**Topics Covered:**
Physics: Laws of Motion; Work, Energy and Power
Chemistry: Classification of elements and periodicity in properties, Chemical bonding and molecular structure
Botany: Biological Classification & Morphology of Flowering Plants(Including Malvaceae, Cruciferae, Leguminosae, Compositae, Graminae)
Zoology: Breathing & Exchange of Gases, Body Fluids & Circulation

General Instructions :

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

PHYSICS

SECTION-A

1. A curved road of diameter 1.8 km is banked so that no friction is required for a vehicle to take a turn with a speed of 30 m/s. The angle of banking is _____ (g = 10 m/s^2)

(1) $\tan^{-1}(1)$

(2) $\tan^{-1}(0.1)$

(3) $\tan^{-1}(0.4)$

(4) $\tan^{-1}(0.5)$

2. Two blocks *A* and *B* rest on a smooth horizontal surface as shown in the figure. If coefficient of friction between *A* and *B* is 0.4 then maximum horizontal force *F* which can be applied on block *A* so the blocks *A* and *B* move together is
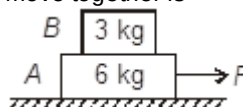

(1) 12 N

(2) 24 N

(3) 36 N

(4) 72 N

3. The momentum P (in kg m/s) of the particle is varying with time t (in second) as $P = 3t + 4$. The magnitude of force acting on the particle at time $t = 1$ s will be

(1) 3 N

(2) 4 N

(3) 7 N

(4) 10 N

4. A body is moving along a straight line by a machine delivering constant power. The distance moved by the body in time 't' is proportional to

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

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

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

(4) t^2

5. Two masses of 5 kg and 10 kg and two light strings (1) and (2) are in a system as shown in figure. Tension in the string (2) is ($g = 10$ m/s^2)


(1) 5 N

(2) 50 N

(3) 15 N
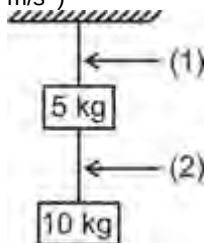
(4) 100 N

6. The work done by a force $\overrightarrow{F} = 2\hat{i} + 2\hat{j}$ around the path *OABCO* as shown in figure is

(1) $\frac{2a^3}{3}$

(2) a^3
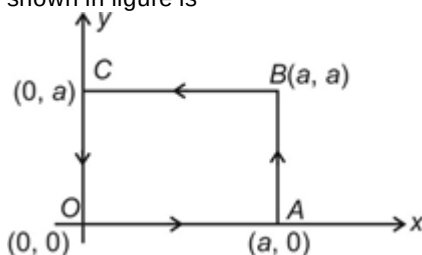
(3) Zero

(4) $\frac{4a^3}{3}$

7. The linear momentum of a system is

(1) Always conserved

(2) Never conserved

(3) Conserved when net external force on the system is zero

(4) None of these

8. A block of mass 10 kg is at rest on a smooth inclined plane with angle of inclination 60°, with the help of a light string as shown in the figure. The normal reaction on the block will be ($g = 10$ m/s^2)

(1) 50 N

(2) $50\sqrt{3}$ N

(3) 25 N
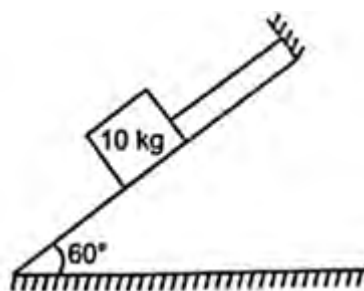
(4) 100 N

9. The magnitude of tension in the horizontal string *AB* if block of mass 10 kg is in equilibrium as shown in figure is [Take $g = 10$ m/s^2]

(1) 100 N

(2) 200 N
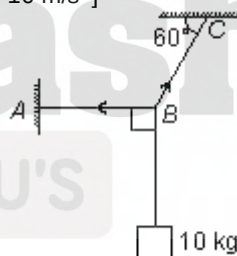
(3) $\frac{100}{\sqrt{3}}$ N

(4) $\frac{200}{\sqrt{3}}$ N

10. A body of mass 4 kg, starting from rest attains a velocity of 5 m/s in 2 s, then the average force acting on the body in this duration is

(1) 2.5 N

(2) 10 N

(3) 1 N

(4) 4 N

11. During inelastic collision
(1) Law of conservation of momentum is valid
(2) Law of conservation of kinetic energy is valid
(3) Both (1) and (2)
(4) Neither (1) nor (2)

12. A block of mass M is held against a rough vertical wall by pressing it with a finger. If the coefficient of friction between the block and the wall is µ and acceleration due to gravity is g, the minimum force required to be applied by the finger to hold the block against wall is
(1) µ Mg
(2) (µ + 1) Mg
(3) $\frac{Mg}{\mu+1}$
(4) $\frac{Mg}{\mu}$

13. A block of mass 1 kg placed on a rough horizontal surface (µ = 0.5) is pulled by a constant horizontal force of 8 N. The net work done on the block after covering a distance of 10 m is (g = 10 ms^{-2})
(1) 20 J
(2) 80 J
(3) 50 J
(4) 30 J

14. A particle of mass m is executing uniform circular motion on a path of radius r. If p is the magnitude of its linear momentum, the radial force acting on the particle is
(1) pmr
(2) $\frac{p^2}{rm}$
(3) $\frac{mp^2}{r}$
(4) $\frac{m}{p}$

15. Instantaneous power is obtained by expression (symbols have usual meaning)
(1) $\frac{W}{2t}$
(2) $\vec{F} \cdot \vec{v}$
(3) $\frac{2m\vec{v} \cdot d\vec{v}}{dt}$
(4) $\frac{1}{2}\vec{F} \cdot \vec{v}$

16. If a body is acted upon by external unbalanced forces, then
(1) It will always be at rest
(2) It will always move with a constant velocity
(3) It will move with some acceleration
(4) Both (1) & (2)

17. Force acting on a body of mass 1 kg shows a sudden spike of 100 N for a short period of 10 ms. If velocity of body just before the spike is 20 m/s, its velocity just after the spike will be nearly
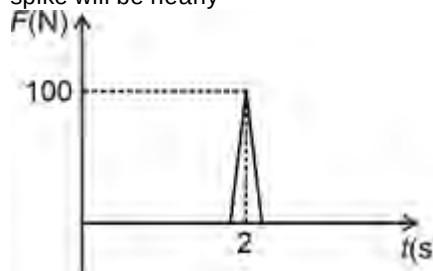
(1) 20.05 m/s
(2) 20.2 m/s
(3) 20.5 m/s
(4) 22 m/s

