PATTERN CLASSES

MM : 100   Pattern Classes Scholarship Test : Phase 1   – Objective) **Time : 1 Hr.**

(for LACHIT -35 Selection)
PCB (For Medical)

Instructions :

   (i) Use Blue/Black ball point pen only to write the correct options.

  (ii) Attempt only 8 questions from Physics & Chemistry Sections And 9 questions from Biology Section.

 (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.

 (iv) Each question carries 4 marks. For every wrong response 1 mark shall be deducted from total score.

PHYSICS

Choose the correct answer :

1. A block of mass 5 kg is moving with a speed of 8 m/s along east. If the force of 10 N is applied on it for 3 s along north, then the final speed of the block will be

    (1) 20 m/s

    (2) 10 m/s

    (3) 30 m/s

    (4) 5 m/s

2. The magnitude of change in velocity of a particle having speed v is v during a time interval Δt while moving in a uniform circular motion. The magnitude of acceleration of the particle is

    (1) $\dfrac{v}{2\Delta t}$

    (2) $\dfrac{v}{\Delta t}$

    (3) $\dfrac{\pi v}{3\Delta t}$

    (4) $\dfrac{\pi v}{2\Delta t}$

3. A particle moves in the $x - y$ plane under the influence of a force such that its linear momentum is $p(t) = \left[\hat{i}\cos(\alpha t) - j\sin(\alpha t)\right]\beta$, where α and β are constants. The angle between the force and the momentum is

    (1) 0°

    (2) 45°

    (3) 60°

    (4) 90°

4. A body of mass m moving with a velocity v in the x-direction collides with another body of mass M moving in the y-direction with a velocity V. They coalesce into one body during collision. The direction of the momentum of the composite body with x-axis is.

    (1) $\tan^{-1}\left(\dfrac{mV}{Mv}\right)$

    (2) $\tan^{-1}\left(\dfrac{MV}{mv}\right)$

    (3) $\tan^{-1}\left(\dfrac{M}{M+m}\right)$

   (4) $\tan^{-1}\left(\dfrac{M+m}{M}\right)$

5. An empty box of mass m is found to accelerate up at the rate of $\dfrac{g}{6}$, when placed deep inside water. How much weight should be put inside the box so that it may accelerate down at the rate of $\dfrac{g}{6}$?

   (1) $\dfrac{2m}{7}$

   (2) $\dfrac{m}{7}$

   (3) $\dfrac{m}{5}$

   (4) $\dfrac{2m}{5}$

6. The normal force exerted by a horizontal surface on a body kept on the surface, in any reference frame

   (1) Must be equal to its weight

   (2) May be greater than its weight

   (3) May be less than its weight

   (4) Both (2) & (3)

7. Initially both blocks A and B stay at equilibrium. If string between A and B is cut, then acceleration of block A just after will be
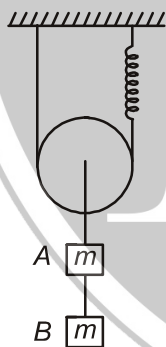

   (1) g downward

   (2) g upward

   (3) Zero

   (4) $2g$ upward

8. Choose the correct statements regarding forces.

   (1) A body can remain in rest position, when external forces acting on it

   (2) If the net force acting on a body be zero, then the body will remain necessarily in rest position

   (3) The force on free fall body in air is uniform

   (4) All of these

9. Figure shows plot of force magnitude vs time during the collision of a 50 g ball with wall. The initial velocity of the ball in 30 m/s perpendicular to the wall, the ball rebounds directly back with same speed perpendicular to the wall. The maximum magnitude of the force on the ball from the wall during the collision is
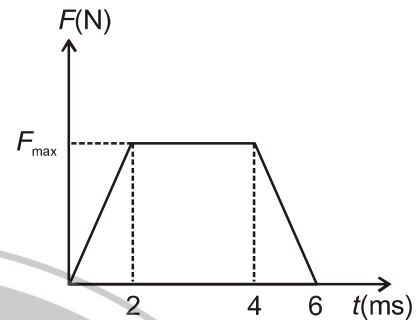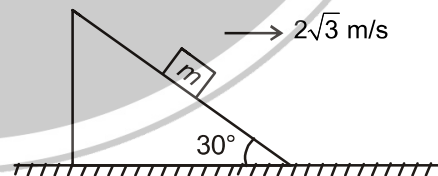

   (1) 1000 N

   (2) 750 N

   (3) 1500 N

   (4) 2000 N

10. A and B are of mass m and C is of mass M. If the system is in equilibrium, then
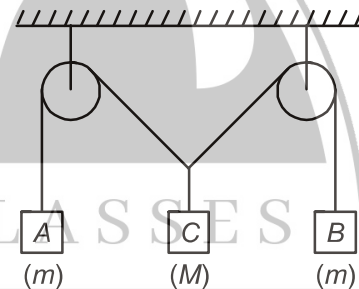
    (1) $M < 2m$

    (2) $M = 2m$

    (3) $M > 2m$

    (4) $M + m < 0$

11. A block of mass m is placed on smooth triangular block. The triangular block is moving horizontally with uniform speed $2\sqrt{3}$ m/s. The acceleration of block of mass m with respect to the triangular block is


    (1) 6 m/s^2

    (2) 8 m/s^2

    (3) 4 m/s^2

    (4) 5 m/s^2

12. A man is hanging from the free end of a massless rope of length 40 m. The mass of the man is 20 kg and the maximum tension that the rope can bear in 300 N. Then starting from rest, the minimum time in which man can reach the other end of the rope is (g = 10 m/s^2)

    (1) 2 s

    (2) 4 s

    (3) 6 s

    (4) 8 s

13. A small block m is placed on another block of mass 5 kg and length 16 cm. A constant horizontal force of 10 N is applied to the block. All the surfaces are assumed frictionless. The time elapsed before the block m separates from 5 kg block
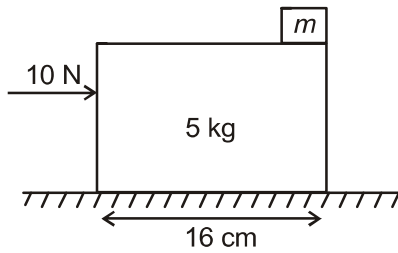

