## Physics - Section A

1 A bomb of mass 9 kg , initially at rest, explodes into two pieces of masses 3 kg and 6 kg . The velocity of mass 3 kg is $16 \mathrm{~m} / \mathrm{s}$. The kinetic energy of mass 6 kg in joule is:

1. 46
2. 384
3. 192
4. 768

2 Subtract 12.589-12.4 and give the answer to the correct significant figure:

1. 0.2
2. 0.189
3. 0.188
4. 0.199

3 If a particle has negative velocity and negative acceleration, its speed:

| 1. | increases |
| :--- | :--- |
| 2. | decreases |
| 3. | remains the same |
| 4. | zero |

4 Given below are two statements:

| Assertion (A): | Banking of roads provides the necessary <br> centripetal force. |
| :--- | :--- |
| Reason (R): | One part of the normal reaction of the <br> automobile gives necessary centripetal <br> force. |

1. Both (A) and (R) are True and (R) is the correct
2. explanation of $(\mathbf{A})$.
3. Both (A) and (R) are True but $(\mathbf{R})$ is not the correct 2. explanation of $(\mathbf{A})$.
4. (A) is True but ( $\mathbf{R}$ ) is False.
5. Both (A) and (R) are False.

5 A man inside a freely falling box throws a heavy ball towards a side wall. The ball keeps on bouncing between the opposite walls of the box. We neglect air resistance and friction. Which of the following figures depicts the motion of the centre of mass of the entire system (man, the ball and the box)?
3.

6 The terminal velocity $\left(v_{T}\right)$ of the spherical raindrop depends on the radius $(r)$ of the spherical raindrop as:

1. $r^{1 / 2}$
2. $r$
3. $r^{2}$
4. $r^{3}$

7 Two bodies of masses 1 kg and 3 kg have position vectors $\hat{i}+2 \hat{j}+\hat{k}$ and $-3 \hat{i}-2 \hat{j}+\hat{k}$ respectively. The magnitude of position vector of center of mass of this system will be similar to the magnitude of the vector:

1. $\hat{i}-2 \hat{j}+\hat{k}$
2. $-3 \hat{i}-2 \hat{j}+\hat{k}$
3. $-2 \hat{\mathrm{i}}+2 \hat{\mathrm{k}}$
4. $-2 \hat{\mathrm{i}}-\hat{\mathrm{j}}+2 \hat{\mathrm{k}}$

8 As per the given figure, two blocks each of mass 250 g are connected to a spring of spring constant $2 \mathrm{Nm}^{-1}$. If both are given velocity $v$ in opposite directions, then the maximum elongation of the spring is:


1. $\frac{v}{2 \sqrt{2}}$
2. $\frac{v}{2}$
3. $\frac{v}{4}$
4. $\frac{v}{\sqrt{2}}$

9 A particle moves with a constant velocity parallel to the X -axis. Its angular momentum with respect to the origin:

1. is zero
2. remains constant
3. goes on increasing
4. goes on decreasing

10 A constant horizontal force is applied on a
block kept at rest on a smooth horizontal surface. Its power $(P)$ versus time $(t)$ graph is best shown by:


11 The moment of inertia for a uniform square sheet about an axis passing through its centre and lying in the plane is:

1. maximum about its diagonal axis.
2. minimum about an axis which is perpendicular to the sides of the square.
3. both (1) and (2).
4. same for all axis.

12 A stone tied to the end of a string of 1 m long is whirled in a horizontal circle with a constant speed. If the stone makes 22 revolutions in 44 s , what is the magnitude and direction of acceleration of the stone?

1. $\pi^{2} \mathrm{~ms}^{-2}$ and direction along the tangent to the circle.
2. $\pi^{2} \mathrm{~ms}^{-2}$ and direction along the radius towards the 2. centre.
3. $\frac{\pi^{2}}{4} \mathrm{~ms}^{-2}$ and direction along the radius towards the centre.
4. $\pi^{2} \mathrm{~ms}^{-2}$ and direction along the radius away from the centre.

13 A child is sitting on a swing. If its minimum and maximum heights from the ground are 0.75 m and 2 m respectively, its maximum speed will be:
( Take $g=10 \mathrm{~m} / \mathrm{s}^{2}$ )

1. $10 \mathrm{~m} / \mathrm{s}$
$2.5 \mathrm{~m} / \mathrm{s}$
$3.8 \mathrm{~m} / \mathrm{s}$
2. $15 \mathrm{~m} / \mathrm{s}$

14 A 2.0 g bullet (specific heat of the metal of the bullet $400 \mathrm{~J} \mathrm{~kg}^{-1}{ }^{\circ} \mathrm{C}^{-1}$ ) moving at $160 \mathrm{~m} / \mathrm{s}$ hits a wall. What is the temperature change of the bullet if all its kinetic energy converts to the heat energy of the bullet?

| 1. | $40^{\circ} \mathrm{C}$ | 2. | $32^{\circ} \mathrm{C}$ |
| :--- | :--- | :--- | :--- |
| 3. | $16^{\circ} \mathrm{C}$ | 4. | $8^{\circ} \mathrm{C}$ |

15 A particle is moving in a circular path of radius $r$, under the action of an attractive potential $U=\frac{-K}{2 r^{2}}$. Total mechanical energy of the particle is:

1. $\frac{K}{2 r^{2}}$
2. $\frac{K}{r^{2}}$
3. $\frac{2 K}{r^{2}}$
4. zero

16 A bullet is fired from a gun. If the gun recoils freely, the kinetic energy of the gun will be:

1. less than that of bullet
2. equal to that of bullet
3. greater than that of bullet
4. zero

17 If the period of a satellite in a circular orbit of radius $R$ is $T$, then the period of another satellite in a circular orbit of radius $2 R$ is:

1. $2 T$
2. $T / 2$
3. $T / \sqrt{8}$
4. $\sqrt{8} T$

18 Two blocks of mass $m$ and $2 m$ are connected with a string which is passing over a pulley (disc) of mass $m$ and radius $R$ as shown in the figure. If the system is released from rest, then the acceleration of the block will be:


1. $g / 5$
2. $2 g / 7$
3. $g / 3$
4. $2 g / 3$

19 Given below are two statements:
The product of pressure $(\mathrm{P})$ and time $(\mathrm{t})$
Assertion (A): has the same dimension as that of the coefficient of viscosity.
Reason (R): Coefficient of viscosity $=\frac{\text { Force }}{\text { Velocity gradient }}$

Both (A) and (R) are True and (R) is the correct explanation of (A).
Both (A) and (R) are True but ( $\mathbf{R}$ ) is not the correct explanation of (A).
3. $(\mathbf{A})$ is True but $(\mathbf{R})$ is False.
4. (A) is False but ( $\mathbf{R}$ ) is True.

20 We sit in the room with the windows open. Then:
the air pressure on the floor of the room equals the

1. atmospheric pressure but the air pressure on the ceiling is negligible.
2 the air pressure is nearly the same on the floor, the walls, and the ceiling.
the air pressure on the floor equals the weight of the
2. air column inside the room (from floor to ceiling) per unit area.
4 the air pressure on the walls is zero since the weight of air acts downward.

21 Given below are two statements:
Assertion (A): Friction is a self-adjusting force.
Reason (R): Friction does not depend upon the mass of the body.

Both (A) and (R) are True and (R) is the correct explanation of $(\mathbf{A})$.
Both (A) and (R) are True but (R) is not the correct explanation of (A).
3. (A) is True but ( $\mathbf{R}$ ) is False.
4. Both (A) and (R) are False.

22 A metal wire of length 0.5 m and cross-sectional area $10^{-4} \mathrm{~m}^{2}$ has breaking stress $5 \times 10^{8} \mathrm{Nm}^{-2}$. A block of 10 kg is attached at one end of the string and is rotating in a horizontal circle. The maximum linear velocity of the block will be:
$1.15 \mathrm{~m} / \mathrm{s}$
2. $50 \mathrm{~m} / \mathrm{s}$
3. $25 \mathrm{~m} / \mathrm{s}$
4. $40 \mathrm{~m} / \mathrm{s}$

23 A projectile is fired with kinetic energy of 1 kJ . If the range is maximum, what is its kinetic energy at the highest point?

