13/07/2025

CODE-A

Corporate Office : AESL, 3rd Floor, Incuspaze Campus-2, Plot No. 13, Sector-18, Udyog Vihar, Gurugram, Haryana - 122015, ***Ph.***+91-1244168300

MM : 720 AIATS Prime for NEET-2026(XII Passed)_Unit Test-02 **Time : 180 Min.**

PHYSICS

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Hints and Solutions

PHYSICS

(1) **Answer :** (1)
Hint:
Use, $R = \frac{u^2 \sin(2\theta)}{g}$
Solution:
$R = \frac{(30)^2 \sin 90^\circ}{10}$
= 90 m
Decrease in range due to air resistance
= 90 – 50
= 40 m

(2) **Answer :** (2)
Hint:
$\vec{v} = \vec{u} + \vec{a}t$
Solution:
$\vec{v} = \left(4\hat{i} + 2\hat{j}\right) + 10\left(0.4\hat{i} + 0.4\hat{j}\right)$
$\vec{v} = \left(8\hat{i} + 6\hat{j}\right)$ m s^{-1}
$\left|\vec{v}\right| = \sqrt{8^2 + 6^2}$
= 10 m s^{-1}

(3) **Answer :** (4)
Hint:
$f_L = \mu_S N$
Solution:
Limiting frictional force on block depends on nature of surfaces in contact and normal reaction.

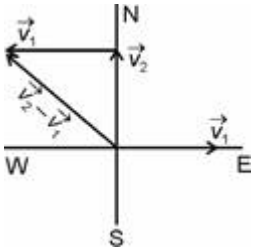
(4) **Answer :** (4)
Solution:
- In uniform circular motion, speed of object remains constant while acceleration changes continuously.
- Speed is a scalar quantity while velocity and acceleration are both vector quantities.

(5) **Answer :** (2)
Solution:
$2\pi r = 44$
$2 \times \frac{22}{7} \times r = 44 \Rightarrow r = 7$ m
$a_c = \frac{v^2}{r} = \frac{(7)^2}{7} = 7\ \text{m/s}^2$

(6) **Answer :** (2)
Solution:
Applying conservation of linear momentum
$\vec{p}_i = \vec{p}_f$
$\Rightarrow \quad m_1\vec{u}_1 + m_2\vec{u}_2 = m_1\vec{v}_1 + m_2\vec{v}_2$
$\Rightarrow \quad 25 \times 0 + 0.1 \times 0 = 25\vec{v}_1 + 0.1 \times 50$
$\Rightarrow \quad \vec{v}_1 = -0.2$ m/s
So recoil speed = 0.2 m/s

(7) **Answer :** (1)
Hint:
For $\vec{A} = a_x\hat{i} + a_y\hat{j} + a_z\hat{k}$ *and* $\vec{B} = b_x\hat{i} + b_y\hat{j} + b_z\hat{k}$ to be parallel.
$\frac{a_x}{b_x} = \frac{a_y}{b_y} = \frac{a_z}{b_z}$
Solution:
$\frac{2}{4} = \frac{p}{8} = \frac{q}{16}$
$\Rightarrow p = 4$ and $q = 8$

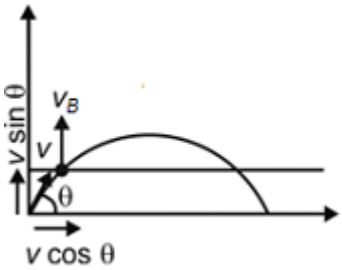
(8) **Answer :** (2)
Solution:



$\left|\vec{v}\right| = \sqrt{(100)+(100)} = 10\sqrt{2}$ (N-W)

(9) **Answer :** (4)
Solution:
$a = R\omega^2 = \frac{1}{2} \times (4\pi)^2 = 8\pi^2$

(10) **Answer :** (3)
Solution:



$v_B^2 = v^2 \sin^2\theta - \frac{2g}{2}\left(\frac{v^2\sin^2\theta}{2g}\right)$

$v_B^2 = \frac{v^2\sin^2\theta}{2}$

$v_B = \frac{v\sin\theta}{\sqrt{2}}$

(11) **Answer :** (1)
Hint:
$R = \frac{2u_x \times u_y}{g}$
Solution:
u_X = 4 m/s, u_Y = 5 m/s,
$R = \frac{2\times4\times5}{10} = 4\text{ m}$

(12) **Answer :** (2)
Solution:
Magnitude of $\overrightarrow{OP}$ remains constant and now directed along *x*-axis.

(13) **Answer :** (3)
Solution:
Uniformly accelerated motion so average velocity
$\vec{v}_{av} = \frac{\vec{u}+\vec{v}}{2}$
$= u\cos\theta\hat{i}$

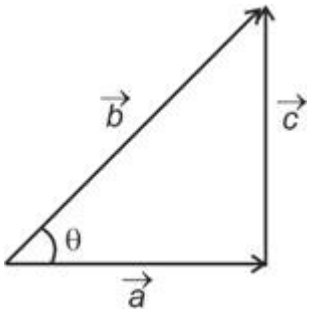
(14) **Answer :** (2)
Hint:
$T = \frac{2u\sin\theta}{g} = \sqrt{3}\text{ s}$
Solution:
$v_y = u_y - gt = 10\sin 60^\circ - 10\times\sqrt{3}$
$= 5\sqrt{3} - 10\sqrt{3}$
$= -5\sqrt{3}$
⇒ Body is at the same horizontal level.
So, $R_C = \frac{v^2}{g\cos\alpha} = \frac{(10)^2}{10\times\cos 60^\circ} = 20\text{ m}$

(15) **Answer :** (3)
Hint:

$\vec{a} - \vec{b} + \vec{c} = \vec{0}$

$\Rightarrow \vec{a} + \vec{c} = \vec{b}$

Solution:



$\vec{a} + \vec{c} = \vec{b}$

$\cos\theta = \frac{\sqrt{3}c}{2c}$

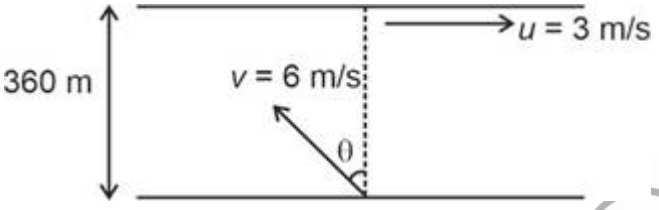
θ = 30°

(16) Answer : (1)

Hint:

For t_{min}, boat should be steered perpendicularly to the flow of river

Solution:



To cross the river in minimum time, θ = 0°

$t_{min} = \frac{d}{v} = \frac{360}{6} = 60$ s

Drift = 3 × 60 = 180 m

(17) Answer : (3)

Solution:

$y = bx^2$

$\frac{dy}{dt} = 2b \times \frac{dx}{dt}$, $v_y = 2b \times v_x$

$\frac{dv_y}{dt} = 2bv_x^2 + 2b \times \frac{dv_x}{dt}$

$a = \frac{dv_y}{dt} = 2bv_x^2 \quad \left(\text{As } \frac{dv_x}{dt} = 0\right)$

$v_X = \sqrt{\frac{a}{2b}}$

(18) Answer : (4)

Hint:

Use $a = v\frac{dv}{dx}$

Solution:

$v = kx^{\frac{3}{2}}$

$\frac{dv}{dx} = \frac{3}{2}kx^{\frac{1}{2}}$

$a = v\frac{dv}{dx} = \frac{3}{2}k^2x^2$

$a \propto x^2 \Rightarrow$ Parabola

(19) Answer : (4)

Solution:

$v_x = \frac{dx}{dt} = 5 - 6t$ and $v_y = \frac{dy}{dt} = 5$

at $t = 1$ s, $v_X = -1$, $v_Y = 5$

$v = \sqrt{(-1)^2 + 5^2} = \sqrt{26}$ m/s

(20) Answer : (2)

Solution:

$\vec{v}_{BA} = \vec{v}_B - \vec{v}_A$

$\vec{v}_A = \left(2\hat{i} + 3\hat{j}\right)$ m/s, $\vec{v}_B = \left(3\hat{i} + 4\hat{j}\right)$ m/s

$\vec{v}_{BA} = \vec{v}_B - \vec{v}_A = \left(\hat{i} + \hat{j}\right)$ m/s

(21) Answer : (4)

Solution:

For 2 kg, block; $F - T_1 = 2a$

For 3 kg block; $T_1 - T_2 = 3a$

For 5 kg block; $T_2 = 5a$

$\frac{T_1 - T_2}{T_2} = \frac{3}{5}$

$\frac{T_1}{T_2} = \frac{8}{5}$

(22) Answer : (3)

Hint:

$F = v_r \frac{dm}{dt} - mg$

Solution:

When the fuel is completely exhausted

Remaining mass $m = 2 \times 10^4 - 1 \times 10^4$

$= 1 \times 10^4$ kg

Net force on rocket

$F = 5 \times 10^6 - 10^4 \times 10$

$F = 49 \times 10^5$ N

$a = \frac{49 \times 10^5}{1 \times 10^4} = 490$ m/s^2

(23) Answer : (2)

Hint:

$W_{\text{app}} = m\,(g + a)$

Solution:

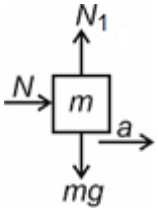
$a = 2$ m s^{-2}, $g = 10$ m s^{-2}

$W_{app} = 50\,(10 + 2)$

= 600 N

(24) Answer : (1)

Solution:



$a = \frac{F_{net}}{M+m} = \frac{100}{20+5} = 4\ \text{m/s}^2$

$N = ma$

$N = 5 \times 4 = 20$ N

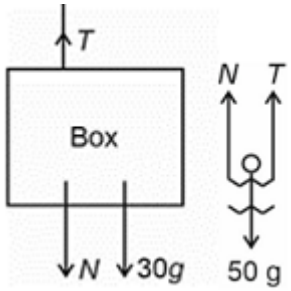
(25) Answer : (1)

Solution:

$I = \frac{2mv}{t} = \frac{2 \times 2 \times 10}{1/50} = 50 \times 10 \times 4 = 2$ kN

(26) Answer : (1)

Solution:



$T = N + 30g$

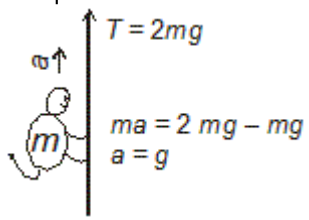
$N + T = 50g$

On solving $T = 400$ N

(27) **Answer :** (3)
Solution:

$F = \frac{\Delta p}{\Delta t} = \frac{3}{0.6} = 5$ N

(28) **Answer :** (1)
Solution:
At equilibrium of block



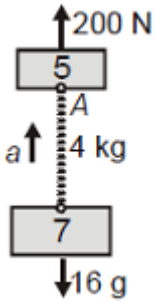
(29) **Answer :** (1)
Solution:

$F = v\frac{dm}{dt}$

$\frac{dm}{dt} = nm_0$

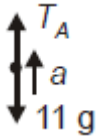
n = number of bullets fired/s
m_0 = mass of one bullet

(30) **Answer :** (2)
Solution:



$200 - 16g = 16a \Rightarrow a = \frac{40}{16}$

At point, A
FBD,



$T_A - 11g = 11a$

$\Rightarrow T_A = \frac{275}{2}$ N $\Rightarrow 137.5$ N

(31) **Answer :** (4)
Solution:

$a = \frac{F\cos 60^\circ}{10} = \frac{10\times\frac{1}{2}}{10} = 0.5 \text{ m/s}^2$

(32) **Answer :** (3)
Solution:

$\because v = \alpha t^2$

$a_t = 2\alpha t$

at $t = 2$ s

$a_t = 4\alpha$

$a_r = \frac{v^2}{r} = \frac{\alpha^2 t^4}{2}$

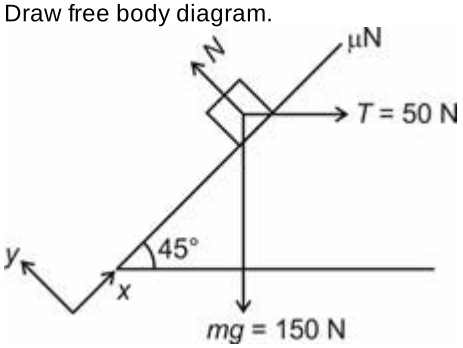
$= 8\alpha^2$

$\therefore \frac{a_r}{a_t} = \frac{8\alpha^2}{4\alpha} = 2\alpha$

(33) **Answer :** (2)
Hint:
Force of limiting friction $f_{lim} = \mu mg$

Solution:
N = mg = 10 N
$F_f = \mu mg$ = 2 N
at t = 3 s, F = 6 N
⇒ friction = 2 N

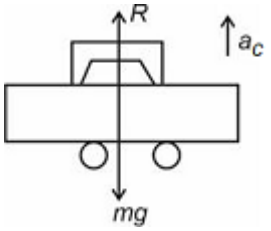
(34) Answer : (1)
Hint:
String is under tension.
Hence there is limiting friction between block and plane.
Solution:
Draw free body diagram.



$\Sigma F_X = 0$
$\mu N + 50 \cos 45° = 150 \sin 45°$
$\mu N = \frac{100}{\sqrt{2}}$ ...(1)
$\Sigma F_Y = 0$
$N = 150 \cos 45° + 50 \sin 45°$
$N = \frac{200}{\sqrt{2}}$ ...(2)
Divide (1) by (2)
$\mu = \frac{1}{2}$

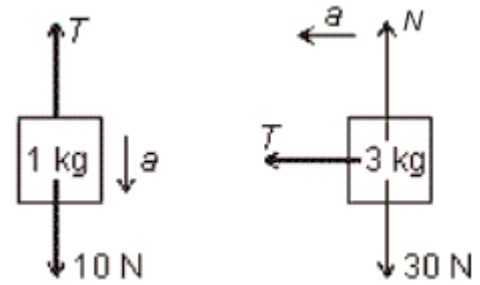
(35) Answer : (1)
Solution:
$\tan\alpha = \mu$
⇒ $P = mv = [MLT^{-1}]$
⇒ $F = Ma = [MLT^{-2}]$
⇒ $a = [LT^{-2}]$

(36) Answer : (2)
Hint:
Use, $F_{\text{centripetal}} = \frac{mv^2}{r}$
Solution:



$R - mg = \frac{mv^2}{r}$
$R = mg + \frac{mv^2}{r}$
Clearly $R > mg$
i.e. the weight of the moving car is greater than the weight of stationary car.

(37) Answer : (2)
Solution:



From F.B.D.

$T = 3.a$

$10 - T = 1.a$

$10 = 4a$

$a = \frac{10}{4} = 2.5 \text{ m s}^{-2}$

(38) Answer : (3)
Solution:

$J = \int F dt = \int_0^2 4t^3 dt = \frac{4}{4}\left[t^4\right]_0^2 = 16$ N-s

(39) Answer : (3)
Solution:

V_r = 4 km/h

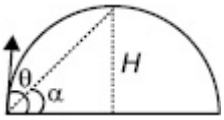
V_g = 3 km/h

$\vec{V}_{rg} = \vec{V}_r - \vec{V}_g$

$\left|\vec{V}_{rg}\right| = \sqrt{v_r^2 + v_g^2}$

$\left|\vec{V}_{rg}\right|$ = 5 km/h

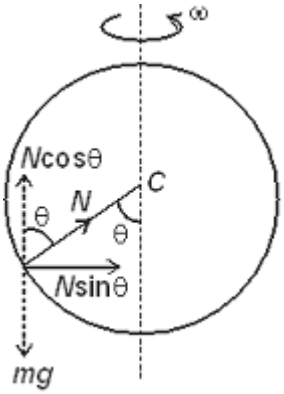
(40) Answer : (2)
Solution:



$\tan\alpha = \frac{1}{2}\tan\theta \Rightarrow \tan\theta = 2 \times \frac{1}{2} = 1$

θ = 45°

(41) Answer : (4)
Solution:



$N\sin\theta = m\omega^2 R\sin\theta$

or $N = m\omega^2 R$ ... (i)

$N\cos\theta = mg$

$\Rightarrow \cos\theta = \frac{mg}{N} = \frac{g}{\omega^2 R}$

$\Rightarrow \cos\theta = \frac{g}{\frac{2g}{R} \times R} = \frac{1}{2}$

$\Rightarrow \theta = 60°$

(42) Answer : (1)
Solution:

$a_{rel} = 0$, hence $\vec{r}_{rel} = \vec{v}_{rel}t$

⇒ Path of one particle w.r.t. other is straight line.

(43) Answer : (4)
Solution:

$v_{\max} = \sqrt{\mu Rg} = \sqrt{\frac{25}{100} \times 40 \times 10} = 10 \text{ m s}^{-1}$

(44) Answer : (3)
Solution:

Multiplication of $\vec{P}$ with a negative scalar will give a vector having opposite direction to $\vec{P}$.

Rotation of $\vec{P}$ by angle θ will result in a new vector with same magnitude as $\vec{P}$ but in different direction.

(45) Answer : (4)
Solution:
Newton's second law is valid in inertial frame of reference.

