21/08/2024

Code-B_Phase-2

Aakash
Medical | IIT-JEE | Foundations

Corporate Office : Aakash Tower, 8, Pusa Road, New Delhi-110005, *Ph.*011-47623456

MM : 720 NCERT Booster Test Series for NEET (RM)-2024-25_T01B **Time : 200 Min.**

PHYSICS

SECTION-A

1. (4)
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SECTION-B

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CHEMISTRY

SECTION-A

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SECTION-B

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BOTANY

SECTION-A

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SECTION-B

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ZOOLOGY

SECTION-A

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SECTION-B

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Hints and Solutions

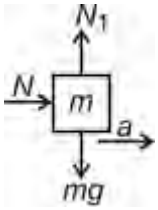
PHYSICS

SECTION-A

(1) **Answer :** (4)
Solution:
Area under a-t curve= $\int adt = \Delta v$
=change in velocity

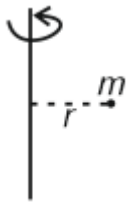
(2) **Answer :** (1)
Solution:
$v_{avg} = \frac{\Delta x}{\Delta t}$
$\Delta x = x_2 - x_1 = 16 - 5 = 11$ m
$\Delta t = (2 - 1)$ s = 1 s
$v_{avg} = \frac{11}{1}$
m/s = 11 m/s

(3) **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

(4) **Answer :** (2)
Solution:
$I = mr^2$



(5) **Answer :** (1)
Solution:
$\omega = \frac{d\theta}{dt} = 12t^2 - 24t, \alpha = \frac{d\omega}{dt} = 24t - 24$
α = 0 at t = 1 s

(6) **Answer :** (1)
Solution:
$a = \frac{\left|\vec{v}_f - \vec{v}_i\right|}{t} = \frac{\sqrt{30^2+40^2}}{10} = 5\ \text{m/s}^2$

(7) **Answer :** (4)
Solution:
$\vec{v}_A = \left(\hat{i} + \hat{j}\right)$ m/s
$\vec{v}_B = \left(4\hat{i} - 3\hat{j}\right)$ m/s
$\vec{v}_{B/A} = \vec{v}_B - \vec{v}_A$
$\vec{v}_{B/A} = \left(4\hat{i} - 3\hat{j}\right) - \left(\hat{i} + \hat{j}\right)$

$\vec{v}_{B/A} = \left(3\hat{i} - 4\hat{j}\right)$

$\left|\vec{v}_{B/A}\right| = 5$ m/s

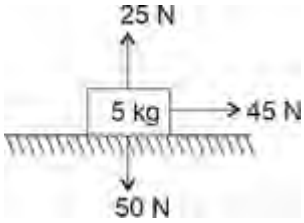
(8) **Answer :** (3)
Solution:
$P = \frac{F}{A} = \frac{F}{\pi r^2} \therefore r^2 = \frac{F}{\pi P}$
$\therefore \frac{2\Delta r}{r} = \frac{\Delta F}{F} + \frac{\Delta P}{P}$
$\frac{\Delta r}{r} = \frac{1}{2} \times \frac{\Delta F}{F} + \frac{1}{2}\frac{\Delta P}{P}$
$\frac{\Delta r}{r} = \frac{1}{2} \times 4\% + \frac{1}{2} \times 1\%$ = 2.5%

(9) **Answer :** (2)
Solution:
$L = F^a V^b T^c$
$L = (MLT^{-2})^a (LT^{-1})^b T^c$
$L = M^a L^{a+b} T^{-2a-b+c}$
$a = 0$
$a + b = 1$
$b = 1$
$-2a - b + c = 0$
$-b + c = 0$
$\boxed{c = 1}$

(10) **Answer :** (2)
Solution:
$2b - a = (2b - a) \pm (\Delta a + 2\Delta b)$
$= (10 - 5) \pm (0.1 + 2 \times 0.2)$
$= 5.0 \pm 0.5$

(11) **Answer :** (4)
Solution:
L.C = 1 MSD – 1 VSD
1 VSD = $\left(\frac{n-1}{n}\right)$ = MSD
L.C. = 1 MSD – $\left(\frac{n-1}{n}\right)$ MSD
= $\frac{1}{n}$ MSD
= $\frac{1}{5}$ mm
= 0.2 mm

(12) **Answer :** (2)
Solution:



F = ma
45 = 5a
a = 9 m s^{-2}

(13) **Answer :** (1)
Solution:
Energy of ball after collision = $\frac{80}{100}mgh = \frac{4}{5}mgh$
Height gained, $h' = \frac{4}{5}h \Rightarrow h' = 80\,m$

(14) **Answer :** (1)
Solution:
Work done by conservative forces
$= U_i - U_f = -(U_f - U_i)$
= negative of change in potential energy

(15) **Answer :** (2)
Solution:

L = Constant

Rotational K.E. $= \frac{L^2}{2I}$

(16) Answer : (2)
Solution:
For complementary angles $R_1 = R_2 = 100\,m$

(17) Answer : (3)
Solution:
$\alpha = \frac{40\times 2\pi - 0}{4} = 20\pi$ rad/s^2
$\theta = \frac{1}{2} \times 20\,\pi\left(4^2 - 2^2\right) = 120\pi$ rad

(18) Answer : (2)
Solution:
Since no external torque acts, angular momentum remains constant, hence bending decreases MOI and increases angular speed.

(19) Answer : (2)
Hint:
$W = \vec{F} \cdot \vec{s}$
Solution:
$s = \frac{1}{2}t^2$
$v = t$
a = 1 m/s^2
$F = ma$ = 2 N
$s = \frac{1}{2}t^2 = \frac{1}{2} \times 2^2 = 2$ m
W = 2 × 2 = 4 J

(20) Answer : (1)
Solution:

$$\vec{\tau} = \vec{r} \times \vec{F} = \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ 1 & -2 & 1 \\ 1 & 2 & -3 \end{vmatrix} = \hat{i}\left(\quad\right) - \hat{j}\left(-4\right) + 4\hat{k}$$

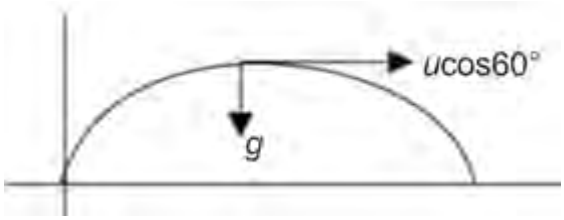
$\vec{\tau} = 4\hat{i} + 4\hat{j} + 4\hat{k}$
$\hat{\tau} = \frac{\vec{\tau}}{\left|\vec{\tau}\right|} \Rightarrow \frac{4(\hat{i}+\hat{j}+\hat{k})}{4\sqrt{3}} = \frac{\hat{i}+\hat{j}+\hat{k}}{\sqrt{3}}$
$\hat{\tau} = \frac{1}{\sqrt{3}}(\hat{i} + \hat{j} + \hat{k})$

(21) Answer : (2)
Solution:
$v = 36\,kmph$ = $36 \times \frac{5}{18} = 10\,m/s$
$F = \frac{mv^2}{r} = \frac{500\times 10^2}{50}$
$F = 1000$ N

(22) Answer : (1)
Solution:
$\vec{v}_{bG} = \left(2\hat{i} + 3\hat{j}\right)$m/s
$\vec{v}_{RG} = \left(-2\hat{i} - 2\hat{j}\right)$m/s
$\vec{v}_{bR} = \vec{v}_{bG} - \vec{v}_{RG}$
$= \left(2\hat{i} + 3\hat{j}\right) - \left(-2\hat{i} - 2\hat{j}\right)$
$= \left(4\hat{i} + 5\hat{j}\right)$m/s

(23) Answer : (2)
Solution:
$a = \frac{v^2}{R}$
$\mu_s g = \frac{\nu^2}{R}$
$\nu_{\max} = \sqrt{\mu_s g R}$

(24) Answer : (1)
Solution:



Radius of curvature, $R = \frac{(u\cos\theta)^2}{g} = \frac{(50\times\cos 60^\circ)^2}{10}$

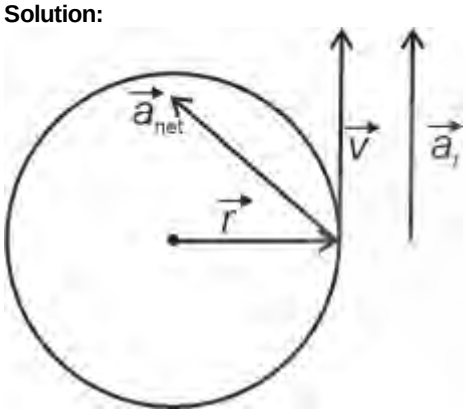
$= \frac{25\times 25}{10} = 62.5\ \text{m}$