(1) 0.2 s   (2) 0.4 s

(3) 0.6 s   (4) 1 s

14. A pendulum with a bob of mass 2 kg is hanging from the ceiling of a trolley. When trolley is uniformly accelerating with an acceleration 7.5 m/s². The tension in the string is
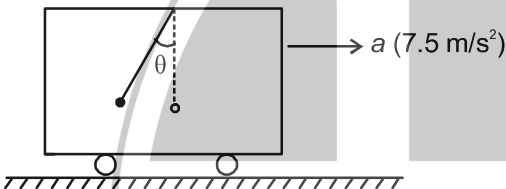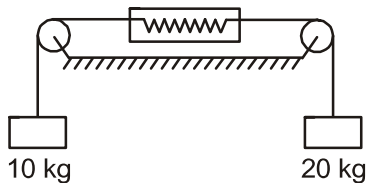

(1) 10 N   (2) 15 N

(3) 20 N   (4) 25 N

15. Magnitude of force F is double the magnitude of spring force at the instant shown. If acceleration of block B is a, than acceleration of block A is (surface is smooth)
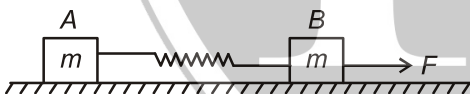
(1) $\dfrac{a}{3}$ (2) $2a$
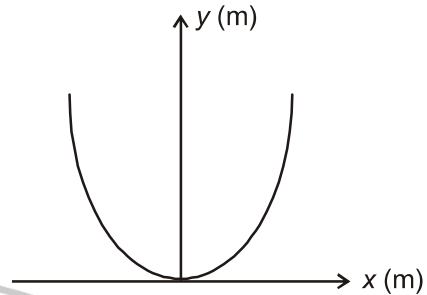
(3) a (4) Both (1) & (3)

16. Reading of the spring balance in the system shown is

(1) $\dfrac{40}{3}$ kg   (2) 60 kg

(3) $\dfrac{20}{3}$ kg   (4) 40 kg

17. The maximum height at which a small mass m can be placed on the parabolic bowl without slipping is

(μ_s = 0.5. Equation of parabolic bowl is $y = \dfrac{x^2}{10}$. Where x and y are in metre)

(1) 30 cm   (2) 35 cm

(3) 40 cm   (4) 62.5 cm

18. A block of mass 5 kg is placed on a horizontal surface with coefficient of friction μ = 0.2, then the maximum and minimum value of force F for which the block remains at rest are (g = 10 m/s²)

(1) 15 N, 10 N   (2) 25 N, 5 N

(3) 10 N, 25 N   (4) 5 N, 25 N

19. If the coefficient of friction between a fixed incline plane and the block is 1, then the acceleration of the block of mass m shown in the figure is (g = 10 m/s²)

$\left(\cos 37° = \dfrac{4}{5} \right)$
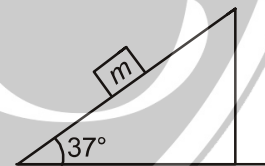
(1) 2 m/s² upward   (2) 2 m/s² downward

(3) 4 m/s² downward   (4) Zero

20. In the figure shown coefficient of friction between 8 kg block and surface is zero and coefficient of friction between the blocks is 0.4. A force of 20 N is applied on 8 kg block. The acceleration of 8 kg mass w.r.t. 4 kg mass is
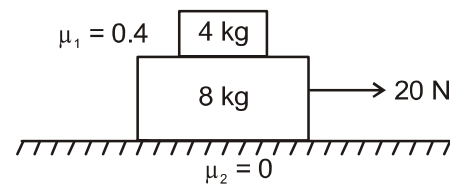
(1) Zero   (2) 0.5 m/s²

(3) $\dfrac{5}{3}$ m/s²   (4) 4 m/s²

21. The magnitude of acceleration of blocks of mass 2 kg and 4 kg are a_1 and a_2 respectively. (Pulley and strings are massless and $g = 10$ m/s²). The relation between a_1 and a_2 is
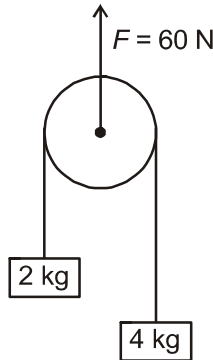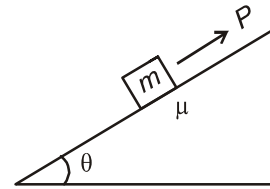

(1) $a_1 = 2a_2$

(2) $2a_1 = a_2$

(3) $a_1 = 4a_2$

(4) $a_1 = a_2$

22. A mass of 1 kg is just able to slide down the slope of an inclined rough surface, when the angle of inclination is 45°. The minimum force parallel to incline necessary to pull the mass up the inclined plane ($g = 10$ m/s²) is

(1) 17 N (2) 14 N

(3) 20 N (4) 16 N

23. At $t = 0$, a small body is released with an initial velocity of 30 m/s on a rough horizontal surface. The coefficient of friction between the surfaces changes with time as the body moves along the surface. What will be the speed of body at $t = 3$ second?
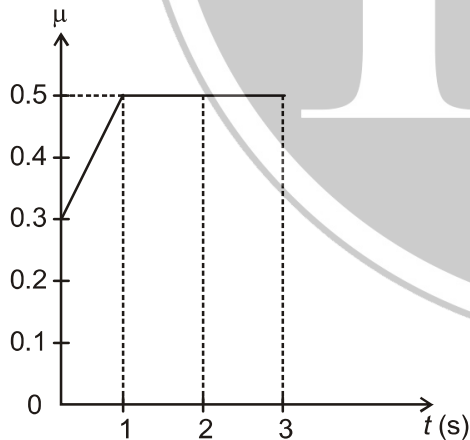

(1) 10 m/s (2) 16 m/s

(3) 20 m/s (4) Zero

24. A coin placed on a rotating turn table just slips if it is placed at a distance 4 cm from the centre. If the angular velocity of the turn table is doubled, it will just slip at a distance of

(1) 3 cm (2) 4 cm

(3) 2 cm (4) 1 cm

25. A block of mass m is being pulled up the rough inclined plane by a man delivering constant power P. The coefficient of friction between the block and the inclined is μ. The maximum speed of block during ascent is

(1) $\dfrac{P}{mg\sin\theta + \mu mg\cos\theta}$

(2) $\dfrac{2P}{mg\sin\theta - \mu mg\cos\theta}$

(3) $\dfrac{P}{mg\sin\theta - \mu mg\cos\theta}$

(4) $\dfrac{3P}{mg\sin\theta - \mu mg\cos\theta}$

26. A boy whirls a stone of mass 100 g in a horizontal circle of radius 2.5 m and at height 2 m above level ground. The string breaks and the stone flies off horizontally and strikes the ground after travelling a horizontal distance of 10 m. Find centripetal force on the body during its circular motion.