18. The kinetic energy of a body of mass 2 kg and momentum 2 N s is
(1) 1 J
(2) 2 J
(3) $\frac{1}{2}$ J
(4) $\frac{1}{4}$ J

19. Blocks A and B are at rest on incline planes as shown in figure, the ratio of the contact forces exerted by incline plane on blocks A and B is
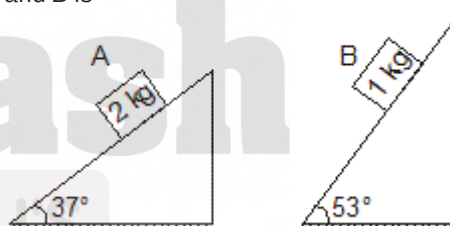
(1) 1 : 1
(2) 2 : 1
(3) 1 : 4
(4) 1 : 8

20. A ball of mass 0.2 kg moves with a velocity of 20 m/s and it stops in 0.1 s; then the magnitude of force on the ball is
(1) 40 N
(2) 20 N
(3) 4 N
(4) 2 N

21. A ball is dropped from height h to a horizontal floor goes up to a height $\frac{h}{4}$ after hitting the floor. The percentage loss of energy in the impact is
(1) 50%
(2) 75%
(3) 25%
(4) 80%

22. A rider on horse falls backward when horse starts running all of a sudden because of
(1) Inertia of motion
(2) Inertia of direction
(3) Inertia of rest
(4) Both (1) and (2)

23. A block of mass 1 kg is forced up a rough inclined surface with angle of inclination 30° by a force of magnitude 12 N parallel to the inclined surface. Coefficient of friction 0.2. If the block is pushed up by 5 m along inclined surface, then (take g = 10 m/s^2).
(1) Work done by gravity is –25 J
(2) Work done by friction is –15 J
(3) Work done by normal is 10 J
(4) All of these

24. A ball B of mass m is moving on a smooth horizontal plane collide with the another identical ball C as shown in the figure. If collision is perfectly elastic then the speed of the ball C just after the collision is
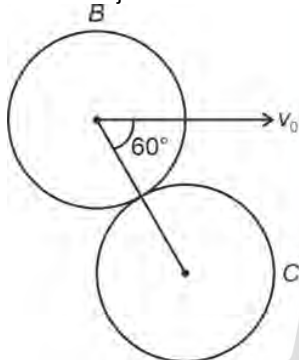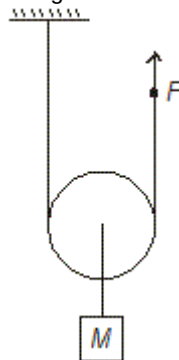

(1) v_0
(2) Zero
(3) $\frac{v_0}{4}$
(4) $\frac{v_0}{2}$

25. The case in which work done by force would be zero is
(1) Displacement of point of application of force is zero
(2) Force and displacement are parallel
(3) Force is antiparallel to displacement
(4) All of the above

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

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

27. A force of $(3\hat{i} + 4\hat{j} + 5\hat{k})$N acts on a body for 2 seconds and produces a displacement of $(2\hat{i} + 3\hat{j} + 2\hat{k})$m. Calculate the power
(1) 7 W
(2) 14 W
(3) 9 W
(4) 12 W

28. A ball of mass m strikes a smooth rigid wall with a speed v at an angle 30° with the wall and get reflected at same angle with wall without change in its speed.
The value of impulse imparted by the wall on the ball will be
(1) mv
(2) $2mv$
(3) $\frac{mv}{3}$
(4) $\frac{mv}{2}$

29. Action and reaction force are
(1) Antiparallel to each another
(2) Parallel to each another
(3) Perpendicular to each another
(4) Inclined at an angle 60° to one another

30. A block is kept on an inclined plane of inclination θ of length l. The velocity of the particle at the bottom of inclined is (The coefficient of friction is μ):
(1) $\sqrt{2gl(\cos\theta + \mu\sin\theta)}$
(2) $\sqrt{2gl(\mu\cos\theta - \sin\theta)}$
(3) $\sqrt{2gl(\sin\theta - \mu\cos\theta)}$
(4) $\sqrt{2gl(\sin\theta + \mu\cos\theta)}$

31. A body constrained to move along the z-axis of a co-ordinate system is subject to a constant force $\vec{F}$ given by $\vec{F} = (2\hat{i} + 3\hat{j} - 5\hat{k})$ N. Work done by this force in moving the body by a distance of 6 m along negative z-axis is

(1) 10 J

(2) 20 J

(3) 30 J

(4) 40 J

32. A force $\vec{F} = \left(4\hat{i} - 3\hat{j} + 2\hat{k}\right)$ N acting on the particle which moves from point P (1, 1, 0) m to Q (3, 2, 1) m. The work done by the force on the particle will be

(1) 6 J

(2) 13 J

(3) 10 J

(4) 7 J

33. CGS unit of force is

(1) Newton

(2) Pound

(3) Dyne

(4) Kilogram-force

34. If a body is released from a certain height, during its fall

(1) Both potential and kinetic energy of the body decrease

(2) Both potential and kinetic energy of the body increase

(3) Its potential energy increases and kinetic energy decreases

(4) Its kinetic energy increases and potential energy decreases

35. A bullet of mass 200 g moving with a velocity of 20 m/s, strikes a fixed wooden block and comes out from other side with a velocity of 10 m/s. The work done by the resistive forces on the bullet will be

(1) 30 J

(2) −15 J

(3) −30 J

(4) +15 J

SECTION-B

36. If angle of repose is 37° then the friction coefficient between the body and the plane is

(1) 0.65

(2) 0.75

(3) 0.85

(4) 0.90

37. Which of the following statements is correct for frictional force?

(1) It is a conservative force

(2) It may cause the motion of body

(3) It may oppose the motion of a moving body

(4) Both (2) & (3)

38. A heavy uniform chain lies on a horizontal table top. If the coefficient of friction between chain and table top is 0.4, then the maximum fraction of length of the chain that can hang over the edge of table is

(1) $\frac{3}{7}$

(2) $\frac{5}{7}$

(3) $\frac{2}{7}$

(4) $\frac{4}{7}$

39. A heavy stone is thrown from a cliff of height h with a speed v. The stone will hit the ground with maximum speed if it is thrown (neglect air resistance)

(1) Vertically downward

(2) Vertically upward

(3) Horizontally

(4) The speed does not depend on the initial direction

40. A stone of mass 20 g falling from height of 2 km hits the ground with a speed of 200 ms^{-1}. The work done by the gravitational force is