(25) Answer : (4)
Solution:
$\because$ For equilibrium of block,
F = |Spring force| = Kx
$x_1 = \frac{F}{K}$; $x_2 = \frac{F}{4K} \Rightarrow x_1 : x_2 = 4 : 1$

(26) Answer : (1)
Solution:
$T = (m_1 + m_2)g = (5 + 10)g = 150$ N

(27) Answer : (1)
Solution:
$(f_s)_{max} = \mu mg = 12$ N
$F_{ext} < (f_s)_{max}$
So, $f = F_{ext} = 5$ N

(28) Answer : (2)
Solution:



(29) Answer : (1)
Solution:
$F = -\frac{dU}{dx} = (-2x + 10)N$

(30) Answer : (4)
Solution:
Work done by kinetic friction may be positive, negative or zero.

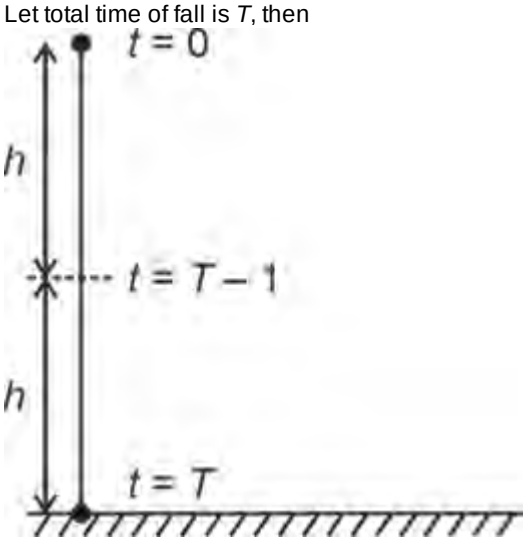
(31) Answer : (3)
Solution:
$W = \frac{1}{2}kx^2 = \frac{F.x}{2} = \frac{F^2}{2k}$
If force is same $W \propto \frac{1}{k}$

(32) Answer : (3)
Solution:
$\left[V\right] = \frac{[W]}{[q]} = \frac{[ML^2T^{-2}]}{[AT]} = \left[ML^2T^{-3}A^{-1}\right]$

(33) Answer : (1)
Solution:
[Linear momentum] = [Impulse] = [MLT^{-1}]

(34) Answer : (1)
Solution:
For uniform rectilinear motion velocity should be constant.

(35) Answer : (1)
Solution:
Let total time of fall is *T*, then



$S_{n^{th}} = u + \frac{a}{2}(2n-1)$

$\therefore \; h = 0 + \frac{g}{2}(2T-1)$ ...(i)

$S = ut + \frac{1}{2}at^2$

$\therefore \; h = 0 + \frac{1}{2}g(T-1)^2$ ...(ii)

Equating equation (i) and (ii), we get

$\frac{g}{2}\left(2T-1\right) = \frac{g}{2}(T-1)^2$

$2T - 1 = T^2 + 1 - 2T \Rightarrow T^2 - 4T + 2 = 0$

$T = \frac{4 \pm \sqrt{16-(4\times1\times2)}}{2\times1}$

$T = 2+\sqrt{2},\; 2-\sqrt{2}$

$T > 1\text{ s} \Rightarrow T = 2+\sqrt{2} = 3.4\text{ s}$

SECTION-B

(36) Answer : (4)
Solution:
Two physical quantity having same dimensions may have different unit like torque and energy.
A dimensionless quantity may have unit like plane angle has unit radian but it is dimensionless.