(1) 10 N (2) 20 N

(3) 50 N (4) 100 N

27. A vehicle is moving with a velocity v on a banked road of width b and radius of curvature r. For balancing the centrifugal force on the vehicle. The difference in the elevation required between the outer and inner edge is

(1) $\dfrac{v^2 b}{2rg}$ (2) $\dfrac{v^2 b}{rg}$

(3) $\dfrac{bv^2}{3rg}$ (4) $\dfrac{2bv^2}{rg}$

28. Gradually lowered mass stretches the spring by y meter. If same body attached to the same spring is released suddenly, then the maximum stretch in this spring will be
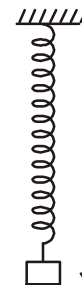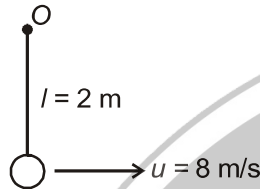

(1) y (2) $2y$

(3) $3y$ (4) $\dfrac{y}{2}$

29. A stone of mass m is moved in a circle of radius r with constant speed v. The work done by the centripetal force over the circumference of the circle is

(1) Zero

(2) $\dfrac{mv^2}{r} \times \pi r$

(3) $\dfrac{mv^2}{r} \times 2\pi r$

(4) $mg \times 2\pi r$

30. A bob suspended from a nail at O is given an initial horizontal velocity $u = 8$ m/s at the lowest point. Maximum height attained by the bob is

(1) Less than 4 m

(2) More than 4 m

(3) Equal to 4 m

(4) Equal to 2 m

31. A particle slides on the surface of a fixed smooth sphere of radius R starting from the top most point. The height from the ground, where it leaves contact with the sphere is

(1) $\dfrac{R}{3}$

(2) $\dfrac{5R}{3}$

(3) $\dfrac{2R}{3}$

(4) $2R$

32. A simple pendulum crosses the highest point of a vertical circle with critical speed. What will be the centripetal acceleration of the bob, when the string is horizontal?

(1) g

(2) $2g$

(3) $3g$

(4) $6g$

33. The force acting on a particle moving along x-axis varies with position on x-axis as shown in figure
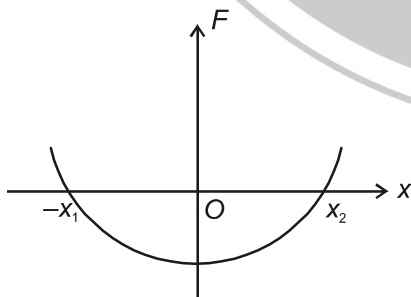
The particle is in stable equilibrium at

(1) $x = -x_1$

(2) $x = x_2$

(3) $x = 0$

(4) Both (1) & (2)

34. A block A of mass m and a pan P of equal mass are connected by a string passing over a smooth light pulley. Initially the system is at rest. A particle of mass m falls freely from height h on the pan and sticks to it. The speed with which A moves just after the collision is
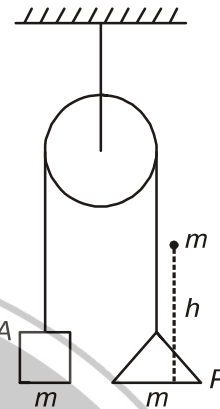
(1) $\dfrac{\sqrt{gh}}{3}$

(2) $\dfrac{\sqrt{2gh}}{3}$

(3) $\dfrac{2\sqrt{gh}}{3}$

(4) $\dfrac{4\sqrt{gh}}{3}$

35. For head-on collision between two colliding balls of equal radii r, the impact parameter is equal to

(1) $2r$

(2) Zero

(3) More than $2r$

(4) Less than $2r$

36. A ball moving with a speed of 9 m/s strikes an identical stationary ball obliquely. If the collision is elastic and the colliding ball makes an angle of 30° with the original line, then the angle made by the second ball with original line is

(1) 0°

(2) 45°

(3) 30°

(4) 60°

37. A car of mass m is moving along a circular track of radius r with a speed which increases linearly with time t as $v = kt$ where k is a constant. The instantaneous power delivered by agent applying the force is

(1) mkt

(2) $\dfrac{mt}{k}$

(3) mk^2t

(4) mt^2k

38. A force $\vec{F} = -k\left(y\hat{i} + x\hat{j}\right)$ (where k is constant) acts on a particle moving in the xy plane. Starting from origin the particle is taken along y-axis to the point $(0, a)$. The work done by agent applying the force $\vec{F}$ on the particle is

(1) $k^2(x^2 + y^2)$

(2) Zero

(3) ky

(4) kx

39. A light rod of length l has a bob of mass m attached to its lower end and is suspended from other end O. What should be the minimum speed given to the bob so that the bob moves in a complete circle
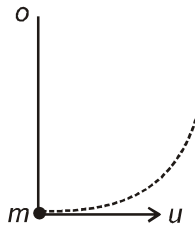
(1) $\sqrt{5gl}$ (2) $\sqrt{gl}$

(3) $\sqrt{2gl}$ (4) $\sqrt{4gl}$

40. In a certain region, the potential energy is $U = ax - bx^3$, where a and b are positive constant.

The particle is in equilibrium at x equal

(1) $\sqrt{\dfrac{a}{3b}}$ (2) $\sqrt{\dfrac{3b}{a}}$

(3) $\sqrt{\dfrac{b}{a}}$ (4) $\sqrt{\dfrac{a}{b}}$

41. No work is done by an agent applying a force on an object, if

(1) The force is always perpendicular to its velocity

(2) The force is always perpendicular to its acceleration

(3) The object moves in such a way that the point of application of the force remain fixed

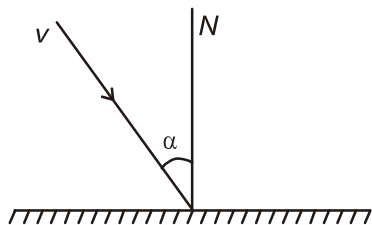(4) Both (1) & (3)

42. A ball of mass m hits a floor with a speed v making an angle α with the normal N. The coefficient of restitution is e. The angle made by reflected ball with floor is

(1) $\cot^{-1}(e\cot\alpha)$ (2) $\tan^{-1}(e\cot\alpha)$

(3) $\tan^{-1}\left(\dfrac{\tan\alpha}{e}\right)$ (4) $\cot^{-1}\left(\dfrac{e}{\tan\alpha}\right)$

43. A body is initially at rest. It undergoes one dimensional motion with constant acceleration. The power delivered to it in time t is proportional to