(1) 100 J

(2) 200 J

(3) 300 J

(4) 400 J

41. When a spring is stretched by 1 cm, it stores energy 50 J. If it is further stretched by 1 cm, the stored energy will be

(1) 50 J

(2) 100 J

(3) 150 J

(4) 200 J

42. A child weighing 25 kg slides down a rope hanging from a branch of a tall tree. If force of friction acting against him is 200 N, the acceleration of the child is (g = 10 m/s^2)

(1) 22.5 m/s^2

(2) 8 m/s^2

(3) 5 m/s^2

(4) 2 m/s^2

43. A body of mass 1 kg moves according to the position relation $x = \left(t^2 + 2t\right)$ m, where t is time in second the work done by the force in 0 to 2 s is

(1) 8 J

(2) 16 J

(3) 12 J

(4) 6 J

44. Given diagram represents the potential energy curve of particle in a field with position (where symbols have usual meaning). Particle will be in equilibrium at position
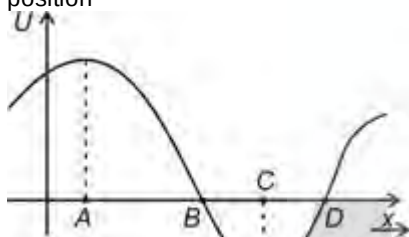

(1) At *B* and *D*

(2) At *A* and *C*

(3) At *A*, *B* and *C*

(4) At *A*, *B*, *C* and *D*

45. An engine lifts 400 kg mass through a height of 100 m in 20 s. The rated power of the engine is, if efficiency of engine is 80% (*g* = 10 m/s^2)

(1) 30 kW

(2) 20 kW

(3) 25 kW

(4) 10 kW

46. A body of mass *m* is moving with speed v_0, towards a wall attached with a massless spring of spring constant *k* as shown in the figure. The maximum compression in spring will be

Smooth surface
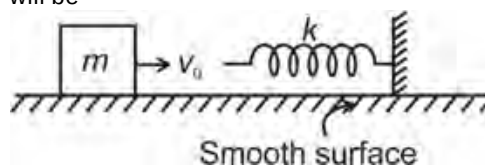
(1) $v_0\sqrt{\dfrac{m}{3k}}$

(2) $v_0\sqrt{\dfrac{2m}{3k}}$

(3) $v_0\sqrt{\dfrac{3m}{k}}$

(4) $v_0\sqrt{\dfrac{m}{k}}$

47. A body of mass *m* is raised to a height *h* from ground along three different paths viz I, II and III against gravity as shown below. If W_I, W_{II} and W_{III} are the work done against gravity along the respective paths I, II and III, then the correct option is (there is no non-conservative force)
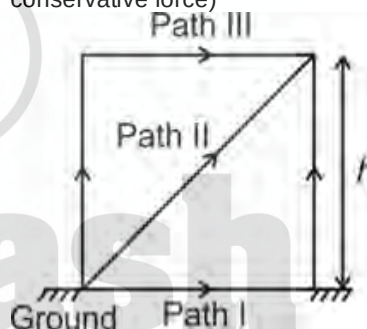
(1) $W_{III} > W_{II} > W_I$

(2) $W_I > W_{II} > W_{III}$

(3) $W_{II} > W_I > W_{III}$

(4) $W_I = W_{II} = W_{III}$

48. A body is being rotated in a circular path with uniform speed. The work done by centripetal force is

(1) Positive

(2) Zero

(3) Negative

(4) Infinite

49. What is the acceleration of 6 kg mass, when acceleration of 3 kg is 3 m s^{-2} as shown in figure?

(1) 3 m s^{-2}

(2) 4 m s^{-2}

(3) 1 m s^{-2}

(4) 2 m s^{-2}

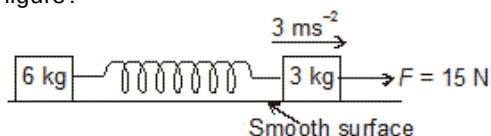**50.** The maximum force of static friction upto which body does not move is called

(1) Kinetic friction

(2) Rolling friction

(3) Limiting friction

(4) Normal reaction

CHEMISTRY

SECTION-A

51. Element of highest electronegativity among the following is

(1) O

(2) S

(3) Se

(4) Te

52. Select the **correct** statement among the following.

(1) Germanium is known as Eka-aluminium

(2) Noble gases exhibit very high chemical reactivity

(3) p-block elements together with s-block elements are called representative elements

(4) Actinoids elements are also known as transuranic elements

53. The incorrect order for atomic/ionic radii is

(1) $F^- > F$

(2) $Na^+ < Na$

(3) $Mg^{2+} > Al^{3+}$

(4) $O^{2-} < Na^+$

54. The atomic number of the element present in fourth period and sixth group of the modern periodic table is

(1) 41

(2) 33

(3) 19

(4) 24

55. Consider the reasons for variation in chemical behaviour of the first member of a group of elements in the s-and p-blocks compared to that of the subsequent members in the same group.

(a) Small size

(b) Large charge/radius ratio

(c) High electronegativity

(d) Unavailability of d-orbitals

The correct reasons are

(1) (a), (b) and (c) only

(2) (a), (c) and (d) only

(3) (a) and (b) only

(4) (a), (b), (c) and (d)

56. The IUPAC symbol for the element having atomic number 106 is

(1) Unq

(2) Unh

(3) Unb

(4) Une

57. Among the following, which pair of elements have diagonal relationship?
(1) N and S
(2) Cl and O
(3) Be and Al
(4) P and C

58. In which of the following arrangements, the given sequence is not strictly according to the properties indicated against it?

(1) $Na_2O < Al_2O_3 < Cl_2O_7$: Increasing acidic character

(2) $Be < B < C$: Increasing electronegativity

(3) $He < Ne < Ar$: Increasing electron gain enthalpies

(4) $B < C < N$: Increasing first ionization enthalpies

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

59. The IUPAC official name of element having atomic number Z = 104 is
(1) Bohrium
(2) Rutherfordium
(3) Meitnerium
(4) Nobelium

60. The atom which has electronic configuration, $1s^2\,2s^2\,2p^6\,3s^2\,3p^4$ belongs to
(1) Period 4, group 16
(2) Period 3, group 14
(3) Period 3, group 16
(4) Period 4, group 14

61. The general electronic configuration of *f*-block elements is
(1) $(n-2)\,f^{1-14}\,nd^{0-1}\,ns^2$
(2) $(n-2)\,f^{1-14}\,(n-1)\,d^{0-1}\,ns^2$
(3) $(n-2)\,f^{1-14}\,(n-1)\,d^{10}\,ns^2$
(4) $(n-2)\,f^{1-14}\,(n+1)\,d^2\,ns^2$