1. 250 J
2. 500 J
3. 750 J
4. none of these

24 Which of the following statements is true about the motion depicted in the diagram?


1. The acceleration is constant and non-zero.
2. The velocity changes suddenly during the motion.
3. The velocity is positive throughout.
4. All of the above are true.

25 A uniform rod on a smooth horizontal table is moving with uniform horizontal speed $v$. Suddenly the rod is hinged at the centre of the rod. The angular momentum of rod will be conserved about point:


1. $A$
2. $B$
3. $C$

Angular momentum will not be conserved about any point.

26 The resultant of $\vec{A}$ and $\vec{B}$ makes an angle $\alpha$ with $\vec{A}$ and $\beta$ with $\vec{B}$, then:

1. $\alpha<\beta$
2. $\alpha<\beta$ if $A<B$
3. $\alpha<\beta$ if $A>B$
4. $\alpha<\beta$ if $A=B$

27 Consider two wires $A$ and $B$ which are made of same material. The diameter of $A$ is four times larger than $B$. If they are stretched by same load, then the stress on $B$ is:

| 1. | equal to that on $A$ |
| :--- | :--- |
| 2. | sixteen times that on $A$ |
| 3. | twice that on $A$ |
| 4. | half that on $A$ |

28 An object kept in a large room having an air temperature of $25^{\circ} \mathrm{C}$ takes 12 minutes to cool from $80^{\circ} \mathrm{C}$ to $70^{\circ} \mathrm{C}$. The time taken to cool for the same object from $70^{\circ} \mathrm{C}$ to $60^{\circ} \mathrm{C}$ would be nearly:

1. 10 min
2. 12 min
3. 20 min
4. 15 min

29 A metal sphere is suspended from a wall by a string.
The forces acting on the sphere are shown in the figure. Which of the following statements is NOT correct?


1. $\vec{N}+\vec{T}+\vec{W}=0$
2. $T^{2}=N^{2}+W^{2}$
3. $T=N+W$
4. $N=W \tan \theta$

30 A disc has angular acceleration $4 \mathrm{rad} \mathrm{s}^{-2}$ and initial angular speed $2 \mathrm{rad} \mathrm{s}^{-1}$. In 4 s , the disc has rotated through an angle of:

1. 14 rad
2. 24 rad
3. 40 rad
4. 56 rad

31 A block of mass $m$ slides down the smooth inclined surface of a wedge of mass $M$; which is itself on a smooth horizontal surface. The centre-of-mass of the system:


1. is stationary
2. accelerates to the left
3. accelerates to the right
4. accelerates downward

32 The platelets are drifting with the blood flowing in a streamlined flow through a horizontal artery as shown below. The artery is contracted in region II.


Chooses the correct statement.
as the platelets enter a constriction, the platelets get

1. squeezed closer together in the narrow region and hence the fluid pressure must rise there.
2. as the platelets enter a constriction, pressure is lower there.
the artery's cross-section area is smaller in the
3. constriction and thus the pressure must be larger there because pressure equals the force divided by area.
4. pressure is the same in all the parts of the artery.

33 What is the projection of $\vec{A}$ on $\vec{B}$ ?

1. $\vec{A} \cdot \vec{B}$
2. $\vec{A} \cdot \hat{B}$
$\vec{B} \cdot \vec{A}$
3. $\hat{A} \cdot \hat{B}$

34 In a vertical capillary of height $h$, water rises upto complete height $h$. If the capillary is tilted at $30^{\circ}$ with horizontal then the height upto which water will rise becomes:

1. $h$
2. $\frac{h}{2}$
3. $\frac{2 h}{3}$
4. $\frac{h}{4}$

35 Imagine that there exists a planet whose mass and radius are both half that of the earth. The acceleration due to gravity on that planet will be:

1. $g / 4$
2. $g / 2$
3. $2 g$
4. $4 g$

## Physics - Section B

36 The temperature of the surface of the sun is nearly 6000 K and the amount of total energy emitted by the sun per second is $4 \times 10^{26} \mathrm{~J}$. If the temperature of the surface of the sun were 18000 K , then the amount of thermal radiation emitted by the same will be:
$1.3 .24 \times 10^{28} \mathrm{~W}$
2. $2.52 \times 10^{28} \mathrm{~W}$
3. $8 \times 10^{26} \mathrm{~W}$
$4.16 \times 10^{27} \mathrm{~W}$
37 The efficiency of a Carnot's engine, working between the steam point and ice point, will be:

1. $26.81 \%$
2. $37.81 \%$
3. $47.81 \%$
4. $57.81 \%$

38 The time period of oscillation of a given spring mass-string system is:


1. $\pi \sqrt{\frac{m}{3 k}}+\pi \sqrt{\frac{m}{2 k}}$
2. $2 \pi \sqrt{\frac{m}{3 k}}$
3. $2 \pi \sqrt{\frac{m}{3 k}}+2 \pi \sqrt{\frac{m}{2 k}}$
4. $2 \pi \sqrt{\frac{m}{k}}$

39 In one metre long open pipe, what is the harmonic of resonance obtained with a tuning fork of frequency
640 Hz ? (Velocity of sound $=320 \mathrm{~ms}^{-1}$ )

1. 2
2. 3
3. 4
4. 5

40 A spring having a spring constant of $1200 \mathrm{~N} / \mathrm{m}$ is mounted on a horizontal table as shown in the figure. A mass of 3 kg is attached to the free end of the spring. The mass is then pulled sideways to a distance of 2.0 cm and released. The maximum acceleration of the mass is:


1. $6 \mathrm{~ms}^{-2}$
2. $8 \mathrm{~ms}^{-2}$
3. $3.3 \mathrm{~ms}^{-2}$
4. $5.1 \mathrm{~ms}^{-2}$

41 The transverse displacement of a string (clamped at both ends) is given by;
$y(x, t)=0.06 \sin \left(\frac{2 \pi}{3} x\right) \cos (120 \pi t)$
where $x$ and $y$ are in metre and $t$ in second. The length of the string is 1.5 m and its mass is $3 \times 10^{-2} \mathrm{~kg}$. The tension in the string is:

1. 540 N
2. 648 N
3. 200 N
4. 425 N

42 A tuning fork has a frequency of 200 Hz . If the velocity of sound in air is $330 \mathrm{~m} / \mathrm{s}$, then how far the sound has traversed while the tuning fork completes 20 vibrations?
1.11 m
2. 22 m
3. 33 m
4. 44 m

43 The molecules of a given mass of gas have rms velocity of $200 \mathrm{~ms}^{-1}$ at $27^{\circ} \mathrm{C}$ and $1.0 \times 10^{5} \mathrm{Nm}^{-2}$ pressure. When the temperature and the pressure of the gas are respectively, $127^{\circ} \mathrm{C}$ and $0.05 \times 10^{5} \mathrm{Nm}^{-2}$, the RMS velocity of its molecules in $\mathrm{ms}^{-1}$ is:

1. $\frac{400}{\sqrt{3}}$
2. $\frac{100 \sqrt{2}}{3}$
3. $\frac{100}{3}$
4. $100 \sqrt{2}$

44 The equation $y=A \cos (k x-\omega t)$ represents a wave motion with:

1. amplitude $A$, frequency $\frac{\omega}{2 \pi}$
2. amplitude $\frac{A}{2}$, frequency $\frac{2 \omega}{\pi}$
3. amplitude $2 A$, frequency $\frac{\omega}{4 \pi}$
4. does not represent a wave motion

45 A vessel contains two nonreactive gases: neon
(monatomic) and oxygen (diatomic). The ratio of their partial pressures is $3: 2$. The ratio of the number of molecules is:
(Atomic mass of $\mathrm{Ne}=20.2 \mathrm{u}$, molecular mass of $\mathrm{O}_{2}$ $=32.0 \mathrm{u}$ )

1. $2: 3$
2. $3: 2$
3. $1: 3$
4. $3: 1$

46 An electric heater supplies 6000 J of heat to a system and the system performs 3000 J of work. What is the increase in the internal energy of the system?