(1) $t^{\frac{1}{2}}$ (2) t

(3) $t^{\frac{3}{2}}$ (4) t^2

44. A body of mass m is moving on a friction less surface. Its kinetic energy E and its momentum is P.

The graph between $\sqrt{E}$ and $\dfrac{1}{P}$ is
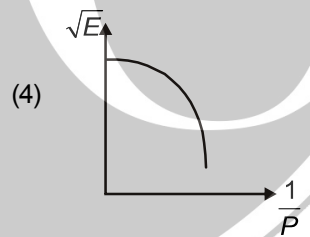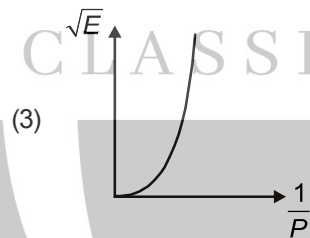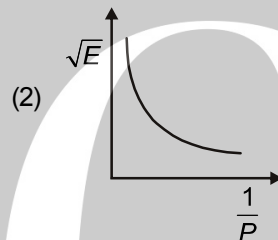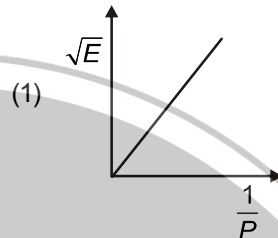
45. Potential energy of a particle along x-axis varies as shown in the figure. If the particle is released from rest at a point on x-axis.
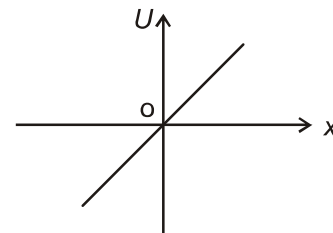
(1) It will move in negative x-direction

(2) It will move with constant acceleration

(3) $(v - x)$ graph for a particle is parabolic

(4) All of these

46. Newland's octave law is true only for elements up to

    (1) P
    (2) Ca
    (3) Mn
    (4) Zn

47. Which of the following series in periodic table contains only radioactive elements?

    (1) Lanthanoids
    (2) $3d$-series
    (3) $6d$-series
    (4) Actinoids

48. The group numbers for the elements having atomic number 102 and 112 are respectively

    (1) 2 & 11
    (2) 3 & 11
    (3) 2 & 12
    (4) 3 & 12

49. The percentage of metals amongst all known elements is

    (1) 78%
    (2) 54%
    (3) 91%
    (4) 39%

50. Which of the following metal exists in liquid state at room temperature?

    (1) Hg
    (2) Ga
    (3) Cs
    (4) All of these

51. Which of the following is the correct order of increasing metallic character?

    (1) Si < Mg < Be < Na
    (2) P < Si < Be < Mg
    (3) Si < P < Mg < Na
    (4) P < Be < Si < Mg

52. The group of the periodic table which contains elements in gaseous, liquid and solid states at room temperature is

    (1) 1
    (2) 13
    (3) 15
    (4) 17

53. The graph below shows successive ionisation energies for an element X. Identify the group of the periodic table does X belongs.

    (1) 2
    (2) 12
    (3) 13
    (4) 14

54. Which of the following elements should have maximum first ionisation enthalpy?

    (1) Mg
    (2) Al
    (3) P
    (4) S

55. Consider the following factors that can affect the first ionisation enthalpy of an element

    I. The charge on the nucleus

    II. Whether the electron is alone or paired in its orbital

    III. The number of electrons between the outer electrons and the nucleus

    Select the correct statements

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

56. Arrange the following elements in the increasing order of atomic radii

    Cs, F, K, Cl

    (1) F < Cl < K < Cs
    (2) F < K < Cl < Cs
    (3) Cs < K < Cl < F
    (4) Cs < Cl < K < F

57. Choose the correct order of negative electron gain enthalpy

    (1) Cl < K < Br < Ca
    (2) Cl < Br < K < Ca
    (3) Ka < Ca < Br < Cl
    (4) Ca < K < Br < Cl

58. The group which does not belong to transition metal is

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

59. Choose the correct statement(s)

    (1) Br_2 is the only non-metal which is liquid at room temperature

    (2) Hg is the metal which is liquid at room temperature

    (3) 'F' is the element which shows only one non-zero oxidation state in its stable compounds

    (4) All are correct

60. Consider the following statements

    I. Ionisation energy of Ga is more than that of Al

    II. Oxides of halogens are acidic in nature

    III. 6th period of the periodic table contains total 36 elements

    Choose the correct statements

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

61. Choose the set of isoelectronic chemical species with same bond order

    (1) NO, CO, O_3
    (2) $N_3^{\ominus}$, $NO_2^{\oplus}$, $CN_2^{2\ominus}$
    (3) $CN^{\ominus}$, N_2, NO^+
    (4) $SO_3^{2\ominus}$, $NO_3^{\ominus}$, $CO_3^{2\ominus}$

62. Consider the following statements

   I. Bond enthalpy increases as bond order increases

   II. Bond length decreases as bond order increases

   III. There is no effect of electronegativity on bond energy

   Select the correct statement(s)

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

63. In which of the following process, bond length increases?

   (1) $O_2 \rightarrow O_2^{\oplus} + e^{\ominus}$
   (2) $N_2 + e^{\ominus} \rightarrow N_2^{\ominus}$
   (3) $NO \rightarrow NO^{\oplus} + e^{\ominus}$
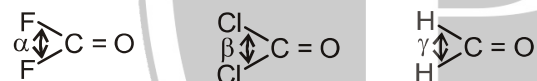   (4) $O_2^{2\ominus} \rightarrow O_2^{\ominus} + e^{\ominus}$

64. Identify the molecule having maximum C – F bond length.

   (1) CH_3F
   (2) CH_2F_2
   (3) CHF_3
   (4) CF_4

65. The compound in which carbon atom is most electronegative?

   (1) CH_3CH_3
   (2) $CH_2 = CH_2$
   (3) $HC = CH$
   (4) Equal in all

66. If α, β and γ are bond angles, then the correct order is

   $\underset{F}{\overset{F}{\alpha}}C = O$ $\underset{Cl}{\overset{Cl}{\beta}}C = O$ $\underset{H}{\overset{H}{\gamma}}C = O$

   (1) $\alpha < \beta < \gamma$
   (2) $\gamma < \alpha < \beta$
   (3) $\beta < \alpha < \gamma$
   (4) $\beta < \gamma < \alpha$