62. Most acidic compound among the following is
(1) CO_2
(2) Cl_2O_7
(3) SO_3
(4) P_4O_{10}

63. The electronic configuration of an element is $1s^2\,2s^2\,2p^6\,3s^2\,3p^6\,4s^2\,3d^{10}\,4p^1$. What is the atomic number of the element, which is just below the above given element in the periodic table?
(1) 35
(2) 56
(3) 50
(4) 49

64. Total number of d electrons present in a platinum atom is
(1) 30
(2) 28
(3) 29
(4) 19

65. The total number of sigma bond electrons in the following molecule is

(1) 32
(2) 38
(3) 34
(4) 36

66. Most polar molecule among the following is
(1) HF
(2) HCl
(3) HBr
(4) HI

67. Which molecule does not have tetrahedral geometry?
(1) CH_4
(2) NH_4^+
(3) PCl_5
(4) CCl_4

68. Which one of the following oxides is expected to have odd number of valence electron?
(1) N_2O_4
(2) NO_2
(3) SO_2
(4) N_2O_5

69. Which among the following is a linear molecule?
(1) $CH_3 - C \equiv CH$
(2) $C_2(CN)_2$
(3) CH_3CHO
(4) $CH_2 = CH_2$

70. Maximum number of atoms present in a plane in SbF_5 is
    (1) 5
    (2) 4
    (3) 3
    (4) 2

71. Correct order of bond angle is
    (1) $\overset{\oplus}{N}H_4 > NH_3 > \overset{\ominus}{N}H_2$
    (2) $\overset{\ominus}{N}H_2 > NH_3 > \overset{\oplus}{N}H_4$
    (3) $NH_3 > \overset{\ominus}{N}H_2 > \overset{\oplus}{N}H_4$
    (4) $\overset{\oplus}{N}H_4 > \overset{\ominus}{N}H_2 > NH_3$

72. The hybridisation of C_1, C_2 and C_5 in the following compound respectively are
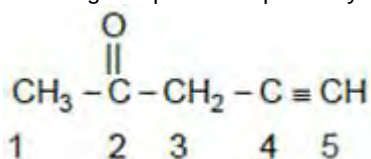
    (1) sp^3, sp^2, sp
    (2) sp^3, sp, sp^2
    (3) sp, sp^2, sp^3
    (4) sp^2, sp^2, sp

73. Species which has square planar shape is
    (1) $[PtCl_4]^{2-}$
    (2) XeO_4
    (3) SF_4
    (4) CH_4

74. The number of electrons present in antibonding molecular orbitals in N_2^+ ion is
    (1) 5
    (2) 4
    (3) 6
    (4) 7

75. Which among the following hybrid orbitals has the maximum % s-character?
    (1) sp
    (2) sp^2
    (3) sp^3
    (4) sp^3d

76. Maximum covalent character is present in
    (1) NaF
    (2) LiF
    (3) KF
    (4) CsF

77. Correct order of bond length is
    (1) C–N > O–H > C–H
    (2) C–H > C–N > O–H
    (3) C–N > C–H > O–H
    (4) O–H > C–H > C–N

78. Hydrogen bond is not observed in
    (1) HCl
    (2) H_2O
    (3) HF
    (4) NH_3

79. The pair of species which are isostructural is
    (1) CCl_4, XeF_4
    (2) NH_3, BF_3
    (3) I_3^+, C_2H_2
    (4) NO_3^-, SO_3

80. Consider the following statements
    Statement I: Total number of electrons present in π antibonding molecular orbital of N_2 is zero.
    Statement II: Total number of antibonding electrons in N_2 is 4.
    Choose the correct option.
    (1) Both the statement I and II are correct
    (2) Both the statement I and II are incorrect
    (3) Statement I is correct but statement II is incorrect
    (4) Statement I is incorrect but statement II is correct

81. A : Formation of O^- ion is exothermic in nature while formation of O^{2-} from O^- is endothermic in nature.

    R : Inter-electronic repulsion in O^- ion makes the second electron gain process an endothermic.
    (1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
    (2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
    (3) Assertion is true statement but Reason is false
    (4) Both Assertion and Reason are false statements

82. **Assertion (A):** $NaNO_3$ is an ionic compound.
Reason (R): There is no covalent bond in $NaNO_3$.
The correct statement is
(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Both Assertion and Reason are false statements

83. The species which does not exist is
(1) O_2^{-2}
(2) He_2^+
(3) Be_2
(4) B_2

84. Shape of $XeOF_2$ molecule is
(1) T-shape
(2) See-saw
(3) Pyramidal
(4) Square pyramidal

85. Match the column.

	Column I (Outer electronic configuration)		Column II (Block)
a.	$2s^1$	(i)	d-block
b.	$3s^23p^4$	(ii)	s-block
c.	$3s^23p^63d^54s^2$	(iii)	f-block
d.	$4f^7$	(iv)	p-block

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

SECTION-B

86. Match the atomic number given in List-I with the IUPAC official name given in List-II.

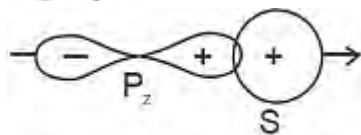| List-I		List-II	
a.	104	(i)	Mendelevium
b.	101	(ii)	Lawrencium
c.	106	(iii)	Rutherfordium
d.	103	(iv)	Seaborgium

The correct match is
(1) a(iii), b(i), c(iv), d(ii)
(2) a(iv), b(i), c(iii), d(ii)
(3) a(ii), b(i), c(iv), d(iii)
(4) a(i), b(iii), c(iv), d(ii)

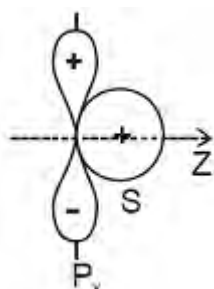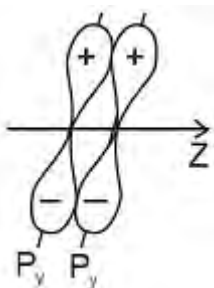**87.** Which of the following representation indicates zero overlapping ?