1. 6000 J
2. 9000 J
3. 3000 J
4. zero

47 Two identical simple pendulums are compared, one $(A)$ located on the surface of the earth and the other $(B)$ - at a height $(h)$ above the earth's surface: $\quad h=\frac{R}{1000}$. Their time periods are related as:

1. $T_{A}\left(1+\frac{1}{1000}\right)=T_{B}$
2. $T_{B}\left(1+\frac{1}{1000}\right)=T_{A}$
3. $T_{A}\left(1+\frac{1}{2000}\right)=T_{B}$
4. $T_{B}\left(1+\frac{1}{2000}\right)=T_{A}$

48 One mole of an ideal gas is taken through a cyclic process as shown in the $(V-T)$ diagram. Which of the following statements is correct?


The magnitude of the work done by the gas is $R T_{0} \ln 2$.
2. Work done by the gas is $V_{0} T_{0}$.
3. Net work done by the gas is zero.
4. Work done by the gas is $2 R T_{0} \ln 2$.

49 Match Column-I with Column-II for an ideal gas:

## Column-I

## Column-II

A. Isobaric expansion
(P) $\Delta W=-\Delta U$
B. Isochoric cooling
(Q) $\Delta W<\Delta U$
C. Adiabatic expansion
(R) $\Delta Q=\Delta U$
D. Isothermal expansion
(S) $\Delta Q=\Delta W$

1. $\mathrm{A} \rightarrow \mathrm{Q}, \mathrm{B} \rightarrow \mathrm{S}, \mathrm{C} \rightarrow \mathrm{R}, \mathrm{D} \rightarrow \mathrm{P}$
2. $\mathrm{A} \rightarrow \mathrm{P}, \mathrm{B} \rightarrow \mathrm{S}, \mathrm{C} \rightarrow \mathrm{R}, \mathrm{D} \rightarrow \mathrm{Q}$
3. $\mathrm{A} \rightarrow \mathrm{S}, \mathrm{B} \rightarrow \mathrm{P}, \mathrm{C} \rightarrow \mathrm{R}, \mathrm{D} \rightarrow \mathrm{Q}$
4. $\mathrm{A} \rightarrow \mathrm{Q}, \mathrm{B} \rightarrow \mathrm{R}, \mathrm{C} \rightarrow \mathrm{P}, \mathrm{D} \rightarrow \mathrm{S}$

50 Two SHMs of the form:
$x=A+A \sin \omega t$
$y=A-A \sin \omega t$
are superposed on a particle, along $x$ and $y$ directions. The resultant of these motions is:

1. circular motion
2. SHM along $x$-axis
3. SHM along $y$-axis
4. SHM, but along a direction other than $x$ or $y$-axis

## Chemistry - Section A

51 In compounds of type $E C l_{3}$, where $\mathrm{E}=\mathrm{B}, \mathrm{P}$, As or
Bi , the angles $\mathrm{Cl}-\mathrm{E}-\mathrm{Cl}$ for different E are in the order:

1. $\mathrm{B}>\mathrm{P}=\mathrm{As}=\mathrm{Bi}$
2. $\mathrm{B}>\mathrm{P}>\mathrm{As}>\mathrm{Bi}$
3. $\mathrm{B}<\mathrm{P}=\mathrm{As}=\mathrm{Bi}$
4. $\mathrm{B}<\mathrm{P}<\mathrm{As}<\mathrm{Bi}$

52 To produce 20 moles of ammonia via Haber's process, how many moles of hydrogen molecules are required?

| 1. | 40 mol | 2. | 10 mol |
| :--- | :--- | :--- | :--- |
| 3. | 20 mol | 4. | 30 mol |

53 The following reaction is given for reference
$2 \mathrm{KI}+\mathrm{HgI}_{2} \rightarrow \mathrm{~K}_{2} \mathrm{HgI}_{4}$
The number of moles of KI required to produce 0.4 moles of $\mathrm{K}_{2} \mathrm{HgI}_{4}$ is:

1. 0.4
2. 0.8
3. 3.2
4. 1.6

## 54

Assertion A spectral line will be seen for a
(A): $2 p_{x}-2 p_{y}$ transition.

Reason (R):
Only Balmer lines are observed in the visible region

In light of the above statements, choose the answer from the options given below:

1. Both (A) and (R) are True and (R) is the correct 1. explanation of $(\mathbf{A})$.
. Both (A) and (R) are True but ( $\mathbf{R}$ ) is not the correct explanation of $(\mathbf{A})$.
2. (A) is True but ( $\mathbf{R}$ ) is False
3. (A) is False but ( $\mathbf{R}$ ) is True

55 What is the correct relationship between changes in enthalpy and internal energy within the following options?

1. $\Delta \mathrm{H}+\Delta \mathrm{U}=\Delta \mathrm{nR}$
2. $\Delta \mathrm{H}=\Delta \mathrm{U}-\Delta n_{g} R T$
3. $\Delta \mathrm{H}=\Delta \mathrm{U}+\Delta n_{g} R T$
4. $\Delta \mathrm{H}-\Delta \mathrm{U}=-\Delta n_{g} R T$

56 The compound among the following that has the highest oxidation number of sulphur is:

1. $\mathrm{H}_{2} \mathrm{SO}_{4}$
2. $\mathrm{SO}_{3}$
3. $\mathrm{H}_{2} \mathrm{~S}_{2} \mathrm{O}_{7}$
4. All have the same oxidation number for sulphur

57 The molar solubility of $\mathrm{Ni}(\mathrm{OH})_{2}$ in a solution containing 0.10 M NaOH , given that the ionic product of $\mathrm{Ni}(\mathrm{OH})_{2}$ is $2.0 \times 10-15$, is:

1. $2.0 \times 10^{-13} \mathrm{M}$
2. $2.0 \times 10^{-12} \mathrm{M}$
3. $2.0 \times 10^{-11} \mathrm{M}$
4. $2.0 \times 10^{-16} \mathrm{M}$

58 Hydrogen bonding is not possible in:

| 1. $\mathrm{CH}_{3} \mathrm{OH}$ | 2. $\mathrm{CH}_{3} \mathrm{OCH}_{3}$ |
| :--- | :--- | :--- |
|  | 4. $\mathrm{CH}_{3} \mathrm{COOH}$ |

## 59

## Assertion

(A):

Reason (R):
The intermolecular forces in these compounds are weak.

Both (A) and (R) are True and (R) is the correct explanation of $(\mathbf{A})$.
2. Both (A) and (R) are True but (R) is not the correct explanation of (A).
3. (A) is True and (R) is False.
4. (A) and (R) both are False.

60 The incorrect statement among the following is:

1. $\mathrm{CH}_{3}{ }^{+}$shows $\mathrm{sp}^{2}$-hybridization whereas $\mathrm{CH}_{3}{ }^{-}$shows $\mathrm{sp}^{3}$-hybridization.
2. $\mathrm{NH}_{4}{ }^{+}$has a regular tetrahedral geometry.
3. The atomic orbitals of comparable energies and
4. proper symmetry combine to form molecular orbitals.
5. Hybridised orbitals form both sigma and pi bonds.