67. Hybrid state of sulphur in H_2SO_4 acid is

   (1) sp^2
   (2) sp^3
   (3) dsp^2
   (4) sp^3d^2

68. Electron deficient molecule

   (1) SiH_4
   (2) H_2S
   (3) B_2H_6
   (4) IF_7

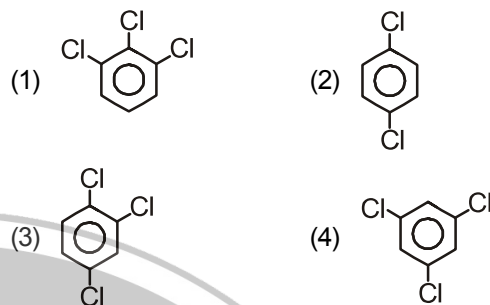69. Match the column I and column II

Column I (Molecule)	Column II (Dipole moment, D)
a. H_2O	(i) 0.23
b. NH_3	(ii) 0.58
c. NF_3	(iii) 1.85
d. PH_3	(iv) 1.47

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

70. Which of the following should have maximum boiling point?

   (1) HF
   (2) H_2O
   (3) H_2Te
   (4) HI

71. Which of the following would have maximum dipole moment?

   (1)
   (2)
   (3)
   (4)

72. The number of internuclear nodal plane in $\sigma^*2\rho$ molecular orbital is

   (1) 0
   (2) 1
   (3) 2
   (4) 3

73. Consider the following statements

   I. Dipole moment of bond = e × d

   II. Molecules are stable if the number of electrons in bonding molecular orbitals is less than that in antibonding molecular orbitals

   III. Magnitude of repulsion decreases in the following order

   lp – lp > lp – bp > bp – bp

   Choose the incorrect statement(s)

   (1) Only II
   (2) I & II
   (3) II & III
   (4) I & III
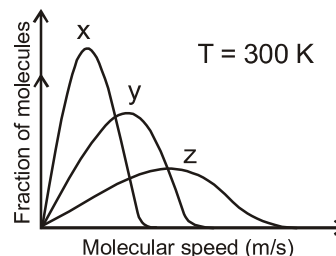
74. Identify the linear chemical species

   (1) $ICl_2^{\ominus}$
   (2) OF_2
   (3) $IF_2^{\oplus}$
   (4) All of these

75. The compound having lowest melting point
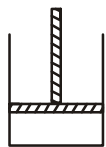
   (1) $CaCl_2$
   (2) $CaBr_2$
   (3) CaI_2
   (4) CaF_2

76. The gases X, Y and Z can be respectively

   (1) Br_2, O_2 and Xe
   (2) Xe, O_2 and Br_2
   (3) Cl_2, N_2 and He
   (4) He, N_2 and Cl_2

77. Consider the following diagram, where a cylinder is fitted with frictionless movable piston containing n moles of the gas at temperature T, pressure P and volume V
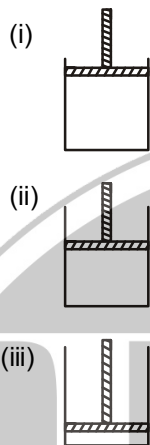

Match the column I to column II

| Column I		Column II
a.	Absolute temperature is doubled at constant n and P	(i)
b.	Pressure on the piston is tripled at constant n and T	(ii)
c.	2n moles of another non-reacting gas is added at constant T and P	(iii)

Choose the correct match

(1) a(ii), b(i), c(iii)   (2) a(iii), b(i), c(ii)

(3) a(i), b(iii), c(ii)   (4) a(ii), b(iii), c(i)

78. In alcohol fermentation, yeast converts glucose to ethanol and carbondioxide

$C_6H_{12}O_6(s) \longrightarrow 2C_2H_5OH(l) + 2CO_2(g)$
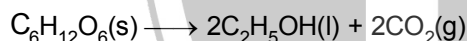
If 6 g of glucose is reacted and 1.33 L of CO_2 gas is collected at 273 K and 1 atm, what is the percentage yield of the reaction?

(1) 87%   (2) 97%

(3) 82%   (4) 90%

79. What is the root mean square speed of He molecules in m/s at 27°C. [R = 8 Jk⁻¹mol⁻¹, He = 4.00]?

(1) 1340 m/s   (2) 42.38 m/s

(3) 128.0 m/s   (4) 515 m/s

80. The decomposition of NaN_3 takes place as

$2NaN_3(s) \longrightarrow 2Na(s) + 3N_2(g)$
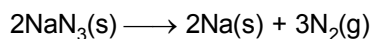
What will be the volume of N_2 released at 87°C and 950 mmHg by decomposition of 130 g of NaN_3?

(1) 63 L   (2) 90 L

(3) 97 L   (4) 71 L

81. Choose the incorrect statement.

(1) Van der Waals equation is not applicable for ideal gas

(2) Dalton's law of partial pressure is only applicable to the mixture of non-reacting gases

(3) With the increase in temperature and decrease in pressure gases tend to behave ideally

(4) Molecular speed of gas molecules $\propto \sqrt{\dfrac{T}{M}}$

82. The temperature of 2.5 L of a gas initially at STP is raised to 250°C at constant volume. What will be final pressure of the gas?

(1) 2.8 atm   (2) 10.6 atm

(3) 1.9 atm   (4) 3.6 atm

83. Select the correct statement(s)

(1) Excluded volume is 4 times the volume of the atom

(2) Absolute zero (−273.15°C) is the lowest theoretical attainable temperature

(3) The ideal gas equation, PV = nRT , combines the laws of Boyle's, Charles's and Avogadro's laws

(4) All are correct

84. The gases X, Y and Z are respectively
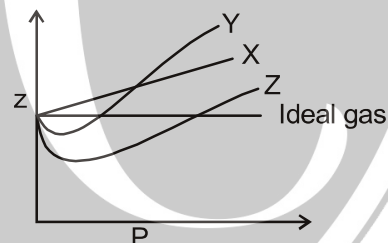
(1) CH_4, He and NH_3 (2) NH_3, He and CH_4

(3) He, CH_4 and NH_3 (4) CH_4, NH_3 and He

85. Cooking time decreases in pressure cooker because

(1) Boiling point of water increases.