(37) Answer : (4)
Solution:
$\omega = \omega_0 + \alpha t$
$= 2 + 2 \times 4 = 10$ rad/s

(38) Answer : (1)
Hint:
$v^2 - u^2 = 2as$
Solution:
$400^2 - 100^2 = 2a(1)$
$\Rightarrow a = -7.5 \times 10^4$
$\text{so, retardation} = 7.5 \times 10^4$

(39) Answer : (3)
Solution:
$P = (2t + 3)$
$\frac{dk}{dt} = 2t+3$
$\int dk = \int_0^2 (2t+3)dt$
$\Delta k = \left[t^2 + 3t\right]_0^2$
$= 4 + 6$

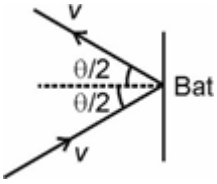
= 10 J

(40) Answer : (1)
Solution:
$\mu g = r\omega^2$
$\Rightarrow \quad r \propto \frac{1}{\omega^2}$

(41) Answer : (3)
Solution:
$W = \vec{F} \cdot \vec{d}$
$= \left(4\hat{i} + 3\hat{j}\right) \cdot \left(2\hat{i} - \hat{j} + 3\hat{k}\right)$
= 8 – 3
= 5 J

(42) Answer : (2)
Solution:
$(W.D)_T$ is zero as T and displacement have angle $\pi/2$.

(43) Answer : (3)
Solution:



Impulse = change in linear momentum
$= mv\cos\frac{\theta}{2} - \left(-mv\cos\frac{\theta}{2}\right)$
$= 2mv\cos\frac{\theta}{2} = 2 \times 2 \times 30\cos 30^\circ$
$= 120 \times \frac{\sqrt{3}}{2} = 60\sqrt{3}\,\text{kgms}^{-1}$

(44) Answer : (2)
Solution:
$u\cos\theta = v\cos\phi$
$v = u\cos\theta \,.\, \sec\phi$

(45) Answer : (1)
Solution:
$R = \frac{u^2 \sin 2\theta}{g} = \frac{2u_x u_y}{g} = \frac{2\times6\times8}{10}$ = 9.6 m

(46) Answer : (1)
Solution:
$\frac{1}{2} \times 1 \times (30)^2 = 450$
I = 1 kg m^2

(47) Answer : (2)
Solution:
$h = ut - \frac{1}{2}gt^2$
h = 15 m
u = 20 m/s
g = 10 m/s
$15 = 20t - 5t^2$
$\Rightarrow t^2 - 4t + 3 = 0$
$\Rightarrow t$ = 1 s and 3 s
So, $\Delta t_{\text{above 15 m}}$ = (3 – 1) = 2 s

(48) Answer : (3)

(49) Answer : (3)
Solution:
$R = u\sqrt{\frac{2H}{g}}$
$= 10\sqrt{\frac{2\times20}{10}}$ = 10 × 2 = 20 m

(50) Answer : (2)
Solution:
$V_{Person}^2 + V_{rain}^2 = V_{relative}^2$

CHEMISTRY

SECTION-A

(51) Answer : (4)
Solution:
Pure substance have a fixed composition. Example: Carbon dioxide

(52) Answer : (2)
Solution:
Prefix used for 10^{-15} is femto.

(53) Answer : (3)
Solution:
Scientific notation is in the form of $N \times 10^n$ where N can vary between 1 to 10.

(54) Answer : (2)
Solution:

$M_{avg} = \frac{100 \times 80 + 102 \times 20}{100} = 100.4\ u$

(55) Answer : (4)
Solution:

Mole = $\frac{\text{Mass of gas}}{\text{Molar mass of gas}}$

Molar ratio of He and CH_4 $= \frac{1}{4} : \frac{8}{16} = 1 : 2$

(56) Answer : (2)
Solution:
8 g Sulphur correspond to 100 g of molecules
1 g Sulphur correspond to $\frac{100}{8}$g of molecules
32 g Sulpur correspond to 400 g
∴ Minimum molecular mass = 400

(57) Answer : (2)
Solution:

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$
Mole of $CO_2 = \frac{2.2}{44} = 0.05$
Mole of $CaCO_3 = 0.05$
Mass of $CaCO_3$ = 0.05 × 100 = 5 g
Percentage purity $= \frac{5}{6.5} \times 100 = 76.9\%$

(58) Answer : (4)
Solution:
1 mole of $Al_2(SO_4)_3$ contains 3 moles of sulphur atoms and 12 moles of oxygen atoms.
In $Al_2(SO_4)_3$
3 moles of sulphur atoms = 12 moles of oxygen atoms.
2 moles of sulphur atoms = $\frac{12}{3} \times 2 = 8$ moles of oxygen atoms.

(59) Answer : (2)
Solution:
Formula in which atoms present are in simplest ratio is known as empirical formula.

Elements	% mass	Atomic mass	Moles atoms	Simple ratio
A	75	60 u	$\frac{75}{60} = \frac{5}{4}$	1
B	25	20 u	$\frac{25}{20} = \frac{5}{4}$	1

Empirical formula = AB.