61 Three thermochemical equations are given below:
(i) $\mathrm{C}_{\text {(graphite) }}+\mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}_{2}(\mathrm{~g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{x} \mathrm{kJ} \mathrm{mol}^{-1}$
(ii) $\mathrm{C}_{\text {graphite }}+1 / 2 \mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}(\mathrm{g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{y} \mathrm{kJ} \mathrm{mol}^{-1}$
(iii) $\mathrm{CO}(\mathrm{g})+1 / 2 \mathrm{O}_{2}(\mathrm{~g}) \rightarrow \mathrm{CO}_{2}(\mathrm{~g}) ; \Delta_{r} \mathrm{H}^{\circ}=\mathrm{z} \mathrm{kJ} \mathrm{mol}^{-1}$

Based on the above equations, find out which one of the relationships given below is correct :

1. $\mathrm{z}=\mathrm{x}+\mathrm{y}$
2. $x=y+z$
3. $y=2 z-x$
4. $x=y-z$

62 If the work function of a metal is $6.63 \times 10^{-19}$, the maximum wavelength of the photon required to remove a photoelectron from the metal is :
(Given $\mathrm{h}=6.63 \times 10^{-34} \mathrm{~J} \mathrm{sec}$ )

1. 280 nm
2. 310 nm
3. 300 nm
4. 290 nm

63 Mark the incorrect property among the following regarding the metal and non-metal.

1. Metals can lose electrons easily and Non-metals cannot lose electrons easily.
2. Metals generally form ionic compounds and Nonmetals generally form covalent compounds.
3. Metal oxides are acidic in nature and Non-metallic oxides are basic in nature.
4. Metals have low ionization enthalpies and Nonmetals have high ionization enthalpies.

64 Mark the correct arrangement of the elements B, C,
At, and S in order of increasing electronegativity.

1. $\mathrm{B}>\mathrm{C}>\mathrm{S}>$ At
2. $\mathrm{S}>\mathrm{C}>\mathrm{B}>\mathrm{At}$
3. $\mathrm{C}>\mathrm{B}>\mathrm{S}>\mathrm{At}$
4. $\mathrm{S}>\mathrm{C}>\mathrm{At}>\mathrm{B}$

65 The molecule/ion exhibiting the greatest $\mathrm{O}-\mathrm{N}-\mathrm{O}$ bond angle is:

1. $\mathrm{NO}_{2}^{-}$
2. $\mathrm{NO}_{2}^{+}$
3. $\mathrm{NO}_{3}^{-}$
4. $\mathrm{NO}_{2}$

66 Recognize the element having an outer electronic configuration $(n-2) f^{7}(n-1) d^{1} n s^{2} \quad(n=6)$

1. Gd
2. Tb
3. Dy
4. Ho

67 Which pair of solutions, when combined in equal volumes, forms a buffer solution?

1. 0.20 M HCl and 0.20 M NaOH
2. $0.40 \mathrm{M} \mathrm{HC}_{2} \mathrm{H}_{3} \mathrm{O}_{2}$ and 0.20 M NaOH
3. 0.20 M HCl and $0.20 \mathrm{M} \mathrm{NH}_{3}$
4. 0.40 M HCl and $0.20 \mathrm{M} \mathrm{NH}_{3}$

68 Which one of the following processes does NOT contribute to the change in enthalpy, $\Delta \mathrm{H}_{\mathrm{rxn}}$, of a chemical reaction:

1. Phase change.
2. Formation of stronger intermolecular forces.
3. Breaking covalent bonds.
4. The presence of a heterogeneous catalyst.

Incorrect statement among the following is:

Molar mass is the mass of one mole of a substance in grams.
One mole is the amount of substance that contains as
2. many particles or entities as there are atoms in exactly 0.012 kg of the ${ }^{14} \mathrm{C}$ isotope.
3. The number of entities (atoms, molecules or any other particles) in 1 mole is Avogadro constant.
4. 1 mole of water molecules contains $6.022 \times 10^{23}$ molecules.

70 For the following reaction,
$2 \mathrm{Na}(\mathrm{s})+\mathrm{H}_{2}(\mathrm{~g}) \rightarrow 2 \mathrm{NaH}(\mathrm{s})$
The correct statement(s) in the balanced equation is(are):
a. Na is oxidized
b. $\mathrm{H}_{2}$ is oxidized
c. $\mathrm{H}_{2}$ is reduced
d. It is a disproportionation reaction

1. a, b
2. b, c
3. c, a
4. a, d

71 The element with atomic number 88 belongs to:

1. s-block
2. p - block
3. d - block
4. f-block

## 72

Assertion
(A):

## Reason

(R):

At a very low concentration of HCl , the contribution of $\mathrm{H}^{+}$from water is considerable.

1. Both (A) and (R) are correct and (R) is the correct 1. explanation of (A).
2. Both (A) and (R) are correct but $(\mathbf{R})$ is not the correct explanation of (A).
3. (A) is True and (R) is False
4. (A) is True and (R) is False

73 The shortest wavelength of the H -atom in the Lyman series is $\lambda_{1}$. The longest wavelength in the Balmer series is $\mathrm{He}^{+}$
is:

1. $\frac{36 \lambda_{1}}{5}$
2. $\frac{5 \lambda_{1}}{9}$
3. $\frac{9 \lambda_{1}}{5}$
4. $\frac{27 \lambda_{1}}{5}$

74 Mark the species among the following that contains the highest number of atoms.
1.4 g He
2. 46 g Na
3. 0.40 g Ca
4. 12 g He

75 The standard enthalpy and standard entropy change for the oxidation of $\mathrm{NH}_{3}$ at 298 K , are $-383.64 \mathrm{~kJ} \mathrm{~mol}^{-1}$ and $-145.6 \mathrm{~J} \mathrm{Mol}^{-1} \mathrm{~K}^{-1}$ respectively. Standard Gibbs energy change for the same reaction at 298 K is:

1. $-221.1 \mathrm{~kJ} \mathrm{~mol}^{-1}$
2. $-340.0 \mathrm{~kJ} \mathrm{~mol}^{-1}$
3. $-439.3 \mathrm{~kJ} \mathrm{~mol}^{-1}$
4. $-523.2 \mathrm{~kJ} \mathrm{~mol}^{-1}$

76 How many atoms are present in a mole of acetic acid:

1. $8 \times 6.02 \times 10^{23} \mathrm{atom} / \mathrm{mol}$
2. $4 \times 6.02 \times 10^{23} \mathrm{atom} / \mathrm{mol}$
3. $6 \times 6.02 \times 10^{23} \mathrm{atom} / \mathrm{mol}$
4. None of the above

77 Given that $Q_{c}$ equals $K_{c}$, which of the following correctly characterizes the direction of the net reaction?

1. Net reaction goes from reactants to products
2. Net reaction goes from products to reactants
3. No net reaction occurs
4. Forward and backward reactions stop.
$78 \mathrm{BrO}_{3}^{-}$changes into $\mathrm{Br}_{2}$ in the acidic medium. The number of electrons that are needed to balance the equation are:
5. 10 electrons on the left-hand side
6. 6 electrons on the left-hand side
7. 3 electrons on the left-hand side
8. 3 electrons on the right-hand side

79 Which of the following is the correct order regarding the energy of 2s orbitals?

1. $E_{2 s}(H)>E_{2 s}(K)>E_{2 s}(N a)>E_{2 s}(L i)$
2. $E_{2 s}(\mathrm{H})>E_{2 s}(\mathrm{Li})>E_{2 s}(\mathrm{Na})>E_{2 s}(\mathrm{~K})$
3. $\mathrm{E}_{2 s}(\mathrm{Li})>\mathrm{E}_{2 s}(\mathrm{Na})>\mathrm{E}_{2 s}(\mathrm{~K})>\mathrm{E}_{2 s}(\mathrm{H})$
4. $\mathrm{E}_{2 s}(\mathrm{~K})>\mathrm{E}_{2 s}(\mathrm{Na})>\mathrm{E}_{2 s}(\mathrm{Li})>\mathrm{E}_{2 s}(\mathrm{H})$

80 If it's discovered that a certain non-spontaneous
reaction becomes spontaneous if the temperature is lowered, then which of the following must be true:

1. $\Delta \mathrm{S}$ is negative and $\Delta \mathrm{H}$ is positive.
2. $\Delta \mathrm{S}$ is negative and $\Delta \mathrm{H}$ is negative.
3. $\Delta \mathrm{S}$ is positive and $\Delta \mathrm{H}$ is positive.
4. $\Delta \mathrm{S}$ is positive and $\Delta \mathrm{H}$ is negative.

