 - Lungs
 - Limbless
171. Adult jawed vertebrates possess all of the following features, **except**
- Ventral myogenic heart
 - Kidneys for osmoregulation
 - Paired fins or limbs
 - Persistent notochord
172. The characteristic not applicable to *Trygon* (sting ray) is
- Dorso-ventrally flattened body
 - Dorsal fin on the tail modified as sting
 - Pectoral fin modified as clasper in males
 - Gill slits are on the ventral surface
173. Choose the **incorrect** match
- Ascidia* – Sessile chordate
 - Pterophyllum* – Angel fish
 - Torpedo* – Ctenoid scales
 - Hyla* – Tree frog
174. Which of the following animal has been **incorrectly** placed from its natural habitat?
- Aptenodytes* – Antarctica
 - Ornithorhynchus* – Australia
 - Struthio* – Africa
 - Protopterus* – North America
175. From the list of animals in the box, how many are bipedal tetrapods?
- Kangaroo, Parrot, Krait, Toad, Pigeon, Human, Whale
- Six
 - Four
 - Five
 - Three
176. Choose the group of animals which show parental care
- Hippocampus*, *Alytes*, *Columba*
 - Alytes*, *Pipa*, *Chelone*
 - Pipa*, *Ichthyophis*, *Labeo*
 - Pavo*, *Pteropus*, *Hemidactylus*
177. The glass snakes are reptiles having all of the following features, **except**:
- Limbless
 - Fixed eyelids
 - Presence of tympanum
 - Absence of venom
178. Furcula or wishbone is a characteristic of skeleton of birds. It is formed by fusion of
- Scapula and clavicle
 - Clavicle and keel
 - Interclavicle with keel
 - Clavicles and interclavicle
179. Pharyngeal gill slits are present in the embryonic stage of
- All agnathans
 - All craniates
 - All gnathostomes
 - All chordates
180. In the following venn diagram A represents Vertebrata, B represents Gnathostomata and C represents Tetrapoda. In which subset can salamander, viper, flying fox and bombay duck be placed together?
- 
- A
 - B
 - C
 - None of these