(60) Answer : (4)
Solution:
Subatomic particles are electron, proton and neutron.

(61) Answer : (3)
Solution:
Characteristics of cathode rays do not depend upon the nature of the gas present in cathode ray tube.

(62) Answer : (4)
Solution:
Na^+, F^-, Ne and Al^{3+} all contains 10 electrons each therefore are isoelectronic.

(63) Answer : (4)
Solution:
$E = h\frac{c}{\lambda}$
$= \frac{6.625\times10^{-34}\times3\times10^{8}}{100\times10^{-9}}$
$= 6.625 \times 10^{-34} \times 3 \times 10^{15}$
$= 19.875 \times 10^{-19}$
$= 1.99 \times 10^{-18}$ J

(64) Answer : (3)
Solution:
Orbital angular momentum $= \sqrt{l(l+1)}\frac{h}{2\pi}$
$= \sqrt{l(l+1)}\,\hbar$
where $\hbar = \frac{h}{2\pi}$
for *p* orbital l = 1

(65) Answer : (4)
Solution:
$(r_2)_{He^+} = 0.529 \times \left(\frac{2^2}{2}\right)$ Å
= 1.058 Å

(66) Answer : (2)
Solution:
$\lambda = \frac{h}{mv}$
$\lambda = \frac{6.625\times10^{-34}}{0.5\times10^{-3}\times200}$
$\lambda = 6.625 \times 10^{-33}$ m

(67) Answer : (2)
Solution:
Work function of group I metals decreases down the group hence Na will have lesser work function than Li.

(68) Answer : (3)
Solution:
l varies from 0 to (n – 1)

(69) Answer : (2)
Solution:
Since Al_2O_3 being amphoteric in nature, will react with both acid and base easily.

(70) Answer : (4)
Solution:
$E(z = 31)$: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^1$
4^{th} period; 13 group
Gallium has atomic number 31.

(71) Answer : (3)
Solution:

Atomic No.	IUPAC official name
106	Seaborgium

(72) Answer : (1)
Solution:
The element K is present below Na in periodic table.

(73) Answer : (1)
Solution:

Li $\rightarrow$[He]$2s^1$ $\rightarrow s$ block element
S $\rightarrow$[Ne]$3s^2\ 3p^4$ $\rightarrow p$ block element
Mn $\rightarrow$[Ar]$4s^2\ 3d^5$ $\rightarrow d$ block element
Gd $\rightarrow$[Xe]$4f^7 5d^1 6s^2$ $\rightarrow f$ block element

(74) Answer : (2)
Solution:
Radii decreases as $O^{2-} > F^- > Na^+ > Mg^{2+}$

(75) Answer : (2)
Solution:
Be' and N' have comparatively more stable electronic configuration than B' and O'.
$\therefore$ Correct order of first ionisation enthalpy is:
Li < B < Be < C < O < N < F < Ne

(76) Answer : (1)
Solution:
The formula of compound is AB_3

(77) Answer : (4)
Solution:
Peroxide ion O_2^{2-} is diamagnetic in nature.

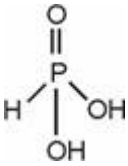
(78) Answer : (3)
Solution:
In SF_6, 12 electrons are present around sulphur

(79) Answer : (1)
Solution:
LiCl has highest lattice enthalpy.

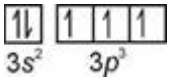
(80) Answer : (3)
Solution:
Energy of resonance hybrid of a molecule is lower than that of any of the canonical structures.

(81) Answer : (1)
Solution:
In H_2O two bond pairs and two lone pairs are present. Hence it is bent shape molecule.

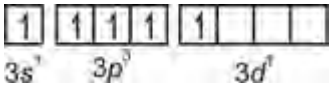
(82) Answer : (2)
Solution:
In H_3PO_3, P has five bonds.



P(15) : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$
Ground state :



Excited state :



H_3PO_3 forms 4σ bond and one π bond with oxygen. p-orbital of oxygen atom and d-orbital of P are involved in π bond.

(83) Answer : (2)
Solution:

Molecules	Hybridization
BCl_3	sp^2
$SiCl_4$	sp^3

SF_4	sp^3d
BrF_5	sp^3d^2

(84) Answer : (3)
Solution:
In HCl molecule H-bonding is absent.