81 Among the options below, identify the nonspontaneous process.

1. Dissolution of salt or sugar in water
2. Mixing of different gases through diffusion
${ }_{3}$ Precipitation of copper when zinc rod is dipped in an
${ }^{3 .}$ aqueous solution of copper sulphate
3. Flow of heat from a cold body to a hot body in 4. contact

82 Which species possesses an atom exhibiting an oxidation number of +3 ?

1. $\mathrm{ClO}_{2}{ }^{-}$
2. $\mathrm{PO}_{4}{ }^{3-}$
3. $\mathrm{S}_{2} \mathrm{O}_{3}{ }^{2-}$
4. $\mathrm{NO}_{2}{ }^{+}$

83 The empirical formula of an oxide of iron, which has $69.9 \%$ iron and $30.1 \%$ dioxygen by mass is-

| 1. | FeO | 2. | $\mathrm{Fe}_{2} \mathrm{O}_{3}$ |
| :--- | :--- | :--- | :--- |
| 3. | $\mathrm{Fe}_{3} \mathrm{O}_{4}$ | 4. | $\mathrm{Fe}_{3} \mathrm{O}_{2}$ |

84 In the exothermic reaction of oxidizing $\mathrm{SO}_{2}$ by $\mathrm{O}_{2}$ to $\mathrm{SO}_{3}$, what factors determine the maximum yield of $\mathrm{SO}_{3}$ ?

1. Temperature is reduced and pressure is increased.
2. Temperature is increased and pressure is kept constant.
3. Both temperature and pressure are reduced.
4. Both temperature and pressure are increased.

85 Dissolving salt ' X ' in water having a pH of 7 results in the solution exhibiting alkaline properties.
Salt X is the combination of:

1. A strong acid and strong base
2. A strong acid and weak base
3. A weak acid and weak base
4. A weak acid and strong base

## Chemistry - Section B

86 The IUPAC name of the following compound is:


1. 3-Propylpent-1-ene
2. 3-Ethylpent-1-ene
3. 4-Ethylhex-1-ene
4. 3-Ethylhex-1-ene

87 In Kjeldahl's method, the nitrogen present in an organic compound is quantitatively converted into:

1. Gaseous ammonia
2. Ammonium sulphate
3. Ammonium phosphate
4. Ammonia

88 Mark the correct order of reactivity towards the electrophilic aromatic substitution reaction.

(I)

(II)

(III)

(IV)

| 1. | I $>$ II $>$ III $>$ IV | 2. | IV $>$ III $>$ II $>$ I |
| :--- | :--- | :--- | :--- |
| 3. | II $>$ I $>$ IV $>$ III | 4. | II $>$ I $>$ III $>$ IV |

89 The substance that can be used as an adsorbent in thin-layer chromatography is:

1. $\mathrm{Na}_{2} \mathrm{O}$
2. $\mathrm{Na}_{2} \mathrm{SO}_{4}$
3. $\mathrm{Al}_{2} \mathrm{O}_{3}$
4. NaCl

90 A compound possessing optical isomerism provided it has the molecular formula $\mathrm{C}_{7} \mathrm{H}_{16}$, would be:

1. 2,3-Dimethyl pentane
2. 2,2-Dimethyl butane
3. 2-Methyl hexane
4. None of the above

91 Which one among the following is most reactive towards nucleophilic addition reaction?
2.

92 The set of molecules having zero dipole moment is:

1. $\mathrm{NF}_{3}, \mathrm{CO}_{2}, \mathrm{CCl}_{4}$
2. $\mathrm{BF}_{3}, \mathrm{H}_{2} \mathrm{~S}, \mathrm{CCl}_{4}$
3. $\mathrm{BF}_{3}, \mathrm{CO}_{2}, \mathrm{CCl}_{4}$
4. $\mathrm{BF}_{3}, \mathrm{CO}_{2}, \mathrm{CHCl}_{3}$

93 The correct chain isomer of $\mathrm{C}_{6} \mathrm{H}_{14}(\mathrm{n}$-hexane $)$ among the following are:
a. 2-Methylpentane
b. 2,3-Dimethylbutane
c. 2-Ethylbutane

| 1. | $a, c$ | 2. | $a, b$ |
| :--- | :--- | :--- | :--- |
| 3. | $b, c$ | 4. | $a, b, c$ |

## 94

Identify the species with identical bond orders from the following options.
(a) $\mathrm{N}_{2}$
(b) $\mathrm{N}_{2}^{-}$
(c) $\mathrm{F}_{2}$
(d) $\mathrm{O}_{2}^{-}$

1. (a), (d)
2. (b), (c)
3. (c), (d)
4. (b), (d)

95 Which of the following alkanes cannot be made in good yield by Wurtz reaction :

1. 2,3-Dimethylbutane
2. n-Heptane
3. n-Butane
4. n-Hexane

96 Which of the following will give a positive Lassaigne's test?

1. $\mathrm{NH}_{4} \mathrm{OH}$
2. $\mathrm{NH}_{4} \mathrm{Cl}$
3. $\mathrm{N}_{2} \mathrm{H}_{4}$
4. $\mathrm{CH}_{3}-\mathrm{NH}_{2}$

97 Identify the most stable carbanion from the following options.


98 The radical

is aromatic because it has:
1.6 p-orbitals and 6 unpaired electrons
2. 7 p -orbitals and 6 unpaired electrons
3.7 p -orbitals and 7 unpaired electrons
4. 6 p-orbitals and 7 unpaired electrons

99 The functional groups are found in phenylalanine are:


Phenylalanine

1. Alkyl, double bond, and aromatic ring.
2. Amine, and carboxylic acid.
3. Double bond, amide and alcohol.
4. Aromatic ring, halide and ketone.

100 Symmetrical alkene 'A' produces two equivalents of a ketone weighing 58 u each upon ozonolysis.
What is the IUPAC name of alkene ' A '?

1. 2,3-Dimethylbut-2-ene
2. But-2-ene
3. But-1-ene
4. 3,4-Diethylhex-3-ene

## Biology I - Section A

101 During which of the following process is the most ATP produced in aerobic cellular respiration?

1. glycolysis
2. the Krebs cycle
3. chemiosmosis
4. substrate-level phosphorylation

102 Identify the given molecule:


1. Cholesterol
2. Phospholipid
3. Triglyceride
4. Fatty acid

103 Members belonging to Solanaceae and
Convolvulaceae will not belong to the same:
I: Order
II: Family
III: Division

1. Only I and III
2. Only II
3. Only I
4. I, II and III

104 Which of the following would be true regarding the anatomy of a monocot leaf?

1. Bulliform cells are absent from the epidermis
2. Veins form a network
3. Mesophyll is well differentiated into these parts
4. Mesophyll is not differentiated into palisade and spongy parenchyma

105 Which of the following will not be applicable to the Gymnosperm Pinus?

1. Coralloid roots
2. Mycorrhizal association

3 Male and female cones or strobili are borne on the same tree
4. Branched stems

106 The enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds are called as:

1. Oxidoreductases
2. Hydrolases
3. Ligases
4. Lyases

107 Petiole expands, becomes green and synthesizes food in:

1. Opuntia
2. Euphorbia
3. Australian acacia
4. Colocasia

108 Light rarely is a limiting factor in nature because:

1. Dark reactions do not depend on light

The rate of photosynthesis can be increased by higher
2. carbon dioxide and lower temperatures even in low light conditions
3. Light saturation occurs at $10 \%$ of full sunlight
4. Carbon fixation is independent of enzymes

109 Identify the incorrect statement regarding mitosis?

1. A single nucleus gives rise to two identical daughter nuclei.
2. The daughter nuclei are genetically identical to the parent nucleus.
3. The centromeres divide at the onset of anaphase.
4. Homologous chromosomes synapse in prophase.