CHEMISTRY

(46) Answer : (1)
Solution:
The correct order of electronegativity is Si < C < N < O

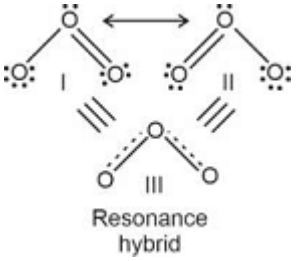
(47) Answer : (3)
Solution:
Dipole moment of NH_3 is greater than that of NF_3. This is because is case of NH_3 the orbital dipole due to lone pair is in the same direction as the resultant dipole moment of the N–H bonds.

(48) Answer : (3)
Solution:

As O^- already has an added electron then the addition of next electron leads to interelectronic repulsion and the process will be endothermic.

(49) Answer : (2)
Solution:
Orbitals with fully filled and half filled electronic configuration are stable and required more energy for ionization.
Hence the correct order is C > D > A > B.

(50) Answer : (4)
Hint:
Energy of O_3 resonance hybrid is lower than either of the two canonical forms
Solution:
O_3 is a resonance hybrid of two canonical structures



(51) Answer : (4)
Hint:
Odd electron species are always paramagnetic.
Solution:

$O_2^{2-}(18) : \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \begin{cases} \pi 2px^2 \\ \pi 2py^2 \end{cases} \begin{cases} \pi^* 2px^2 \\ \pi^* 2py^2 \end{cases}$

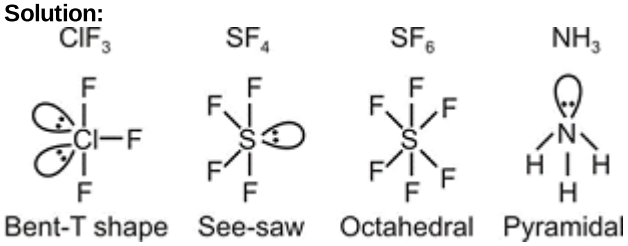
In O_2^{2-} there is no unpaired electrons therefore diamagnetic in nature.

(52) Answer : (2)
Solution:
Group number = (ns + (n – 1)d) electron

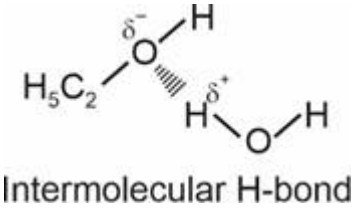
= 2 +7 = 9

(53) **Answer :** (3)
Solution:
Copper → Transition metal
Fluorine → Non-metal
Silicon → Metalloid
Cerium → Lanthanoid

(54) **Answer :** (3)
Solution:



(55) **Answer :** (2)
Hint:
Ethyl alcohol forms H–bond with water.
Solution:



Ethanol forms intermolecular H-bond with water hence it dissolves in water.

(56) **Answer :** (1)
Solution:

Elements	$\Delta_{eg}H$ (kJ/mol)
F	–328
I	–295
S	–200
O	–141

(57) **Answer :** (2)
Solution:
I_3^- → Linear (planar)
ClF_3 → Bent T shape (planar)
BF_3 → Trigonal planar
XeO_3 → Pyramidal
B_2H_6 → non-planar

(58) **Answer :** (3)
Solution:

Species	**Bond enthalpy/(kJ mol^{-1})**
O_2(O = O)	498
N_2(N ≡ N)	946
HCl	431
H_2	435.8

(59) **Answer :** (3)
Hint:
σ-bond is formed using σ molecular orbital
Solution:

Molecules	**Nature of bond**
B_2	1π bond
C_2	2π bond

H_2	1σ bond
N_2	1σ and 2π bonds

N_2 (electronic configuration): $(\sigma 1s)^2\ (\sigma^*1s)^2\ (\sigma 2s)^2\ (\sigma^*2s)^2\ \ (\pi 2p_x^2 = \pi 2p_y^2)\ (\sigma 2p_z^2)$

(60) **Answer :** (2)
Hint:
Number of hybrid orbitals (H) = Number of σ bond + number of lone pairs.
Solution:

- XeF_4 : H = 4 + 2 = 6 sp^3d^2

$XeOF_4$: H = 5 + 1 = 6 sp^3d^2

XeF_6 : H = 6 + 1 = 7 sp^3d^3

(61) **Answer :** (4)
Hint:
The maximum covalency of B is 4.
In $[AlCl(H_2O)_5]^{2+}$, the covalency of Al is 6.

(62) **Answer :** (2)
Hint:
Species having net dipole moment zero are called non-polar.
Solution:
XeF_4 has 4 bp and 2 lp so acquires square planar geometry and net dipole moment of four Xe-F bonds is found to be zero, so it is a non-polar species.

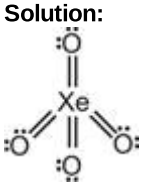
(63) **Answer :** (1)
Solution:
In CO_3^{2-} only *p*π-*p*π bond is present

(64) **Answer :** (1)
Hint:
Neptunium comes after uranium in periodic table
Solution:
Samarium is a lanthanoid element

(65) **Answer :** (3)
Hint:
Cerium (Ce) is *f*-block element
Solution:
• *s* and *p* block elements are called representative elements. Bismuth (Bi) and rubidium (Rb) are *p* and *s* block elements respectively.
• Ge and Sb are semi-metals or metalloids.
• Ti is *d* block element.