(85) Answer : (2)
Solution:

Element	$\Delta_{eg}H$ (kJ/mol)
F	–328
Cl	–349
Br	–325
I	–295

SECTION-B

(86) Answer : (1)
Solution:

$n_{AgNO_3} = \frac{17}{170} = 0.1 \text{ mol}$

$n_{NaCl} = \frac{5.85}{58.5} = 0.1 \text{ mol}$

$AgNO_3 + NaCl \rightarrow \underset{(ppt)}{AgCl\downarrow} + NaNO_3$

∴ Mass of AgCl formed = 0.1 × 143.5
= 14.35 g

(87) Answer : (2)
Solution:

$M = \frac{\frac{160}{40}}{\frac{500}{1000}} = \frac{160}{40} \times \frac{1000}{500} = 8$

(88) Answer : (1)
Solution:

$$\underset{\frac{5.6}{28}}{N_2(g)} + \underset{\frac{2}{2}}{3H_2(g)} \longrightarrow 2NH_3(g)$$

$\frac{1}{5}$ mol 1 mol

∵ N_2 is the limiting reagent.
Also, 28 g of N_2 produce 34 g of NH_3
∴ 5.6 g of N_2 will produce $\frac{34}{28}$ × 5.6 g of NH_3
= 6.8 g of NH_3

(89) Answer : (1)
Solution:
Number of mole in 5.6 L CH_4, at NTP $= \frac{5.6}{22.4}$
Number of atoms in 5.6 L CH_4, at $\text{NTP} = \frac{5.6}{22.4} \times 5\ N_A$
= 1.25 N_A
= 7.52×10^{23}

(90) Answer : (4)
Solution:
Atoms having same mass number but different atomic number are known as isobars.

(91) Answer : (4)
Solution:
IR > Visible > UV

(92) Answer : (2)
Solution:
Mg : $1s^2\ 2s^2\ 2p^6\ 3s^2$
$\ell = 1,\ m = 0 \Rightarrow \text{p orbital} = 2 \text{ electron}$

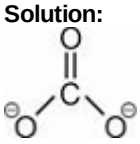
(93) Answer : (3)
Solution:
General electronic configuration of lanthanoid elements is $(n-2)f^{1-14}\ (n-1)d^{0-1}\ ns^2$

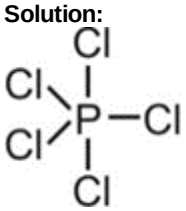
(94) Answer : (1)
Solution:

Bond	Covalent Bond length (in pm)
C – C	154
C – O	143
C – H	107
O – H	96

(95) Answer : (4)
Solution:
Beryllium and aluminium show diagonal relationship with each other

(96) Answer : (4)
Hint:
He and Ne are having positive electron gain enthalpy.
Solution:
Sulphur has most negative electron gain enthalpy among the given elements.

(97) Answer : (2)
Solution:

Bond order $=\frac{4}{3}=1.33$

(98) Answer : (3)
Solution:

Hybridisation of P = sp^3d

(99) Answer : (2)
Solution:
Only $\pi-$ bonds are present in C_2 molecule

(100) Answer : (1)
Solution:

Element	Electronegativity
Na	0.9
Mg	1.2
Al	1.5
Be	1.5

BOTANY

SECTION-A

(101) Answer : (3)
Solution:
Some organelles' functions are coordinated and they constitute an endomembrane system. Mitochondria are not included in endomembrane system.

(102) Answer : (2)
Solution:

Plasmid DNA is extra chromosomal DNA found in some prokaryotes. It is smaller than genomic DNA.

(103) Answer : (2)
Solution:
Reserve material in prokaryotic cells are stored in the cytoplasm in the form of inclusion bodies.

(104) Answer : (3)
Solution:
There are three categories of leucoplasts on the basis of the reserve food material
(a) Amyloplast – Stores starch
(b) Aleuroplast – Stores proteins
(c) Elaioplast – Stores oils and fats
Chromoplast is a type of plastid which has fat soluble carotenoid pigments.

(105) Answer : (1)
Solution:
Robert Brown first described nucleus as a cell organelle. Anton Von Leeuwenhoek first observed and described the live cell. Rudolf Virchow proposed *Omnis Cellula-e-Cellula*. Singer and Nicolson gave an improved model of cell membrane known as Fluid Mosaic Model.