110 Consider the following statements regarding meiosis:

At metaphase I, the microtubules from the opposite
I: poles of the spindle attach to the pair of homologous chromosomes.
At anaphase I, the homologous chromosomes
II: separate, while sister chromatids remain associated with each other.
Of the two statements:

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

111 Plant cells that lack a nucleus at maturity are:

1. Cambium cells
2. Cells of pericycle
3. Xylem parenchyma
4. Sieve tubes

112 Unlike dicot stems, the hypodermis of monocot stem is composed of:

1. Parenchyma
2. Sclerenchyma
3. Collenchyma
4. Chlorenchyma

113 The 'alpha helix' describes the:

1. primary structure of a protein
2. secondary structure of a protein
3. tertiary structure of a protein
4. quaternary structure of a protein

114 A lateral branch with short internodes and each
node bearing a rosette of leaves
and a tuft of roots is found in:

1. Chrysanthemum
2. Pistia
3. Jasmine
4. Pineapple

115 "Semi-autonomous organelles" in a eukaryotic cell include:

1. Golgi apparatus and ER
2. Nucleus and ER
3. Nucleus and Mitochondria
4. Mitochondria and Chloroplasts

116 Rust and smut fungi belong to the fungal class:

| 1. | Ascomycetes | 2. | Phycomycetes |
| :--- | :--- | :--- | :--- |
| 3. | Deuteromycetes | 4. | Basidiomycetes |

117 The primary carbon dioxide acceptor in Calvin cycle in $\mathrm{C}_{3}$ plants is:

1. PEP (phosphoenol pyruvate)
2. RuBP (ribulose-1-5-biphosphate)
3. PGA (phosphoglyceric acid)
4. PG (phosphoglycolate)

118 The chlorophyll in photosynthetic bacteria is associated with:

1. Infoldings of cell membrane
2. Extensions of cell wall
3. Plastids
4. Plasmids

119 Identify the statement that will not be true for photorespiration:

Light stimulates this reaction by forming $\mathrm{O}_{2}$ during photolysis
2. $\mathrm{O}_{2}$ is consumed and $\mathrm{CO}_{2}$ is released
3. Photorespiration is virtually non-existent in $\mathrm{C}_{4}$ plants

4 Photorespiration generates a large number of ATP molecules

120 Products of the Krebs cycle include:
I. carbon dioxide
II. NADH
III. $\mathrm{FADH}_{2}$

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

121 Proteins and fats can be used as respiratory substrates if:

1. they are converted into glucose
2. they enter their own pathways that are separate from
3. the glucose metabolic pathways

3 they are degraded completely into atoms before
3. entering a pathway

4 they are modified so that they can enter the glucose
metabolic pathways
All the following will be correct for members of
Phaeophyceae except:

1. Chlorophyll a and Chlorophyll c are dominant
2. photosynthetic pigments
3. Pyriform gametes
4. Floridean starch is the stored food
4.2 unequal and lateral flagellar insertions

123 The correct chronological sequence of protein complexes in the thylakoid membrane involved in light reactions is:

1. Photosystem II (PS II), Cytochrome b6f complex, - Photosystem I (PS I), and ATP synthase.
2. Photosystem I (PS I), Cytochrome b6f complex,
${ }^{2 .}$ Photosystem II (PS II), and ATP synthase.
3. Photosystem II (PS II), Photosystem I (PS I),
${ }^{3 .}$ Cytochrome b6f complex, and ATP synthase.
4 Photosystem I (PS I), Photosystem II (PS II),
4. Cytochrome b6f complex, and ATP synthase.

124 The following diagram can represent the position of the ovary in:


1. Brinjal
2. Guava
3. Rose
4. Mustard

125 Ovary is one-chambered but becomes twochambered due to the formation of the false septum in:

1. Argemone
2. Salvia
3. Cassia
4. Primrose

126 Pteridophytes differ from mosses as the former have:

1. an independent gametophyte
2. a dependent sporophyte
3. an independent and dominant sporophyte
4. flagellated antherozoids

127 Identify the correct statements regarding Dinoflagellates:

They appear yellow, green, brown, blue or red,
I: depending on the main pigments present in their cells
II: The cell wall has stiff cellulosic plates on the outer surface
III: Most of them have single flagellum

1. Only I and II
2. Only I and III
3. Only II and III
4. I, II and III

128 Photolysis of water and liberation of oxygen as a product in photosynthesis is associated with

1. pigment system I
2. pigment system II
3. cytochrome B6
4. plastocyanin

129 The famous aphorism "Omnis cellulae cellula", given by Rudolf Virchow, means that:

1. Plant cells have cell walls that are not seen in animal cells
2. All cells arise from pre-existing cells
3. Cell is the structural and functional unit of life
4. All plants and animals are composed of cells and extracellular material

130 Alternate phyllotaxy is seen in:

1. China rose and mustard
2. Calotropis and guava
3. Alstonia and sunflower
4. Sunflower and Calotropis

131 The members of which of the following classes of fungi, predominantly, reproduce sexually?

1. Ascomycetes
2. Imperfect fungi
3. Basidiomycetes
4. Phycomycetes

132 Fermentation is important as it regenerates:

1. $\mathrm{O}_{2}$
2. $\mathrm{NAD}^{+}$
3. acetyl-CoA
4. ATP

133 The causative agents of the Potato Spindle Tuber
Disease possess:

1. low molecular weight RNA not enclosed by protein 1. coat
2. low molecular weight DNA not enclosed by protein 2. coat
3. high molecular weight DNA enclosed by protein coat
4. high molecular weight RNA enclosed by protein coat

134 The classification system given by Bentham and Hooker is a/an:

1. Artificial system
2. Natural system
3. Phylogenetic system
4. Useless system

135 In contrast to eukaryotic cells, the prokaryotic cells generally are:

1. smaller and multiply rapidly
2. larger and multiply rapidly
3. smaller and multiply slowly
4. larger and multiply rapidly

## Biology I - Section B

## 136

Assertion Plant cells are capable of forming a spindle (A): apparatus during cell division.

## Reason

(R): All plant cells have centrioles.

1. Both (A) and (R) are True and (R) correctly explains (A).
Both (A) and (R) are True and (R) does not correctly explain (A).
2. (A) is True; (R) is False
3. Both $\mathbf{( A )}$ and ( $\mathbf{R}$ ) are False

## 137

| Assertion <br> (A): | Red algae are often found in deep waters. |
| :--- | :--- |
| Reason <br> (R): | They have unique pigments that enable <br> adaptations to low light conditions |

1. Both (A) and (R) are True and (R) correctly explains (A).
2. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are True and $(\mathbf{R})$ does not correctly explain (A).
3. (A) is True; (R) is False
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False

138
Assertion Diatoms are the chief 'producers' in the (A):

Reason (R): oceans.
Diatoms are one of the most abundant and diverse groups of
photosynthetic phytoplankton in the oceans.

1. Both (A) and (R) are True and (R) correctly explains (A).
2. Both (A) and (R) are True and (R) does not correctly 2. explain (A).
3. (A) is True; ( $\mathbf{R}$ ) is False
4. Both (A) and (R) are False

## 139

The processes of lactic acid and alcohol

| Assertion <br> (A): | fermentation are less efficient in harnessing <br> the energy stored in glucose compared to <br> aerobic respiration. |
| :--- | :--- |
| Reason | In these fermentation pathways, the <br> incomplete breakdown of glucose occurs <br> under anaerobic conditions, where oxygen <br> is not available. |
| R): | in |

1. Both (A) and (R) are True and (R) correctly - explains (A).
${ }_{2}$ Both (A) and (R) are True and (R) does not correctly explain (A).
2. (A) is True; (R) is False
3. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are False

## 140

The term "dark reactions" in
Assertion (A): photosynthesis is considered a misnomer.
"Dark reactions" are strictly dependent on darkness.