(66) **Answer :** (2)
Solution:
Ionisation enthalpy : $Na \rightarrow Na^+ + e^-$
E = 5.1 eV
Electron gain enthalpy : $Na^+ + e^- \rightarrow Na$
E = –5.1 eV

(67) **Answer :** (3)
Hint:
There is no lone pair on 'Xe' but there is two lone pairs on each 'O' of XeO_4.
Solution:



No. of lone pairs of electrons = 8, in XeO_4

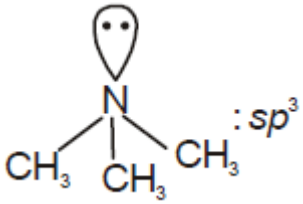
(68) **Answer :** (3)
Solution:
Electronic configuration (atomic No = 60)
= [Xe] $4f^4 6s^2$

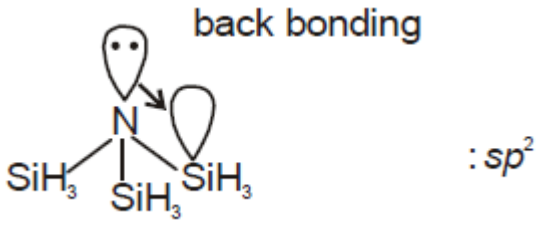
(69) **Answer :** (3)

Solution:

Species	Bond order
N_2	3.0
O_2^-	1.5
N_2^+	2.5
B_2	1.0
CO	3.0
O_2^+	2.5
C_2^{2-}	3.0

(70) **Answer :** (4)
Hint:
If lone pair is involved in back bonding, then it will not consider in hybrid orbital.
Solution:





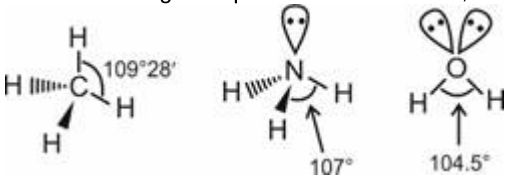
(71) **Answer :** (2)
Solution:
In CCl_4, the number of 109.5° bond angles is six.

(72) **Answer :** (4)
Solution:
Halogens belong to 17 group in periodic table.

(73) **Answer :** (3)
Solution:
IUPAC name of element : 119 : Ununennium

(74) **Answer :** (2)
Solution:
From Fajans rule, for a given metal ion, as the size of anion increases, polarizability of anion increases then the increasing order of covalent character is $MgF_2 < MgCl_2 < MgBr_2 < MgI_2$

(75) **Answer :** (2)
Solution:
With increasing lone pairs on central atom, the bond angle of the molecule decreases.



(76) **Answer :** (3)
Solution:
Cu, Ag and Au are coinage metals. These do not belong to Dobereiner's Triads.

(77) **Answer :** (3)
Solution:
In molecules with an odd number of electron like NO and NO_2 act as odd electron species.

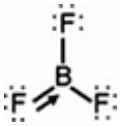
(78) **Answer :** (1)

Solution:
In PCl_5 axial bonds are longer than equatorial bonds.

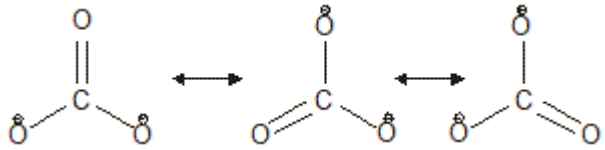
(79) Answer : (2)
Hint:
Percentage ionic character = $\frac{\mu_{observed}}{\mu_{calculated}} \times 100$
$\mu_{calculated}$ = q × d
Solution:
$\mu_{calculated} = 1.6 \times 10^{-19} \times 125 \times 10^{-12}$ C m
$= \frac{1.6\times10^{-19}\times125\times10^{-12}}{3.33\times10^{-30}}$ D
Percentage ionic character = $\frac{1\times3.33\times10^{-30}}{1.6\times125\times10^{-31}} \times 100$
= 16.65%

(80) Answer : (1)
Hint:
For O_2, the order of energy of the molecular orbitals is
$\sigma 1s < \sigma^*1s < \sigma 2s, < \sigma^* 2s, < \sigma 2p_z < \begin{cases}\pi 2p_x \\ \pi 2p_y\end{cases} < \begin{cases}\pi^* 2p_x \\ \pi^* 2p_y\end{cases} < \sigma^* 2p_z$
Solution:
Molecular orbital configuration of O_2 is
$(\sigma 1s)^2, (\sigma^*1s)^2, (\sigma 2s)^2, (\sigma^*2s)^2, (\sigma 2p_z)^2, \begin{cases}\pi(2p_x)^2 \\ \pi(2p_y)^2\end{cases} \begin{cases}(\pi^* 2p_x)^1 \\ (\pi^* 2p_y)^1\end{cases}$
So, the electron is removed from π*orbital

(81) Answer : (3)
Solution:
Due to large size and relatively less electronegativity of Cl, HCl does not form H-bonding.

(82) Answer : (4)
Hint:
• BF_3 is an electron deficient species with only 6 electrons on central atom 'B'.
• In BF_3, 'B' atom is sp^2 hybridised.
Solution:


• The observed B-F bond length is smaller than expected B-F bond length due to pπ-pπ back bonding (partial double bond character).
∴ (a), (c) and (d) are correct.

(83) Answer : (4)
Hint:
CO_3^{2-} has three resonating structures.
Solution:


B.O. = number of bonds on central atom/no. of surrounding atom.
Bond order of C – O Bond = $\frac{2+1+1}{3} = 1.33$

(84) Answer : (3)
Solution:
I_3^- , CO_2 and $BeCl_2$ are linear.

(85) Answer : (1)
Solution:
NO, CO, N_2O are neutral oxides, while As_2O_3, Al_2O_3 are amphoteric oxide. NO_2 is acidic oxide.

(86) Answer : (1)
Solution:

Electron present in antibonding molecular orbital destabilises molecule due to repulsion.

(87) **Answer :** (3)
Solution:
$\Rightarrow \quad \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \left(\pi 2p_x^2 = \pi 2p_y^2\right) \sigma 2p_z^2$

(88) **Answer :** (2)
Solution:

Ions	Be^{2+}	H^+	Li^+	Na^+	Mg^{2+}
Electrons	2	0	2	10	10

(89) **Answer :** (1)
Solution:
Most electronegative is 'F', which belongs to group 17 and period 2.