(106) Answer : (2)
Solution:
Middle lamella of plants is composed of calcium pectate and magnesium pectate.

(107) Answer : (3)
Solution:
Cytoskeleton present in the cytoplasm is an elaborate network of filamentous structures made up of proteins.

(108) Answer : (4)
Solution:
The given diagram shows internal structure of cilia and flagella.
A represents-radial spoke, B represents-interdoublet bridge, C represents-plasma membrane, D represents-central sheath.

(109) Answer : (3)
Solution:
Golgi apparatus is present in close proximity with nucleus but does not have direct connection with nuclear membrane. Outer membrane of nucleus is often connected with ER.

(110) Answer : (3)
Solution:
Cytoskeleton maintains the shape of cell as well as helps to provide motility.

(111) Answer : (2)
Solution:
Cells in G_0 phase are metabolically active. However, cells in this stage do not proliferate unless called on to do so.

(112) Answer : (2)
Solution:
Synaptonemal complex formation takes place in zygotene.

(113) Answer : (4)
Solution:
Cytokinesis marks the end of the cell division.

(114) Answer : (3)
Solution:
Duration of cell cycle in yeast is generally 90 minutes.

(115) Answer : (1)
Solution:
G_1 = 20 pg, S = 40 pg, G_2 = 40 pg.
DNA in meiotic-I product = 20 pg
DNA in meiotic-II product = 10 pg

(116) Answer : (3)
Solution:
A bivalent (tetrad) is a pair of homologous chromosomes made up of 4 chromatids.

(117) Answer : (3)
Solution:
Two sequential cycles of nuclear and cytoplasm division but single cycle of DNA replication occur in meiosis.

(118) Answer : (2)
Solution:

By both mitosis and meiosis gamete formation can occur.

(119) Answer : (2)
Solution:
Prophase-I is more elaborate, complex than prophase of mitosis.
The correct sequence of stages of prophase-I is
Leptotene → zygotene → pachytene → diplotene → diakinesis

(120) Answer : (2)
Solution:
Growth and reproduction are mutually inclusive events in unicellular organisms.

(121) Answer : (2)
Solution:
Wheat belongs to order-Poales and class-Monocotyledonae.

(122) Answer : (3)
Solution:
Lower the taxa, more the characteristics within a taxon will share. Higher the category, fewer are the number of common characters.

(123) Answer : (4)
Solution:
ICBN has set of rules for nomenclature of plants.

(124) Answer : (2)
Solution:
Taxonomy is derived from two Greek words `*taxis*' and `*nomos*'.

(125) Answer : (2)
Solution:
About 1.7 – 1.8 million species are known and described.

(126) Answer : (2)
Solution:
Mycoplasma are facultative anaerobes *i.e.*, they can survive without oxygen.

(127) Answer : (2)
Solution:
Halophiles live in extreme saline environment.

(128) Answer : (3)
Solution:
Mode of nutrition is not the basis of classification of fungi, as all fungi are heterotrophs.

(129) Answer : (4)
Solution:
Nostoc is an autotroph.

(130) Answer : (1)
Solution:
Lichens are symbiotic association of a fungal partner (mycobiont) and an algal partner (phycobiont).

(131) Answer : (3)
Solution:
The three-domain system divides kingdom Monera into two domains, leaving the remaining eukaryotic kingdoms in the third domain.

(132) Answer : (4)
Solution:
Most of the chrysophytes are photosynthetic.

(133) Answer : (2)
Solution:
Viroids are smaller than viruses and lack protein coat.

(134) Answer : (2)
Solution:
Entamoeba is an amoeboid protozoan.

(135) Answer : (3)
Solution:
Members of Phycomycetes are found in aquatic habitats and on decaying wood in moist and damp places or as obligate parasites on plants. The mycelium is aseptate and coenocytic.

SECTION-B

(136) Answer : (3)
Solution:
Species is the lowest category and Kingdom is highest. The taxonomical hierarchy is as follows:
Species $\rightarrow$ Genus $\rightarrow$ Family $\rightarrow$ Order $\rightarrow$ Class $\rightarrow$ Phylum $\rightarrow$ Kingdom

(137) Answer : (4)
Solution:
Terminalisation of chiasmata takes place during diakinesis. In anaphase I, separation of homologous chromosomes takes place.

(138) Answer : (4)
Solution:
Phospholipids of plasma membrane are quasi-fluid in nature.