1. Both (A) and (R) are True and (R) correctly explains (A).
2 Both (A) and (R) are True and (R) does not correctly explain (A).
2. (A) is True; (R) is False
3. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False

## 141

## Assertion <br> (A):

## Reason

(R):

The current atmospheric carbon dioxide concentration is limiting to $\mathrm{C}_{3}$ plants and not to $\mathrm{C}_{4}$ plants. The $\mathrm{C}_{4}$ plants and $\mathrm{C}_{3}$ plants respond differently to carbon dioxide concentration.

1. Both (A) and (R) are True and (R) correctly
2. explains (A).
3. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are True and $(\mathbf{R})$ does not correctly 2. explain (A).
4. (A) is True; ( $\mathbf{R}$ ) is False
5. Both (A) and (R) are False

## 142

| Assertion | Secondary metabolites in plants do not <br> (A): |
| :--- | :--- |
| play any roles in the plant bodies. |  |$|$| Reason | All secondary metabolites are excretory |
| :--- | :--- |
| (R): | products in plants. |

1. Both (A) and (R) are True and (R) correctly explains (A).
Both (A) and (R) are True and (R) does not correctly
2. explain (A).
3. (A) is True; ( $\mathbf{R}$ ) is False
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False

## 143

Assertion Xylem and phloem are not called complex (A): tissues in a plant body.

Reason They are composed of a single type of cell (R): with similar structures and functions.

1. Both (A) and (R) are True and (R) correctly explains (A).
Both (A) and (R) are True and (R) does not correctly explain (A).
2. (A) is True; (R) is False
3. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False

144
Assertion (A):

Reason (R):
An apple is considered a "true fruit".
In botanical terms, a fruit in apple develops from only the ovary of a flower after fertilization, containing seeds within.

1. Both (A) and (R) are True and (R) correctly explains (A).
2. Both (A) and (R) are True and (R) does not correctly 2. explain (A).
3. (A) is True; ( $\mathbf{R}$ ) is False
4. Both (A) and (R) are False

145

Assertion
(A):

Reason Unlike animal cells plant cells do not have
(R):

Plant cells utilize a strategy during respiration that involves catabolizing glucose in multiple small steps. metabolic machinery to catabolize glucose.

1. Both (A) and (R) are True and (R) correctly explains (A).
2. Both (A) and (R) are True and (R) does not correctly explain (A).
3. (A) is True; (R) is False
4. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False

## 146

Assertion Photorespiration decreases the efficiency
(A):

## Reason

(R): of photosynthesis in plants.
Carbon dioxide is released during photorespiration, which represents a loss of fixed carbon.

## 147

## Assertion <br> (A):

## Reason

 (R):Pneumatophores are critical for the survival of certain mangrove species, including Rhizophora. Mangrove plants live in unique habitat, which is characterized by waterlogged and often anoxic soil conditions and pneumatophores help in respiration under such conditions.

| 1. Both (A) and (R) are True and (R) correctly |
| :--- | :--- |
| explains (A). | | Both (A) and (R) are True and (R) does not correctly |
| :--- |
| explain (A). |
| 3. |
| (A) is True; (R) is False |
| 4. Both (A) and (R) are False |

148 How many of the given statements will be true for the members of the class Ascomycetes of fungi?
(i) These are commonly called sac fungi
(ii) These are mostly multicellular They are saprotrophic, decomposers, parasitic or
(iii) coprophilous
(iv) Their mycelium is aseptate
(v) Conidia produced by them are endogenous

1. Two
2. Three
3. Four
4. Five

## 149

| Assertion <br> (A): | Bryophytes have not been very successful <br> on land. |
| :--- | :--- |
| Reason <br> (R): | The gametophyte is the dominant stage in <br> the alternation of generation in Bryophytes. |

1. Both (A) and (R) are True and (R) correctly
2. explains (A).
3. Both (A) and (R) are True and (R) does not correctly explain (A).
4. (A) is True; (R) is False
5. Both $(\mathbf{A})$ and $(\mathbf{R})$ are False
6. Both (A) and (R) are True and (R) correctly
7. explains (A).
8. Both $\mathbf{( A )}$ and $(\mathbf{R})$ are True and $(\mathbf{R})$ does not correctly explain (A).
9. (A) is True; (R) is False
10. Both (A) and (R) are False

150

| Assertion <br> (A): | Alternaria solani is a deuteromycete |
| :--- | :--- |
| Reason <br> (R): | Only asexual stages in the life cycle of the <br> fungus have been observed. |

1. Both (A) and (R) are True and (R) correctly
${ }^{1 .}$ explains (A).
2. Both (A) and (R) are True and (R) does not correctly ${ }^{2 .}$ explain (A).
3. (A) is True; ( $\mathbf{R}$ ) is False
4. Both (A) and (R) are False

## Biology II - Section A

151 A bipolar neuron is characteristically seen in which of the following parts of human body?

1. Cerebellum
2. Retina
3. Corpus callosum
4. Dorsal root ganglion of spinal nerve

152 Exhalation of air into the lungs can be brought about by:
I: Contraction of diaphragm
II: Contraction of internal intercostal muscles
III: Contraction of external intercostal muscles

1. Only I and II
2. Only II
3. Only I and III
4. Only III

153 Which biomolecule will be the most common in when considering the average composition of cells in living organisms [\% of total cellular mass)?

1. Proteins
2. Carbohydrates
3. Nucleic acids
4. Lipids

154 What type of synovial joint is present between atlas and axis bones in human vertebral column?

1. Pivot
2. Condyloid
3. Gliding
4. Saddle

155 If a ds DNA molecule is composed of $26 \%$ thymine, what would be the percent composition of cytosine in this DNA molecule?

1. 26
2. 24
3. 13
4. 48

156 The hormone which acts as a check on RAAS mechanism is secreted from:

| 1. | The kidneys | 2. | The liver |
| :--- | :--- | :--- | :--- |
| 3. | The heart | 4. | The bones |

157 Unmyelinated neurons:

1. are not found in human neural system

2 are surrounded by Schwann cells in peripheral neural system
3. are bipolar neurons
4. conduct impulse at a faster rate than myelinated neurons

158 Which hormone, capable of increasing blood glucose levels, is also a potent anti-inflammatory?

1. Cortisol
2. Thyroxine
3. Melatonin
4. Aldosterone

159 What structure in molluscs forms the shell and houses the gills?

1. mantle.
2. epidermis.
3. gastrovascular cavity.
4. odontophore

160 What connects the two cerebral hemispheres in human brain?

1. Corpus callosum
2. Cerebellar peduncle
3. Corpora quadrigemina
4. Corticospinal tract

161 Which of the following hormones does not exert its effect on target cell through a second messenger?

1. Aldosterone
2. ACTH
3. Melatonin
4. Secretin

162 ADH:
I: facilitates water reabsorption from the later parts of the tubules.
II: is a vasodilator.

1. Only $\mathbf{I}$ is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

163
The type of tissue shown in the figure is found in:


## I: Tendon

II: Ligament
III: Skin

1. Only I and II
2. Only III
3. Only II
4. I, II and III

164 The membrane of which of the following organelles does not relate functionally to the membranes of other three?

1. Endoplasmic reticulum
2. Mitochondria
3. Golgi apparatus
4. Lysosome

165 Ciliated epithelium is expected to be found in:
I: Respiratory passage
II: Oviducts

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

166 Repolarisation after depolarisation of the polarised
axonal membrane is primarily due to:

1. Influx of sodium ions
2. Influx of potassium ions
3. Efflux of sodium ions
4. Efflux of potassium ions

167 The head of the myosin myofilament has sites for:
I: binding to active sites on actin myofilaments
II: binding to ADP

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

168 Functional residual capacity is defined as:

1. Total volume of air a person can inspire after a normal expiration.
Volume of air that will remain in the lungs after a normal expiration.
Total volume of air a person can expire after a normal inspiration.
2. The maximum volume of air a person can breathe in 4. after a forced expiration

169 Name the stinging cells seen in Cnidaria that help
them catch their prey and in defence?

1. Cnidoblasts
2. Nematocysts
3. Collobalsts
4. Grey cells

170 What is correct regarding the skin of frog [Rana tigrina]?

1. It is dry with scales.
2. The colour of ventral side of body is generally olive green with dark irregular spots.
3. On the dorsal side the skin is uniformly pale yellow.
4. The frog never drinks water but absorb it through the skin.