(90) **Answer :** (2)
Solution:
Lawrencium – 103
Seaborgium – 106
Dubnium – 105
Nobelium – 102

BOTANY

(91) **Answer :** (3)
Solution:
Methanogens are methane producing bacteria abundant in marshy area and gut of ruminants.

(92) **Answer :** (2)
Solution:
Mucor belongs to Phycomycetes and its mycelium is aseptate and coenocytic.

(93) **Answer :** (4)
Solution:
The morphology of the mycelium, mode of spore formation and fruiting bodies form the basis for the division of the kingdom fungi into various classes.

(94) **Answer :** (3)
Solution:
Neurospora is used extensively in biochemical and genetic work.

(95) **Answer :** (2)
Solution:
Pellicle is present in Euglenoids. Diatoms are found in fresh water as well as in marine environments.

(96) **Answer :** (3)
Solution:
Bladderwort and Venus fly trap are examples of insectivorous plants. They are partially heterotrophic.
The viruses are non-cellular organisms that are characterised by having an inert crystalline structure outside the living cell.

(97) **Answer :** (1)
Hint:
Linnaeus proposed 'two kingdom system' of classification.
Solution:
Kingdom Plantae and Kingdom Animalia were the two kingdoms proposed by Linnaeus.

(98) **Answer :** (2)
Solution:
Diatoms are chief producers in the ocean. They have left behind large amount of cell wall deposits in their habitat, this accumulation over billions of years is referred to as 'Diatomaceous earth'.

(99) **Answer :** (4)
Solution:
Archaebacteria can survive in most harsh habitats.

(100) **Answer :** (3)
Hint:
Plants are autotrophic. Animals do not have cell walls.
Solution:

Member of both kingdom Monera and Fungi have cell walls. Most of the bacteria and all fungi are heterotrophic.

(101) Answer : (2)
Solution:
In diatoms, cell wall form two thin overlapping shells, which fit together as in a soap box.

(102) Answer : (3)
Solution:
Toadstools are poisonous members of Basidiomycetes.

(103) Answer : (2)
Hint:
In bacteria when photosynthesis is anoxygenic means there is no release of O_2.
Solution:
H_2S acts as electron donor in bacterial photosynthesis.

(104) Answer : (3)
Hint:
Both algae and fungi are eukaryotic.
Solution:
Algae are photosynthetic and fungi are non-photosynthetic.

(105) Answer : (3)
Solution:
The given diagram is of a dinoflagellate.
They have stiff cellulosic plates on the outer surface.

(106) Answer : (3)
Solution:
The spores in slime moulds possess true walls.

(107) Answer : (3)
Solution:
· Lichens do not grow in SO_2 polluted areas.
· Phycobiont provides food and mycobiont provides shelter.

(108) Answer : (3)
Solution:
Potato spindle tuber disease is caused by viroids.

(109) Answer : (2)
Solution:
Convolvulaceae and Solanaceae are included in the order Polymoniales, mainly based on the floral characters.

(110) Answer : (4)
Solution:
Presence of gullet – *Paramoecium*
Occurrence of spore-like stage in the life cycle – *Plasmodium*
Marine forms having silica shell on their surface – *Amoeboid* protozoan
Presence of pigments identical to higher plants – *Euglena*

(111) Answer : (2)
Solution:
In members of ascomycetes, asexual reproduction occurs by means of exogenous spores and sexual reproduction occurs by means of endogenous spores. It shows dikaryophase, in its sexual life cycle.

(112) Answer : (3)
Solution:
Plantae includes autotrophic organisms. *Cuscuta* is a parasitic plant. Few members are partially heterotrophic such as insectivorous plants, *eg*. Venus fly trap and Bladderwort.

(113) Answer : (3)
Solution:
W. M. Stanley showed that viruses could be crystallised and crystals consist largely of proteins.

(114) Answer : (2)
Hint:
Agaricus is a member of Basidiomycetes.
Solution:
In *Agaricus*, the dikaryotic structure ultimately gives rise to basidium in which karyogamy and meiosis take place.

(115) Answer : (2)
Solution:
Albugo is a parasitic fungus which causes white rust of mustard.

(116) Answer : (4)
Solution:
Morels and truffles are edible fungi of ascomycetes.

(117) Answer : (3)
Hint:
Penicillin interferes in the synthesis of peptidoglycan, a component of cell wall of bacteria.
Solution:
Mycoplasma are facultative anaerobes and lack cell wall. They can survive without oxygen.

(118) Answer : (2)
Solution:
In binomial nomenclature, name of author appears after the specific epithet.

(119) Answer : (2)
Solution:
The correct order from the lowest to the highest taxonomic category is:
Species $\rightarrow$ Genus $\rightarrow$ Family $\rightarrow$ Order $\rightarrow$ Class $\rightarrow$ Phylum $\rightarrow$ Kingdom

(120) Answer : (4)
Hint:
In basidiomycetes, karyogamy and meiosis occurs in club-shaped structures known as basidium.
Solution:
In basidiomycetes, the secondary mycelium is long lived and dominant phase of life cycle.

(121) Answer : (3)
Solution:
Higher the category, fewer is the number of common characteristics in it.

(122) Answer : (3)
Solution:
Dog – Canidae
Cat, Tiger, Lion – Felidae
Man – Hominidae
Housefly - Muscidae

(123) Answer : (2)
Solution:
According to five kingdom classification system given by R.H. Whittaker, both *Chlorella* and *Amoeba* are unicellular eukaryotes and they have been placed under the kingdom protista.

(124) Answer : (4)
Solution:
Internal and external structure, development process as well as ecological information form the basis of the modern taxonomic studies.