(2) Boiling takes place earlier in pressure cooker

(3) Pressure cooker is made up of aluminium

(4) All of these

86. The value of compressibility factor of 0.5 mole of a real gas at critical conditions is

(1) $\dfrac{3}{4}$ (2) $\dfrac{3}{8}$

(3) $\dfrac{3}{16}$ (4) $\dfrac{3}{5}$

87. Choose the incorrect match

(1) z < 1   - Gas is more compressible

(2) $\dfrac{8a}{27Rb}$ - Critical temperature

(3) $\dfrac{a}{27b^2}$ - Critical pressure

(4) z ≠ 1   - For 10 moles of ideal gas

88. On increasing temperature, pressure inside a closed container containing He will

(1) Increase

(2) Decrease

(3) Remain same

(4) May decrease or increase

89. Identify the van der Waals equation

(1) $\left(P + \dfrac{an^2}{V^2}\right)(V - nb) = nRT$

(2) $\dfrac{nRT}{V - nb} - \dfrac{an^2}{V^2} = P$

(3) $\dfrac{nRT}{V - nb} = P + \dfrac{an^2}{V^2}$

(4) All of these

90. If the densities of methane and oxygen are in the ratio 1 : 2, the ratio of rate of diffusion of O_2 and CH_4 respectively

(1) 1 : 2   (2) 1 : 1 · 414

(3) 2 : 1   (4) 1 · 414 : 1

BOTANY

91. Which of the following feature(s) of *Pinus* help to tolerate or withstand extreme conditions?

(1) Sunken stomata

(2) Pinnate leaves

(3) Needle-like leaves

(4) More than one option is correct

92. Which one of the following is a vascular cryptogams?

(1) *Ficus*   (2) *Funaria*

(3) *Cedrus*   (4) *Psilotum*

93. Select common feature amongst *Ginkgo*, *Selaginella* and *Sphagnum*.

(1) Independent sporophyte

(2) Vascular tissue

(3) Flask-shaped female sex organ

(4) Independent gametophyte

94. Which of the following event is a precursor to seed habit in some pteridophytes?

(1) Development of zygote within female gametophyte

(2) Homospory

(3) All four megaspores are functional

(4) Development of zygote outside female gametophyte

95. Select the **incorrect** match.

(1) *Cycas*   –   Coralloid roots

(2) *Pinus*   –   Endomycorrhiza

(3) *Cedrus*   –   Branched stem

(4) *Ginkgo*   –   Long shoot

96. Select **incorrect** statement w.r.t gymnosperms.

(1) Roots in all genera have fungal association

(2) Ovules are exposed

(3) The pollen tube carries single male gamete

(4) Seeds are exposed

97. Match the following.

	Column-I		Column-II
a.	*Selaginella*	(i)	Megaspores
b.	*Dryopteris*	(ii)	Rhizome
c.	*Salvinia*	(iii)	Sori
d.	*Equisetum*	(iv)	Microphyll

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

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

98. Elaborate mechanism of spore dispersal is found in

(1) *Marchantia*, *Riccia*, *Anthoceros*

(2) *Funaria*, *Polytrichum*, *Riccia*

(3) *Sphagnum*, *Polytrichum*, *Marchantia*

(4) *Polytrichum, Sphagnum*, *Funaria*

99. Which of the following is not a feature of pteridophytes?

(1) Water is required for transfer of antherozoids

(2) Independent sporophyte

(3) Undifferentiated vascular tissue

(4) True roots

100. Choose **odd** one out w.r.t members of true mosses.

(1) *Polytrichum*   (2) *Funaria*

(3) Peat moss   (4) Spike moss

101. Among *Ulothrix*, *Porphyra*, *Sphagnum*, *Selaginella*, *Fucus*, *Funaria*, *Spirogyra* and *Marchantia*, no immediate reduction division takes place in how many members?

   (1) Three
   (2) Four
   (3) Six
   (4) Five

102. Match the following.

Column-I	Column-II
a. *Chlamydomonas*	(i) Static female gamete
b. *Fucus*	(ii) Biflagellated zoospores
c. *Ulothrix*	(iii) Quadriflagellated zoospores
d. *Volvox*	(iv) Motile male gamete

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

103. In *Cycas*, the root shows symbiotic association of

   (1) A bacterium
   (2) A fungus
   (3) A filamentous cyanobacteria
   (4) Both (1) & (2)

104. Which of the following microbes help in N_2 fixation in the root of *Ginkgo biloba*?

   (1) *Anabaena*
   (2) *Frankia*
   (3) *Rhizobium*
   (4) *Nostoc*

105. Match the following.

Column-I	Column-II
a. Agar	(i) *Fucus*
b. SCP	(ii) *Chondrus*
c. Algin	(iii) *Spirullina*
d. Carrageen	(iv) *Gelidium*

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

106. Select the **incorrect** match w.r.t shape of chloroplast.

   (1) *Oedogonium* – Reticulate
   (2) *Chlorella* – Discoid
   (3) *Chlamydomonas* – Cup-shaped
   (4) *Ulothrix* – Ribbon-shaped

107. What is the chromosomes number in capsule, gemma and protonema if spore mother cell contains 20 chromosomes?

   (1) 10, 10 and 20 respectively
   (2) 10, 20 and 10 respectively
   (3) 20, 10 and 10 respectively
   (4) 10, 10 and 10 respectively

108. Rhizoids of *Funaria* are

   (1) Unicellular and non-pigmented
   (2) Multicellular and pigmented
   (3) Unicellular and pigmented
   (4) Multicellular and non-pigmented

109. *Ulothrix*, *Marchantia* and *Dryopteris* resemble with each other in which of the following feature?

   (1) Presence of embryo
   (2) Haplo-diplontic life cycle
   (3) Dependence on water for fertilization
   (4) Gametophytic plant body

110. Find set of features related to *Selaginella*

   a. Rhizomorph
   b. Microspore
   c. Sori
   d. Macrophyll
   e. Strobili
   f. True leaves

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

111. Which of the following are heterosporous with dependent male and female gametophyte?

   (1) *Adiantum*, *Selaginella* and *Salvinia*
   (2) *Cycas*, *Pinus* and *Ginkgo*
   (3) *Cedrus*, *Selaginella* and *Adiantum*
   (4) *Salvinia*, *Cycas* and *Dryopteris*

112. If the leaf cells of dicot plant contain 48 chromosomes, the chromosome number in synergid cell, secondary nucleus, nucellar cell and PEN are respectively

   (1) 12, 24, 24, 36
   (2) 24, 48, 24, 36
   (3) 24, 48, 48, 72
   (4) 12, 48, 48, 72

113. The non-vascular amphibians show

   (1) True roots
   (2) Independent sporophyte
   (3) Thallus-like plant body
   (4) Diplontic life cycle

114. In *Marchantia*, nine detached gemmae form plant body will form how many daughter plants?

   (1) 27
   (2) 9
   (3) 18
   (4) 36

115. Gametophytic plant body in most of the ferns is

   (1) Dioecious, independent and non-vascular
   (2) Monoecious, dependent and inconspicuous
   (3) Small, dependent and non-vascular
   (4) Non-vascular, independent and photosynthetic

116.
   a. Presence of gelatinous coating on the cell wall of *Chara*
   b. Pyrenoids are food storage in *Ulothrix*
   c. Frond is the photosynthetic organ in *Fucus*

   (1) Only b is incorrect
   (2) b and c are correct
   (3) Only a is correct
   (4) a and c are incorrect

117. Natural system of classification was based on all, **except**

   (1) Phytochemistry
   (2) Anatomy
   (3) Phylogeny
   (4) External features

118. Select the **incorrect** match.

   (1) *Adiantum* – Homosporous member of pteropsida
   (2) *Salvinia* – Heterosporous member of sphenopsida
   (3) *Dryopteris* – Macrophyll and homosporous
   (4) *Equisetum* – Rhizome as underground stem

119. Some algal members are given in a box.

Porphyra, *Gracilaria*, *Polysiphonia*, *Chondrus*, *Ectocarpus*, *Spirogyra*, *Laminaria*

   How many of them lack flagella in their life cycle?