(1)
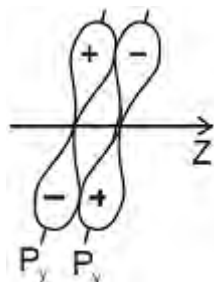
(2)

(3)

(4)

88. The number of elements present in sixth period
(1) 18
(2) 8
(3) 32
(4) 2

89. Which of the following electronic configuration represents a noble gas?
(1) $1s^2, 2s^2\, 2p^6, 3s^2\, 3p^6$
(2) $1s^2, 2s^2\, 2p^6, 3s^2\, 3p^3$
(3) $1s^2, 2s^2\, 2p^6, 3s^2\, 3p^1$
(4) $1s^2, 2s^2\, 2p^6, 3s^2\, 3p^4$

90. **Statement I :** Ionic radius of F^- is greater than O^{2-}.
Statement II : F^- and O^{2-} are isoelectronic species.
In light of above statements, choose the correct answer in the options given below.
(1) Statement I is correct but statement II is incorrect
(2) Both statement I and statement II are correct
(3) Both statement I and statement II are incorrect
(4) Statement I is incorrect but statement II is correct

91. A : C–Cl bond in CCl_4 molecule is non-polar whereas molecule is polar.
R : The resultant dipole moment of four C–Cl bonds in CCl_4 is non-zero.
(1) Both Assertion & Reason are true and the reason is the correct explanation of the assertion
(2) Both Assertion & Reason are true but the reason is not the correct explanation of the assertion
(3) Assertion is true statement but Reason is false
(4) Both Assertion and Reason are false statements

92. Total number of lone-pairs of electrons present in ClF_3 is
(1) 11
(2) 12
(3) 13
(4) 10

93. Ion which has the largest size is
(1) Al^{3+}
(2) K^+
(3) S^{2-}
(4) Ca^{2+}

94. Isostructural pair among the following is
(1) ClF_3 and PCl_3
(2) SF_4 and $N\overset{\oplus}{H}_4$
(3) SO_3 and BCl_3
(4) PCl_3F_2 and BrF_5

95. Which among the following has maximum bond length?
(1) $C = O$
(2) $N = O$
(3) $C = C$
(4) $C \equiv N$

96. The species which is see-saw in shape is
 (1) XeO_2F_2
 (2) $SiCl_4$
 (3) XeF_4
 (4) SO_4^{2-}

97. Highest occupied molecular orbital of B_2^+ ion is
 (1) σ
 (2) σ*
 (3) π
 (4) π*

98. Which species has highest ionization energy?
 (1) Na
 (2) Mg
 (3) Na^+
 (4) Mg^{2+}

99. Which among the following has highest lattice enthalpy?
 (1) LiCl
 (2) NaCl
 (3) LiI
 (4) NaI

100. Bond order of C_2 molecule is
 (1) 0
 (2) 1
 (3) 2
 (4) 3

BOTANY

SECTION-A

101. *Nostoc* lacks
 (1) Heterocysts
 (2) Mucilagenous sheath
 (3) Photosynthetic pigments
 (4) Heterotrophic mode of nutrition

102. A parasitic protozoan that has flagella is
 (1) *Gonyaulax*
 (2) A malaria causing organism
 (3) *Amoeba*
 (4) A sleeping sickness causing organism

103. Under unfavourable conditions bacteria reproduce by means of
 (1) Binary fission
 (2) Spores
 (3) Zoospores
 (4) Fragmentation

104. Which of the following statements is **not** correct?
 (1) Eubacteria are true bacteria
 (2) Cyanobacteria are eubacteria
 (3) The colonies of blue-green algae are surrounded by gelatinous sheath
 (4) Autotrophic bacteria are most abundant in nature

105. Red tides in the oceans is mainly caused by
 (1) Cyanobacteria
 (2) *Ulothrix*
 (3) *Gonyaulax*
 (4) *Fucus*

106. Dikaryophase is seen during the sexual reproduction of
 (1) Mushroom
 (2) *Alternaria*
 (3) *Albugo*
 (4) *Mucor*

107. Edible members of Ascomycetes are
 (1) *Agaricus* and yeast
 (2) Morels and truffles
 (3) Yeast and *Ustilago*
 (4) *Trichoderma* and truffles

108. Fungi growing on cow dung are called
 (1) Xylophilous
 (2) Corticolous
 (3) Coprophilous
 (4) Epixylic

109. Two kingdom system of classification proposed by Linnaeus distinguishes between
 (1) Eukaroytes and prokaryotes
 (2) Unicellular and multicellular organisms
 (3) Plants and animals
 (4) Photosynthetic and non-photosynthetic organisms

110. Mycelium is aseptate and coenocytic in
 (1) *Penicillium*
 (2) *Albugo*
 (3) *Agaricus*
 (4) *Aspergillus*

111. Viruses that infect bacteria usually have
 (1) Single stranded RNA
 (2) Double stranded RNA
 (3) Double stranded DNA
 (4) Single stranded DNA

112. On the basis of five kingdom system of classification, *Chlorella* and *Amoeba* belong to kingdom
 (1) Monera
 (2) Plantae and Animalia respectively
 (3) Protista
 (4) Plantae and Protista respectively

113. Infectious agent that causes potato spindle tuber disease
 (1) Is found to be a free DNA
 (2) Lacks the protein coat
 (3) Was discovered by D.J. Ivanovsky
 (4) Is bigger than viruses

114. Slime moulds
 (1) Are autotrophs
 (2) Produce spores under unfavourable conditions
 (3) Lack cell wall throughout the life cycle
 (4) Are unicellular prokaryotes

115. Mark the **wrong** one about methanogens.
 (1) Are found in marshy habitats
 (2) Are capable of converting CH_4 into CO_2
 (3) Are present in the guts of ruminant animals
 (4) Belong to archaebacteria

116. Cyanobacteria are neither
 (1) Saprotrophic nor parasitic
 (2) Colonial nor filamentous
 (3) Aquatic nor terrestrial
 (4) Freshwater forms nor marine forms

117. Non-motile sexual spores produced inside sac like structure are
 (1) Zoospores
 (2) Ascospores
 (3) Basidiospores
 (4) Conidia

118. _____ is used extensively in biochemical and genetic work.
 Select the **correct** option to fill in the blank.
 (1) *Neurospora*
 (2) *Claviceps*
 (3) *Aspergillus*
 (4) *Agaricus*

119. Which of the following features does **not** belong to mustard flowers?
 (1) Polyadelphous stamens
 (2) Tetramerous flower
 (3) Ovary superior
 (4) Actinomorphic flower

120. Seed coat is membranous and fused with fruit wall in
 (1) Gram
 (2) Maize
 (3) Bean
 (4) Pea

121. Fruits of which of the given plants have persistent calyx?
 (1) Brinjal
 (2) Mustard
 (3) Tulip
 (4) *Gloriosa*

122. Select the **odd** one out w.r.t. the members of family Poaceae.
 (1) *Triticum*
 (2) *Brassica*
 (3) *Zea mays*
 (4) *Oryza*