(125) Answer : (2)
Solution:
Total number of species that are known and described range between 1.7 – 1.8 million.

(126) Answer : (4)
Solution:
Potato, brinjal and makoi all are different species.

(127) Answer : (3)
Solution:
Monkey, gorilla and gibbon are placed under the order, Primata.

(128) Answer : (2)
Hint:
Plants also show sensitivity.
Solution:
Photoperiod affects reproduction in plants.

(129) Answer : (1)
Solution:
Usually plant viruses have ss RNA as their genetic material.

(130) Answer : (4)
Hint:
Euglena, *Lactobacillus* and diatoms all are single-celled organisms.
Solution:
These single celled organisms reproduce by binary fission.

Euglena, and Diatoms — Photosynthetic

Lactobacillus — Heterotrophic

(131) Answer : (1)

Hint:

Kingdom Protista has only unicellular eukaryotic organisms.

Solution:

Boundaries of Kingdom Protista are not well defined. They have the features of fungi, plants and animals. They have cellular body organisation.

(132) Answer : (3)

Solution:

Viruses did not find a place in classification since they are not considered truly 'living'.

(133) Answer : (3)

Hint:

Members of Protista may show isogamy anisogamy or oogamy.

Solution:

Members of kingdom Protista reproduce sexually as well as asexually.

(134) Answer : (3)

Solution:

All single-celled eukaryotes are placed under kingdom Protista according to Whittaker's classificaiton

(135) Answer : (4)

Solution:

Growth and reproduction are mutually exclusive events in higher plants and animals.

ZOOLOGY

(136) Answer : (1)

Solution:

A unique vascular connection exists between the digestive tract and liver called hepatic portal system. Special venous connection between kidney and lower parts of body are present in frogs. It is called renal portal system.

(137) Answer : (2)

Hint:

Asbestosis

Solution:

Occupational respiratory disorders occur due to long exposure in stone breaking or grinding industries.
Respiratory alkalosis is a disturbance in acid and base balance due to alveolar hyperventilation.
Emphysema is caused due to chronic cigarette smoking.

(138) Answer : (2)

Solution:

Monocytes = 6-8% of the total WBCs
Basophils = 0.5-1% of the total WBCs
Neutrophils = 60-65% of the total WBCs

(139) Answer : (3)

Solution:

Inspiration can occur if the pressure within the lungs (intra-pulmonary pressure) is less than the atmospheric pressure, *i.e.*, there is a negative pressure in the lungs with respect to atmospheric pressure.

(140) Answer : (2)

Solution:

Total Lung Capacity (TLC) is the total volume of the air accommodated in the lungs at the end of a forced inspiration.
This includes RV, ERV, TV and IRV or vital capacity + residual volume.
Functional residual capacity includes ERV and RV.

(141) Answer : (3)

Hint:

Diffusion membrane is the respiratory membrane.

Solution:

Diffusion membrane is made up of three layers:
(i) Thin squamous epithelium of alveoli.
(ii) Endothelial lining of alveolar capillaries.
(iii) Between the above two layers acellular basement substance is present.

(142) Answer : (4)

Solution:

SA node is located in the upper right corner of the right atrium.
AV node is located in the lower left corner of the right atrium.
AV bundle arises from AV node, continue through ventricular septum and then to the entire ventricular musculature as Purkinje fibres.

(143) Answer : (3)

Solution:

Under normal conditions 100 mL of oxygenated blood delivers → 5 mL of O_2 to tissues.

∴ 5 L will deliver → $\frac{5\times5000}{100} = 250\,mL$

(144) Answer : (4)

Hint:

Diffusion occurs along pressure gradient.

Solution:

Partial pressure (in mm Hg) of O_2 and CO_2 at different parts involved in diffusion in comparison to those in atmosphere

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

(145) Answer : (2)

Solution:

The heart rate is equal to the number of QRS complexes in the ECG in one minute.

(146) Answer : (3)

Solution:

Inspiration is initiated by the contraction of diaphragm which increases the volume of thoracic chamber in antero-posterior axis. The contraction of external inter-costal muscles lifts up the ribs and sternum causing an increase in volume of the thoracic chamber in the dorso-ventral axis.

(147) Answer : (3)

Solution:

The tunica media is comparatively thin in the veins than the arteries. Artery carries blood away from the heart whereas vein carries blood towards the heart. Capillaries are one layered; made up of endothelium only.
Veins have wider lumen as compared to arteries. Aorta has high pressure as compared to pulmonary artery.

(148) Answer : (1)

Solution:

Thromboplastins help in the formation of the enzyme complex thrombokinase. Thrombokinase converts an inactive protein prothrombin, present in the plasma, into thrombin. Thrombin is an enzyme which converts soluble fibrinogen of plasma into insoluble fibrin.

(149) Answer : (1)

Solution:

Rh antibodies from the mother (Rh –ve) can leak into the blood of the foetus (Rh +ve) and destroy the foetal RBCs. This could be fatal to the foetus or could cause severe anaemia and jaundice to the baby. This condition is called erythroblastosis foetalis.

(150) Answer : (3)

Solution:

Blood Group	Antigens on RBCs	Antibodies in Plasma	Donor's Group
A	A	anti-B	A,O
B	B	anti-A	B,O
AB	A,B	nil	AB, A,B,O
O	nil	anti-A,B	O

(151) Answer : (2)

Solution:

Each Hb molecule can carry a maximum of four molecules of O_2. Binding of oxygen with haemogobin is primarily related to the partial pressure of O_2. Exchange part of the human respiratory system is the site of actual diffusion of O_2 and CO_2 between blood and atmospheric air. The trachea, primary, secondary and tertiary bronchi and initial bronchioles are supported by incomplete cartilaginous rings.

(152) Answer : (2)

Solution:

• The factors favourable for the formation of oxyhaemoglobin at the alveolar level are; high pO_2, low pCO_2, less H^+ concentration and lower temperature.