171 Identify the correct statements regarding the absorptive capabilities of the limbs of loop of Henle in human kidneys:
I: Descending limb is impermeable to water.
II: Ascending limb is impermeable to electrolytes.

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

172 The number of basic phases in the cell cycle of typical eukaryotic cells will be:

1. 2
2. 3
3. 4
4. 5

173 Identify the correct statements:
I: Humans have a closed circulatory system.
II: Arthropods have an open circulatory system.

1. Only I
2. Only II
3. Both I and II
4. Neither I nor II

174 Which of the following bones will not be a part of the facial skeleton of human skull?

1. Ethmoid
2. Zygomatic
3. Mandible
4. Maxilla

175 Which gastrointestinal hormone can cause an increased secretion of HCl by parietal cells?

1. Secretin
2. Cholecystokinin
3. Gastrin
4. Gastric inhibitory peptide

176 Which part of the nodal tissue in the human heart functions as the normal pacemaker?

1. SA Node
2. AV Node
3. Bundle of Hiss
4. Purkinje Fibres

177 The arrangement of axonemal microtubules in cilia and flagella of the eukaryotic cells is described as:

1. a $9+9$ array
2. a $9+0$ array
3. a $9+2$ array
4. a $0+9$ array

180 What is the partial pressure of carbon dioxide in the alveoli of human lungs?

1. 40 mm Hg
2. 45 mm Hg
3.95 mm Hg
3. 104 mm Hg

181 The two main phagocytes in the human blood include neutrophils and:

| 1. | Lymphocytes | 2. | Basophils |
| :--- | :--- | :--- | :--- |
| 3. | Monocytes | 4. | Eosinophils |

182 Protonephridia are osmoregulatory and excretory structures in all the following animals except:

1. Flat worms
2. Amphioxus
3. Most annelids
4. Rotifers

## 183 Ichthyophis is:

1. a flightless bird
2. a limbless amphibian
3. an egg laying mammal
4. an extinct reptile that was direct ancestor of mammals

184 Skeletal muscle fibres:

1. contract involuntarily
2. have a striated appearance
3. are always uninucleate
4. are present in the walls of internal organs

185 What organelle in a eukaryotic cell is the major site for synthesis of lipid?

1. Rough Endoplasmic Reticulum
2. Smooth Endoplasmic Reticulum
3. Golgi Apparatus
4. Mitochondria

178 Which of the following is not a mollusk?

| 1. | Cuttle fish | 2. | Devil fish |
| :--- | :--- | :--- | :--- |
| 3. | Tusk Shell | 4. | Flying fish |

179 Crocodiles:
I: have a four chambered heart.
II: are endotherms.

1. Only I is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

## Biology II - SECTION B

186 The joint shown in the given figure is present between:


1. humerus and pectoral girdle
2. atlas and axis
3. the carpals
4. carpal and metacarpal of thumb

187 Regarding haemoglobin and oxygen binding:
I:
Oxygen binds with haemoglobin in an irreversible manner to form oxyhaemoglobin.
Each haemoglobin molecule can carry a maximum
II: of four molecules of $\mathrm{O}_{2}$.

III: The binding of oxygen with haemoglobin is primarily related to the partial pressure of $\mathrm{O}_{2}$.

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

188 Regarding leucocytes:
I: They are nucleated.
II: Neutrophils, eosinophils and basophils are different types of granulocytes.
III: Lymphocytes and monocytes are the agranulocytes.

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

189 Regarding Osteichthyes:

| Statement <br> I: | They have four pairs of gills which are covered by an operculum on each side. |
| :---: | :---: |
| Statement II: | Air bladder is absent. |
| 1. Statement I is correct; Statement II is incorrect |  |
| 2. Statement I is correct; Statement II is correct |  |
| 3. Statement I is incorrect; Statement II is incorrect |  |
| 4. Statement I is incorrect; Statement II is correct |  |

190 Consider the given two statements:

| Statement | Coelenterates, ctenophores and <br> I: |
| :--- | :--- |
| lahinoderms have bilateral symmetry as |  |
| larvae and radial symmetry as adults. |  |$|$| Statement | Animals like annelids and arthropods <br> II: |
| :--- | :--- |

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct

191 Consider the given two statements:

| Statement <br> I: | An increase in blood flow to the atria of the <br> heart can cause the release of Atrial <br> Natriuretic Factor (ANF). |
| :--- | :--- |
| Statement <br> II: | A fall in glomerular blood flow/glomerular <br> blood pressure/GFR can activate the JG <br> cells to release renin. |

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct

192 In Echinoderms:

Statement
I:
Statement
II:

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct

193 Consider the given two statements:
Statement I: Frogs do not have a lymphatic system.
Statement II: Frogs do not have a [portal system.

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct


How many of the given statements are true?
I: All vertebrates possess a muscular chambered heart.

II:
Fishes have a 2-chambered heart with an atrium and a ventricle.
III: ${ }^{\text {All amphibians and all reptiles have a 3-chambered }}$ heart.

| 1. | 0 | 2. | 1 |
| :--- | :--- | :--- | :--- |
| 3. | 2 | 4. | 3 |

195 How many of the given statements are correct?
I: Medulla region of the brain is the location of respiratory rhythm centre.
II: Pneumotaxic centre is located in hypothalamus. A chemosensitive area is situated adjacent to the
III: rhythm centre which is highly sensitive to CO 2 and hydrogen ions.
Receptors associated with aortic arch and carotid
IV: artery respond only to change in partial pressure of oxygen.
1.1
2. 2
3.3
4.4

196
How many of the given statements are correct?
I:
Protonephridia are primarily concerned with ionic and fluid volume regulation, i.e., osmoregulation.
II: Nephridia are the tubular excretory structures of earthworms and other annelids.
III: Malpighian tubules are the excretory structures of most of the insects including cockroaches.
IV: Antennal glands or green glands perform the excretory function in crustaceans like prawns.

1. 1
2. 2
3.3
3. 4

197 An excess secretion of aldosterone in the human body is expected to lead to:
I: an increase in potassium ion concentration in plasma
II: an increase in the blood pressure

1. Only $\mathbf{I}$ is correct
2. Only II is correct
3. Both I and II are correct
4. Both I and II are incorrect

198 Which part of the sarcomere retains its length during muscle contraction?


1. 1
2. 2
3. 3
4. 4

199 Consider the given two statements:
Statement Stratified squamous epithelium lines the I:

Statement Simple columnar epithelium lines the
II: alveoli. proximal convoluted tubules of nephron.

1. Statement I is correct; Statement II is incorrect
2. Statement I is correct; Statement II is correct
3. Statement I is incorrect; Statement II is incorrect
4. Statement I is incorrect; Statement II is correct

200 Regarding normal ECG tracings:
I: The P-wave represents the electrical excitation (or depolarisation) of the atria.
The QRS complex represents the depolarisation of
II: the ventricles, which initiates the ventricular contraction.

III: The end of the T-wave marks the end of diastole.

1. Only I and II are correct
2. Only I and III are correct
3. Only II and III are correct
4. I, II and III are correct

## Fill OMR Sheet*

*If above link doesn't work, please go to test link from where you got the pdf and fill OMR from there. After filling the OMR, you would get answers and explanations for the questions in the test.