123. The term gamosepalous is used for
 (1) Corolla when its components are free
 (2) The components of corolla attached with gynoecium
 (3) Sepals which are united with gynoecium
 (4) Calyx when its components are united

124. Which of the following plants does **not** have the modified storage tap root?
(1) Carrot
(2) Sweet potato
(3) Radish
(4) Turnip

125. Thorns and spines of plants are similar in being
(1) Modified structures of the same part of the plants
(2) The structures for self defence
(3) The structures for vegetative propagation
(4) Perennating organs of the plant

126. The placenta develops at the base of the ovary in
(1) Marigold
(2) *Dianthus*
(3) *Argemone*
(4) China rose

127. The edible part of mango fruit is
(1) Endosperm
(2) Endocarp
(3) Mesocarp
(4) Epicarp

128. Micropyle of dicot seed
(1) Develops from integuments and forms the seed coat
(2) Consists of embryonal axis and two cotyledons
(3) Is formed as the result of double fertilization
(4) Is found above the hilum as a small pore

129. In the flowers like lily, the two whorls which are **not** distinct, are
(1) Androecium and corolla
(2) Calyx and corolla
(3) Calyx and androecium
(4) Corolla and gynoecium

130. Select the **incorrect** match from the following
(1) Whorled phyllotaxy – *Alstonia*
(2) Pulvinus – Swollen leaf base
(3) Petiole – Green expanded part of leaf
(4) Stipule – Small leaf-like structure at the leaf base

131. A compound leaf differs from a simple leaf in
(1) Bearing axillary buds in axil of its leaflets
(2) Having reticulate venation
(3) Having a number of leaflets as incisions of the lamina reach upto the midrib
(4) Bearing a bud in the axil of the petiole

132. Tendrils of pea differ from cucumber as the former
(1) Are sensitive structures
(2) Are modified leaves
(3) Coil around the nearby support
(4) Help the plant in climbing

133. Medicinal plant of family Fabaceae is
(1) Ashwagandha
(2) Belladonna
(3) Muliathi
(4) *Aloe*

134. Which among the following is **not** true w.r.t. modification of leaves?
(1) Leaves in grapevines are converted into tendrils for climbing
(2) Petioles become green and photosynthetic in Australian *Acacia*
(3) Fleshy leaves in garlic store food
(4) Spines of cacti are modified leaves

135. Root hairs are present in the region of
(1) Root cap
(2) Meristematic activity
(3) Elongation
(4) Maturation

SECTION-B

136. All the given features are common between the members of Ascomycetes and Deuteromycetes, **except**
 (1) Septate and branched mycelium
 (2) Formation of conidia
 (3) Can be decomposers
 (4) Production of sexual spores

137. "Though they are photosynthetic in the presence of sunlight, when deprived of sunlight they behave like heterotrophs by predating on other smaller organisms".
This statement is **correct** for
 (1) Dinoflagellates
 (2) Slime moulds
 (3) Chrysophytes
 (4) Euglenoids

138. Prions are
 (1) Larger than viruses
 (2) Abnormally folded genetic material
 (3) Causal agent of mad cow disease
 (4) Devoid of proteins

139. Choose the **correct** sequence of events with respect to fungal sexual cycle
 (1) Karyogamy, Plasmogamy, Meiosis
 (2) Plasmogamy, Meiosis, Karyogamy
 (3) Plasmogamy, Karyogamy, Meiosis
 (4) Meiosis, Karyogamy, Plasmogamy

140. Loose tissue body organisation is characteristic feature of
 (1) Monera
 (2) Protista
 (3) Fungi
 (4) Plantae

141. A common feature between members of kingdom Fungi and Plantae is
 (1) Being autotrophic
 (2) Presence of cell wall
 (3) Composition of cell wall
 (4) Absence of nuclear membrane

142. Aristotle classified the animals on the basis of
 (1) Morphological characters
 (2) Phylogenetic relationships
 (3) Natural affinities among them
 (4) Absence or presence of red blood

143. Which group of organisms have cell wall with stiff cellulosic plates on the outer surface?
 (1) Diatoms
 (2) Cyanobacteria
 (3) Dinoflagellates
 (4) Euglenoids

144. Primary root is short lived and a large number of roots originate from the base of stem constituting   A   as found in   B .
Fill in the blank with **correct** option for A and B.
 (1) A - Tap root system, B - Dicots
 (2) A - Adventitious root system, B- Dicots
 (3) A - Fibrous root system, B- Monocots
 (4) A - Fibrous root system, B - Dicots

145. Pneumatophores
 (1) Are modification of stem
 (2) Help to get oxygen for respiration
 (3) Are found in *Rhizopus*
 (4) Are modification of root for mechanical support

146. Select the **odd** one w.r.t. plant containing edible underground stem.
 (1) Potato
 (2) Ginger
 (3) *Colocasia*
 (4) *Pistia*

147. Member of angiospermic family that includes colchicine producing plant
 (1) Produce non-endospermous seeds
 (2) Have tricarpellary syncarpous gynoecium with axile placentation
 (3) Lack cymose inflorescence
 (4) Are characterised by presence of zygomorphic flowers

148. Prop roots are found in
 (1) Watermelon
 (2) *Citrus*
 (3) *Opuntia*
 (4) Banyan

149. In cymose inflorescence
(a) Main axis terminates into a flower.
(b) Flowers are borne in basipetal order.
(c) Younger flowers are present towards the apex and older at the base.
 (1) Only (c) is correct
 (2) All (a), (b) and (c) are correct
 (3) Only (a) and (b) are correct
 (4) Only (a) is correct

150. Which of the following feature is **not** associated with China rose?
 (1) Twisted aestivation
 (2) Monoadelphous stamen
 (3) Perigynous flower
 (4) Axile placentation

<div style="text-align:center">

ZOOLOGY

</div>

SECTION-A

151. Respiration is helpful in all, **except**
 (1) Removing wastes from the body
 (2) Producing energy within the body
 (3) Maintaining oxygen supply to body cells
 (4) Elimination of glucose

152. Select the **wrong** statement.
 (1) The role of oxygen in the regulation of respiratory rhythm is quite insignificant.
 (2) Respiratory rhythm centre primarily responsible for regulating the normal respiratory rhythm, is located in pons region.
 (3) Receptors associated with aortic arch and carotid artery can recognise changes in CO_2 and H^+ concentration.
 (4) Neural signals from pneumotaxic centre result in shallow and fast breathing, by shortening the duration of inspiration.