   (1) Six
   (2) Five
   (3) Three
   (4) Four

120. Main plant body is green, photosynthetic and haploid in all, **except**

   (1) *Marchantia*
   (2) *Polytrichum*
   (3) *Funaria*
   (4) *Psilotum*

121. Chemotaxonomy is based on

   (1) DNA sequence
   (2) Chemical nature of protein
   (3) Chromosome structure
   (4) Both (1) & (2)

122. Which of the following structures degenerate after fertilization?

   (1) Polar nuclei and central cell
   (2) Antipodals and synergids
   (3) Synergids and central cell
   (4) Central cell and antipodals

123. Double fertilization occurs in

   (1) Sunflower, *Cycas*, *Pinus*
   (2) *Wolfia*, *Eucalyptus*, Sunflower
   (3) *Ginkgo*, *Pinus*, *Wolfia*
   (4) *Eucalyptus*, *Wolfia*, *Cycas*

124. Which of the following is **correct**?

   (1) In *Pinus*, pollen grains are developed inside the megasporangia
   (2) Coralloid roots are associated with *Frankia*
   (3) Male and female cones are borne on the same tree in *Pinus*
   (4) In *Cycas*, the pinnate leaves persist for many years

125. Among synergids, antipodal cells, integuments and pollen grains, how many structures are gametophytic?

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

126. Angiosperms lack

   (1) Nucellus
   (2) Sieve tube
   (3) Albuminous cells
   (4) Ovary

127. In Gymnosperms

   (1) Microspore is developed into female gametophyte
   (2) Mature female gametophyte is unicellular
   (3) Male and female gametophytes have an independent free living existence
   (4) Female gametophyte bears two or more archegonia

128. The sporophyte is dominant and photosynthetic in the life cycle of

   (1) Some pteridophytes and bryophytes
   (2) Gymnosperms
   (3) Few spermatophytes and pteridophytes
   (4) Algae, bryophytes

129. Which of the following event is unique to angiosperms?

   (1) Seeds dispersal
   (2) Triple fusion
   (3) Pollination
   (4) Heterospory

130. Complexity in body organisation is maximum in ____'a'____ and complex post-fertilization changes are seen in ____'b'____ .

   (1) a – Brown algae; b – Red algae
   (2) a – Red algae; b – Red algae
   (3) a – Green algae; b – Red algae
   (4) a – Brown algae; b – Green algae

131. Antheridiophores are found in

   (1) *Sphagnum*
   (2) *Marchantia*
   (3) *Funaria*
   (4) More than one option is correct

132. Sporophytic generation is represented only by one celled zygote in
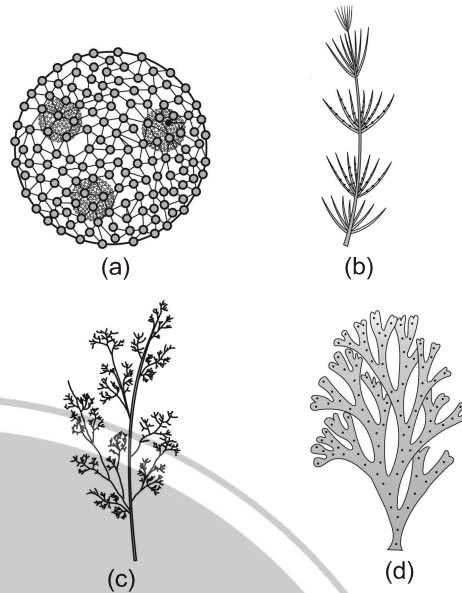
(1) Algae

(2) Ferns

(3) Mosses

(4) Liverworts

133. Asexual spores as pear shaped with two unequal lateral flagella are found in a plant group which is also characterised by

(1) Having unicellular and filamentous thalloid plant body

(2) Photosynthetic pigments as chlorophyll a and phycoerythrin

(3) Storage food as complex carbohydrate mannitol

(4) Absence of isogamous sexual reproduction

134. Chilgoza is obtained from

(1) *Pinus roxburghii*

(2) *Pinus gerardiana*

(3) *Abies balsamea*

(4) *Cycas revoluta*

135. Examine the following figures and select the right choice.

(a)   (b)

(c)   (d)

(1) (a) – Aquatic embryophyte; (b) – Stonewort

(2) (c) – *Polysiphonia*; (d) – Brown algae

(3) (a) – Aquatic green algae; (d) – *Fucus*

(4) (b) – *Chara*; (c) – Leafy bryophyte

ZOOLOGY

136. Jaws, scales and paired fins are absent in

(1) *Hippocampus*, *Exocoetus*

(2) *Anabas*, *Pterophyllum*

(3) *Petromyzon*, *Myxine*

(4) *Myxine*, *Anguilla*

137. Presence of notochord only in the tail which is lost during metamorphosis is a characteristic feature of

(1) *Branchiostoma*   (2) *Balanoglossus*

(3) *Ascidia*   (4) *Salamandra*

138. Choose the **incorrect** statement w.r.t. chordates

(1) Coelomates with organ system level of organisation

(2) Presence of dorsal, hollow notochord

(3) Ventral heart and mostly closed circulatory system

(4) Nerve cord is dorsal to notochord

139. Which of the following statements is **incorrect**?

(1) *Petromyzon* is ectoparasite on fish

(2) *Petromyzon* shows catadromous migration in its breeding season

(3) *Petromyzon* reproduces only once in its life

(4) Ammocoete is the larva of *Petromyzon* which migrates from fresh water to ocean

140. Which of the following characteristics is not found in all chordates?

(a) Dorsal, single, hollow nerve cord

(b) Metamerism

(c) Muscular diaphragm

(d) Pharyngeal gill clefts

(e) Cranium

(1) (c) & (e)   (2) (a) & (b) & (c)

(3) (b) & (c) & (e)   (4) (b) & (c)