• The conditions favourable for the dissociation of oxygen from oxyhaemoglobin at the tissue level are; low pO_2, high pCO_2, high H^+ concentration and high temperature.

(153) Answer : (2)

Hint:

Haemoglobin has a quaternary structure.

Solution:

Adult human haemoglobin consists of 4 subunits-2α subunits and 2β subunits that can carry a maximum of four molecules of oxygen.

(154) Answer : (3)

Solution:

Trachea divides at the level of 5th thoracic vertebra into right and left bronchi.

(155) Answer : (4)

Solution:

Coronary Artery Disease (CAD) affects the vessels that supply blood to the heart muscle. It is caused by deposits of calcium, fat, cholesterol and fibrous tissues, which makes the lumen of arteries narrower. Angina is a symptom of acute chest pain when not enough oxygen is reaching the heart muscle. Heart failure means the state of heart when it is not pumping blood effectively enough to meet the needs of the body. Hypertension is the term for blood pressure that is higher than normal.

(156) Answer : (2)

Solution:

Systemic arteries have oxygenated blood having pO_2 95 mm Hg and pCO_2 40 mm Hg.

Respiratory Gas	Atmospheric Air	Alveoli	Blood (Deoxygenated)	Blood (Oxygenated)	Tissues
O_2	159	104	40	95	40
CO_2	0.3	40	45	40	45

(157) Answer : (2)

Solution:

The outer pleural membrane is in close contact with the thoracic lining whereas the inner pleural membrane is in contact with the lung surface.

(158) Answer : (4)

Solution:

Lub is the first heart sound produced due to closure of bicuspid and tricuspid valves at the beginning of ventricular systole.

(159) Answer : (1)

Solution:

CO_2 enters RBCs and reacts with water in the presence of enzyme carbonic anhydrase to form carbonic acid which dissociates into H^+ and HCO_3^-. About 20-25% of CO_2 is transported as carbaminohaemoglobin. Whereas 70 percent of it is carried as bicarbonate. About 7 percent of CO_2 is carried in a dissolved state through plasma.

(160) Answer : (1)

Solution:

On an average, a healthy human breathes 12-16 times/minute.

(161) Answer : (2)

Hint:

This wave also represents repolarisation of ventricles.

Solution:

P-wave is a small upward wave that represents electrical excitation (or depolarisation) of the atria which leads to contraction of both the atria.

QRS complex represents the depolarisation of ventricles which initiates the ventricular contraction (systole) and end of T-wave represents the end of ventricular systole.

(162) Answer : (4)

Solution:

TV is approx 500 mL

Residual volume : This averages 1100 mL to 1200 mL

Inspiratory reserve volume : This averages 2500 mL to 3000 mL
Vital capacity : This averages 4000 mL to 4600 ml

(163) Answer : (4)
Solution:
Earthworms use their moist cuticle for respiration. Aquatic arthropods, molluscs and fishes respire through gills.

(164) Answer : (2)
Solution:
The SAN generates the maximum number of action potentials and is responsible for initiating and maintaining the rhythmic contractile activity of the heart. The conducting pathway is : SA node → AV node → Right and left bundle branches → Purkinje fibres .

(165) Answer : (2)
Solution:
Functional residual capacity is defined as the volume of air that will remain in the lungs after a normal expiration. This includes expiratory reserve volume and residual volume.
FRC = ERV + RV = 2500 mL

(166) Answer : (2)
Solution:
During normal respiration, a healthy man can inspire or expire 6000 to 8000 mL of air per minute. Relaxation of the diaphragm and the external inter-costal muscles leads to return of the diaphragm and sternum to their normal positions and reduces the thoracic volume and thereby the pulmonary volume.

(167) Answer : (4)
Solution:
Peripheral chemoreceptors are sensitive to mainly arterial pCO_2 and pH (H^+ concentration). These receptors are associated with aortic arch and carotid artery and they send impulses to respiratory rhythm centre for remedial action.

(168) Answer : (4)
Solution:
A – Epiglottis
B – Larynx or sound box
C – Alveoli
D – Diaphragm (Contracts and becomes flat during inspiration)

(169) Answer : (4)
Solution:
Balaenoptera is a mammal which respires *via* lungs.

(170) Answer : (4)
Solution:
The 'exchange part' of the human respiratory system which includes alveoli and alveolar ducts is involved in diffusion of O_2 and CO_2 between blood and atmospheric air. Whereas conducting part of the respiratory system humidify the air and trap the dust particles.

(171) Answer : (3)
Solution:
Fishes have a 2-chambered heart with an atrium and a ventricle. Amphibians and reptiles (except crocodile) have 3-chambered heart with 2 atria and a single ventricle, whereas, birds and mammals possess a 4-chambered heart with two atria and two ventricles.

(172) Answer : (3)
Solution:
The lungs are situated in the thoracic chamber which is anatomically an air-tight chamber.

(173) Answer : (4)
Solution:
Blood is a specialized (fluid) connective tissue which is devoid of fibres.

(174) Answer : (2)
Solution:
In cardiac arrest, the heart stops beating.

(175) Answer : (3)
Solution:
Human RBCs have an average life span of 120 days.

(176) Answer : (1)
Solution:
Cardiomegaly is enlargement of the heart.

(177) Answer : (4)
Hint:

Second heart sound is shorter and high pitched.
Solution:
Second heart sound is called dub and is caused by closure of the semilunar valves at the beginning of ventricular diastole.

(178) Answer : (3)
Solution:
Monocytes and neutrophils are phagocytic cells. Eosinophils resist infection and are also associated with allergic reactions. Erythrocytes transport respiratory gases.

(179) Answer : (1)
Solution:
Due to atrial systole, flow of blood into the ventricles increases by about 30 percent.

(180) Answer : (3)
Solution:
Heart is mesodermal in origin .