153. In humans, solubility of CO_2 in the blood is _____ times higher than O_2.
Select the correct option to fill the blank.
 (1) 120-125
 (2) 80-100
 (3) 20-25
 (4) 40-70

154. Match column I with column II and select the **correct** option.

Column I		Column II
a. FRC	(i)	ERV + RV
b. VC	(ii)	RV + ERV + IRV + TV
c IC	(iii)	TV + IRV
d. TLC	(iv)	ERV + TV + IRV

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

155. How many of the below mentioned structures are components of human respiratory system?

> Larynx, green glands, bronchi, bronchioles, tracheoles, nasopharynx

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

156. The major fraction of CO_2 is transported by/as
 (1) $NaHCO_3$ in blood plasma
 (2) Dissolved form in cytoplasm of RBC
 (3) Carboxyhaemoglobin
 (4) Carbaminohaemoglobin

157. Read this reaction carefully and find A, B and C.

$$CO_2 + H_2O \overset{\text{'A'}}{\rightleftharpoons} \text{'B'} \rightleftharpoons HCO_3^- + \text{'C'}$$

(1) A = Carbonic anhydrase, B = Adenylate cyclase, C = CO_2

(2) A = Carbonic anhydrase, B = H_2CO_3, C = H^+

(3) A = Carbonic anhydrase, B = H_2CO_3, C = HCO_3^-

(4) A = Acetic anhydrase, B = HCO_3^-, C = H^+

158. Oxygen dissociation curve tends to shift towards right side under which of the given conditions?

(1) Increased partial pressure of O_2 than CO_2

(2) Increased concentration or level of H^+ and CO_2 in blood

(3) Low temperature

(4) High pH

159. Complete the analogy by selecting the **correct** option.
Industrial pollutants : Occupational respiratory disorders :: Cigarette smoking : _____

(1) Asthma

(2) Emphysema

(3) Rhinitis

(4) Heart attack

160. Read the following statements and select the **correct** option.
Statement A: The rate of diffusion of gases is inversely related to the thickness of diffusion membrane.
Statement B: Negative pressure breathing is characteristic of mammals.

(1) Both statements A and B are correct

(2) Both statements A and B are incorrect

(3) Only statement A is correct

(4) Only statement B is correct

161. Which among the following structures is the part of conducting zone of respiratory system in humans but is not supported by the incomplete cartilaginous rings?

(1) Initial bronchioles

(2) Tertiary bronchi

(3) Alveolar ducts

(4) Terminal bronchioles

162. Read the following features:
i. Presence of thin flattened simple squamous epithelium
ii. Absence of ciliated epithelium
iii. Absence of cartilage
Choose the option which fulfills all the above criteria.

(1) Primary bronchi

(2) Pharynx

(3) Alveoli

(4) Trachea

163. Choose the **incorrect** match.

(1) Chemosensitive area – Medulla oblongata

(2) Pneumotaxic centre – Pons

(3) Aortic bodies – Chemoreceptors

(4) Carotid bodies – Thermoreceptors

164. During inspiration in humans,

(1) Contraction of diaphragm increases the volume of thoracic cavity in antero-posterior axis

(2) Relaxation of diaphragm increases the thoracic volume in antero-posterior axis

(3) Contraction of internal intercostal muscles increases the volume of thoracic cavity in dorso-ventral axis

(4) Relaxation of internal intercostal muscles decreases the volume of thoracic cavity in dorso-ventral axis

165. Choose the **correct** pair of muscles which contract during forceful exhalation in humans.

(1) Diaphragm and external intercostal muscles

(2) Diaphragm and internal intercostal muscles

(3) External inter-costal and internal intercostal muscles

(4) Internal inter-costal muscles and abdominal muscles

166. Assertion (A) : SAN is known as the pacemaker of human heart.
Reason (R) : It generates the maximum number of action potentials *i.e.,* 70–75 min^{-1} and is responsible for initiating and maintaining the rhythmic contractile activity of the heart.
In the light of above statements, select the **correct** option.

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

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

(3) Assertion is true statement but Reason is false

(4) Both Assertion and Reason are false statements

167. Left atrium receives the oxygenated blood from both lungs and skin while a single ventricle receives both oxygenated and deoxygenated blood in

(1) Amphibians

(2) Crocodiles

(3) Aves

(4) Mammals

168. Choose the option with only **correct** statements w.r.t. lymph
a. It carries nutrients and hormones
b. Fats are absorbed through lymph in lacteals.
c. Lymphocytes and platelets are absent in lymph.
d. Lymph is drained into major veins.

(1) a and b only

(2) a, b and d

(3) b and d only

(4) a and c

169. 70 mL is the volume of blood pumped by each ventricle per beat under normal resting conditions in humans. This volume is called

(1) Cardiac output

(2) Stroke volume

(3) Diastolic volume

(4) Isovolumetric volume

170. Read the following statements A and B and choose the correct option.
A. ABO grouping is based on the presence or absence of two surface antigens AB and O.
B. Person having blood group AB, has anti-AB antibodies in plasma.

(1) Statement A is correct but statement B is incorrect

(2) Statement A is incorrect but statement B is correct

(3) Both statements A and B are correct

(4) Both statements A and B are incorrect

171. Match column I with column II.

	Column I		Column II
a.	Tunica externa	(i)	Smooth muscles
b.	Tunica media	(ii)	Fibrous connective tissue
c.	Tunica intima	(iii)	Flattened squamous epithelial cells

Select the **correct** option.

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

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

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

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

172. Globulins present in human blood plasma are primarily involved in

(1) Clotting of blood

(2) Maintaining osmolarity of blood

(3) Transport of gases in blood

(4) Defence mechanism of the body

173. Opening of semilunar valves is observed

(1) At the beginning of ventricular diastole

(2) During atrial systole

(3) During ventricular systole

(4) During joint diastole

174. Sympathetic nervous system stimulates SAN that leads to all the following, **except**

(1) Increased number of heart beat

(2) Increased strength of ventricular contraction

(3) Increased cardiac output

(4) Decreased speed of conduction of action potential

175. If a victim of a road traffic accident with unknown blood group requires immediate blood transfusion, the best option is to use blood group

(1) AB^{+ve}

(2) AB^{-ve}

(3) O^{+ve}

(4) O^{-ve}

176. Human heart is protected by a double-walled membranous bag called
 (1) Epicardium
 (2) Pericardium
 (3) Myocardium
 (4) Endocardium

177. Erythroblastosis foetails can be prevented by injecting _____A_____ mother with anti – Rh antibodies immediately after the birth of _____B_____ baby. Choose the option that fill the blanks **correctly** for A and B respectively.
 (1) Rh – ve, Rh + ve
 (2) Rh + ve, Rh + ve
 (3) Rh + ve, Rh – ve
 (4) Rh – ve, Rh – ve