141. Choose the animal which is **incorrectly** paired with the number of gill slits, it has

(1) Elasmobranchs   — 5 to 7 pairs

(2) Teleosts   — 4 pairs

(3) Cyclostomes   — 6 to 15 pairs

(4) Tadpoles   — 6 pairs

142. Hepatic portal system is present in

(1) Amniotes only

(2) Anamniotes only

(3) Amniotes as well as anamniotes

(4) Acraniates only

143. Among vertebrates, the biodiversity is maximum for

   (1) Fishes

   (2) Amphibians

   (3) Birds

   (4) Mammals

144. Which structure allows fishes to control their depth in an aquatic environment?

   (1) Operculum

   (2) Swim bladder

   (3) Lateral line

   (4) Jaws

145. Observe the chart below and choose the row with **incorrect** information

| Row	Group	Characteristic
A.	Invertebrate chordates	Lack a backbone
B.	Jawless fishes	Lack a notochord
C.	Bony fish	Mesodermal cycloid or Ctenoid scales
D.	Cartilaginous fishes	Scroll valve in intestine

   (1) A

   (2) B

   (3) C

   (4) D

146. Snakes find their prey and mates by the help of

   (1) Jacobson's organs

   (2) Johnston's organs

   (3) Loreal pit

   (4) Tactile receptors

147. Choose the **incorrect** statement

   (1) Most reptiles, except for some aquatic turtles, depend primarily on lungs for gas exchange

   (2) Reptiles inhale air by contracting muscles of rib-cage and body wall to expand the upper part of body cavity

   (3) Reptiles exhale air by relaxing the muscles of rib-cage and body wall and contraction of diaphragm

   (4) Reptilian lungs have larger surface area for exchange than the lungs of amphibians

148. Analyse the following graph for metabolic rate vs. body mass of some mammals represented as A, B, C & D. Choose the animals which would correctly fit the description according to the graph.
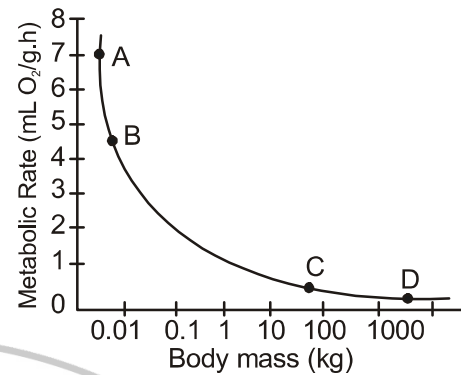
	A	B	C	D
(1)	Mouse	Shrew	Elephant	Human
(2)	Shrew	Mouse	Human	Elephant
(3)	Elephant	Human	Mouse	Shrew
(4)	Human	Mouse	Shrew	Elephant

149. Oil glands, sweat glands and mammary glands are responsible for which functions?

   (1) Hair and skin maintenance, temperature regulation, milk production

   (2) Reproduction, hair and skin maintenance, temperature regulation

   (3) Temperature regulation, milk production, reproduction

   (4) Milk production, oxygen delivery, hair and skin maintenance

150. Which is **not** a characteristic of the duck-billed platypus?

   (1) Webbed feet

   (2) Egg laying ability

   (3) Three chambered heart

   (4) Absence of pinna

151. In which of the animals the heart does not have the left and right auricles?

   (1) Cartilage and bony fish

   (2) Frogs and toads

   (3) Lizards and snakes

   (4) Crocodiles and alligators

152. During the embryonic development of chordates the blastopore develops into

   (1) Mouth   (2) Stomodeum

   (3) Anus   (4) Archenteron

153. The chordates with metamorphosis in their life cycle are

a. Amphibia   b. Pisces

c. Cyclostomata   d. Tunicata

e. Reptilia   f. Aves

(1) a & d   (2) a, c & d

(3) a, b & c   (4) a, d & f

154. Which of the following statements is **not** correct?

(1) Fishes were the first vertebrates to make their appearance

(2) All vertebrates have an endoskeleton derived from mesoderm

(3) All vertebrates have a ventral heart

(4) Placoid scales cover the body of sharks and lampreys

155. Which of the following groups of animals is correctly matched with its one characteristic feature without even a single exception?

(1) Mammalia   —   Viviparity

(2) Reptilia   —   Three chambered heart with partially divided ventricle

(3) Chordata   —   Excretion by kidneys

(4) Chondrichthyes   —   Cartilaginous endoskeleton

156. The following animals are endemic to certain parts of the world. Choose the animal which is **incorrectly** paired with the region.

(1) *Struthio*   —   Africa

(2) *Sphenodon*   —   New Zealand

(3) *Vipera*   —   New Zealand

(4) Koala   —   Australia

157. Moist skin without scales and used as an accessory respiratory organ is found in

(1) *Rana*, *Hyla*

(2) *Hyla*, *Hemidactylus*

(3) *Ichthyophis*, *Myxine*

(4) *Salamandra*, *Catla*

158. Which of the following feature is not common between *Ichthyophis* and *Naja*?

(1) Elongated slender body without limbs

(2) Head with pair of eyes and tympanum

(3) Pulmonary respiration

(4) Closed circulatory system

159. What would be the **correct** sequence of classification of *Delphinus*?

a. Gnathostomata   b. Vertebrata

c. Chordata   d. Mammalia

e. Tetrapoda

(1) c, b, e, a, d   (2) c, b, a, e, d

(3) c, e, a, b, d   (4) d, e, a, b, c

160. Vertebrates adapted for terrestrial existence have the following characteristics in common

(1) Shelled eggs

(2) Presence of copulatory organ

(3) Internal fertilization

(4) Parental care

161. In which of the following species, the male shows parental care?

(1) *Ichthyophis*   (2) *Pipa*

(3) *Alytes*   (4) *Testudo*

162. Out of the following set of characters, how many are found in bony fish?

Placoid scales, Homocercal tail fin, Swim bladder, Claspers, Operculum, Weberian ossicles.

(1) Two   (2) Three

(3) Four   (4) Five

163. Age and growth rate in salmon can be determined by its

(1) Number of gill slits   (2) Size only

(3) Annuli on scales   (4) Number of teeth

164. Consider the following animals - *Pristis*, *Catla*, *Hyla*, *Calotes*, *Pavo*. Group them into the smallest taxon

(1) Chordata   (2) Vertebrata

(3) Gnathostomata   (4) Tetrapoda

165. The following characteristics are true for *Crocodilus*, **except**

(1) Thecodont dentition

(2) Heart with foramen of Panizzae

(3) Amnion around developing embryo

(4) Epidermal scales on the body lubricated by oil glands

166. The salamanders, newts and mud puppies are

(1) Group of extinct amphibians

(2) Amphibians exhibiting neoteny

(3) Tailed amphibians

(4) Amphibians that permanently live in water