178. In humans, deoxygenated blood during circulation does **not** come in contact with
 (1) Right auricle
 (2) Pulmonary artery
 (3) Pulmonary vein
 (4) Tricuspid valve

179. Assertion (A) : The cardiac output of an athlete during exercise will be much higher than that of an ordinary man.
 Reason (R) : Cardiac output is based on the body's ability to alter the heart rate but not stroke volume.
 On the basis of above statements, choose the correct answer from the options given below.
 (1) Both Assertion & Reason are true and the Reason is the correct explanation of the assertion
 (2) Both Assertion & Reason are true but the Reason is not the correct explanation of the assertion
 (3) Assertion is true but Reason is false
 (4) Both Assertion and Reason are false

180. In a standard ECG, wave that represents the return of the ventricles from excited to normal state *i.e.* repolarisation, is
 (1) P wave
 (2) T wave
 (3) QR wave
 (4) RS wave

181. Conversion of inactive prothrombin into thrombin occurs in the presence of
 (1) Fibrin and Ca^{2+}
 (2) Ca^{2+} only
 (3) Thrombokinase and Ca^{2+}
 (4) Thromboplastins only

182. The part of conducting system present in ventricular wall of human heart is
 (1) Sino-atrial node
 (2) Atrio-ventricular node
 (3) Purkinje fibres
 (4) Internodal pathways

183. Different types of hearts and the blood circulation patterns seen in the animal kingdom are given in table below. Which of the following is **incorrect** w.r.t. animal, type of heart and type of circulation?

	Animal	Type of heart	Type of circulation
(1)	*Rohu*	2 chambered	Single circulation
(2)	Frog	3 chambered	Incomplete double circulation
(3)	Lizard	3 chambered	Incomplete single circulation
(4)	Human	4 chambered	Double circulation

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

184. Read the given statements and select the **correct** option w.r.t. true (T) and false (F).
 (a) Duration of each cardiac cycle is 0.8 seconds which can be altered in fear or fight conditions.
 (b) Rapid passive ventricular filling takes place when auricles are in diastole and auriculoventricular valves remain closed.
 (c) Semilunar valves open when intraventricular pressure exceeds the pressure within aorta.
 (d) Sinoatrial node comprises autoexcitable tissue.

	(a)	(b)	(c)	(d)
(1)	T	F	T	T
(2)	F	T	F	T
(3)	T	F	T	F
(4)	F	T	T	F

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

185. Which of the following is not included in systemic circulation?
 (1) Right atrium
 (2) Left ventricle
 (3) Pulmonary vein
 (4) Vena cava

SECTION-B

186. Every 2 L of oxygenated blood can deliver about 'X' mL of oxygen to the tissues under normal conditions in humans. Choose the **correct** value for 'X'.
    (1) 80
    (2) 100
    (3) 12
    (4) 120

187. Which of the following is responsible for the movement of O_2 from the alveoli into the blood in the pulmonary capillaries?
    (1) Active transport
    (2) Facilitated diffusion
    (3) Simple diffusion
    (4) Osmosis

188. Which of the following labelling from the figure given below is not a part of diffusion membrane?
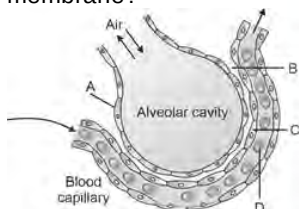
    (1) A
    (2) B
    (3) C
    (4) D

189. If end systolic volume and end diastolic volume of a person are 60 mL and 130 mL respectively, then calculate the value of stroke volume and select the correct option.
    (1) 60 mL
    (2) 70 mL
    (3) 80 mL
    (4) 90 mL

190. The pCO_2 of lungs alveoli in humans is equal to
    (1) pO_2 of oxygenated blood
    (2) pCO_2 of oxygenated blood
    (3) pCO_2 of tissues
    (4) pCO_2 of deoxygenated blood

191. Select the **incorrect** match.

	Respiratory volume/capacity	Value
(1)	Residual volume	1100 mL – 1200 mL
(2)	Expiratory reserve volume	1000 mL – 1100 mL
(3)	Functional residual capacity	2300 mL
(4)	Expiratory capacity	3000 mL – 3500 mL

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

192. If a molecule of carbon dioxide released into the blood in your left foot travels up to your lungs, it must pass through all of the following structures, **except**
    (1) Right atrium
    (2) Pulmonary vein
    (3) Inferior vena cava
    (4) Pulmonary artery

193. What type of blood contains anti B-antibodies in the plasma and lacks Rh antigens?
    (1) AB negative
    (2) A negative
    (3) B negative
    (4) O positive

194. What would be the effect on human heart if we give an injection of adrenaline to an individual?
    (1) Increase in the rate of heart beat
    (2) Decrease in the rate of heart beat
    (3) Increase in the rate of heart beat but decrease in the strength of ventricular contraction
    (4) Decrease in cardiac output

195. If the cardiac output of a person is about 6.3 litres/minute and his stroke volume is 70 mL, then heart rate of the person will be
    (1) 100/minute
    (2) 90/minute
    (3) 80/minute
    (4) 70/minute

196. Read the following statements A and B and choose the **correct** option w.r.t. humans.
A. Movement of air into and out of the lungs is due to a pressure gradient between the lungs and the atmosphere.
B. Inspiration takes place when there is a positive pressure inside the lungs with respect to atmospheric air.

(1) Statement A is correct and B is the correct explanation of A

(2) Statement A is correct but B is incorrect

(3) Both statements A and B are correct

(4) Statement A is incorrect but B is correct

197. We can usually determine the rate of heart beat of an individual by counting the number of
(1) P-waves
(2) T-waves
(3) QRS complexes
(4) P-Q intervals

198. Special fibrous cords which prevent the AV valves from collapsing back into atria during ventricular systole are called
(1) Chordae tendineae
(2) Papillary muscles
(3) Interatrial septum
(4) Conus arteriosus

199. Match column A with column B and choose the **correct** option w.r.t. a healthy human

Column A		Column B
a. Neutrophils	(i)	20-25 % of total WBCs
b. Eosinophils	(ii)	6-8 % of total WBCs
c. Monocytes	(iii)	2-3 % of total WBCs
d. Lymphocytes	(iv)	60-65 % of total WBCs

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

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

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

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

200. Select the **incorrectly** matched option.

(1)	Red blood cells	–	Helps in transport of gases
(2)	Neutrophils	–	Destroy foreign organisms entering the body
(3)	Basophils	–	Resist allergic infections
(4)	Thrombocytes	–	Involved in coagulation of blood

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