(139) Answer : (4)
Solution:
Cell wall determines the shape of the cell and provides structural support.

(140) Answer : (3)
Solution:
No virus contains both DNA and RNA.

(141) Answer : (2)
Solution:
M-Phase is the most dramatic period of the cell cycle

(142) Answer : (3)
Solution:
The main criteria for classification used by R. H. Whittaker include cell structure, body organisation, mode of nutrition, reproduction and phylogenetic relationship.

(143) Answer : (4)
Solution:
Sexual spores are absent in life cycle of fungi imperfecti.

(144) Answer : (2)
Solution:
Name of genus and species are printed in italics. Author's name is not printed in italics.

(145) Answer : (2)
Solution:
Fimbriae are the structures of bacteria which help them to attach to the rocks.

(146) Answer : (1)
Solution:
In diatoms, the cell wall is made up of two halves; one half covering the other (epitheca over hypotheca) resembling a 'soap box'.

(147) Answer : (2)
Solution:
Metabolism is a defining feature of life.

(148) Answer : (3)
Solution:
Chromatophores help in photosynthesis in bacteria.

(149) Answer : (4)
Solution:
Following are the sizes of :
A typical eukaryotic cell $\rightarrow$ 10-20 µm
Viruses $\rightarrow$ 0.02 - 0.2 µm
PPLO $\rightarrow$ about 0.1 µm
Typical bacteria – 1-2 µm

(150) Answer : (2)
Solution:
Genera – *Felis* and *Panthera* are placed under a common family - Felidae

ZOOLOGY

SECTION-A

(151) Answer : (2)
Solution:
Synaptic junction is inter neuronal junction.

(152) Answer : (3)
Solution:
Alveoli of lungs are lined by simple squamous epithelium.

(153) Answer : (4)
Solution:
Bone is hard due to the presence of calcium salts.
Bones have hard and non-pliable ground substance rich in calcium salts and collagen fibres. The intercellular material of cartilage is solid, pliable and resists compression.

(154) Answer : (3)
Solution:
Smooth muscle fibres.
Cell junctions hold these fibres together and gap junctions help them to contract as one unit.

(155) Answer : (2)
Solution:
Hint: They make up more than one half the volume of neural tissue.
Sol.: Neurons are excitable cells. Neuroglial cells protect and support neurons.
Dendrites carry the nerve impulse towards the cell body whereas axon carry the nerve impulse away from the cell body.

(156) Answer : (2)
Solution:
Bone to bone is joined by ligament.
Ligament is an example of dense regular connective tissue.

(157) Answer : (2)
Solution:
Ciliated epithelium are mainly present in the inner surface of hollow organs like bronchioles and fallopian tubes.

(158) Answer : (4)
Solution:
Proteins are considered as heteropolymers containing different amino acids. Insulin is a protein while starch, chitin and inulin are homopolymers of glucose, N-acetyl glucosamine and fructose respectively.

(159) Answer : (4)
Solution:
Adenylic acid is a nucleotide and adenosine is a nuceloside.
Adenylic acid can be converted to adenosine by removing the phosphate group.

(160) Answer : (2)
Hint:
Nitrogenous bases, nucleosides and nucleotides possess heterocyclic rings.
Solution:
Cysteine is a sulphur containing amino acid. Cytosine is a heterocyclic nitrogen-containing compound. Cytidine and uridine are nucleosides in which the nitrogenous base molecule *i.e.,* cytosine and uracil respectively are joined to the sugar molecule by glyosidic bond.

(161) Answer : (1)
Solution:
Hydrolases belongs to class III of enzymes.

(162) Answer : (2)
Solution:
Secondary structure of protein contains peptide bond and hydrogen bond.

(163) Answer : (2)
Solution:
Glycosidic bond is found in both sugars and DNA.

(164) Answer : (4)
Solution:
Enzyme-substrate complex passes through transition state to produce product and enzyme again becomes free.

(165) Answer : (4)
Solution:
R-Group in glycine is hydrogen.
R-Group in serine is hydroxyl methyl ($–CH_2OH$).

(166) Answer : (1)
Hint:
Part of oxygen carrying molecule in blood.
Solution:
Haem is the prosthetic group for peroxidase and catalase enzymes.
Zinc is co-factor for carboxypeptidase. Vitamin niacin is present in co-enzyme NAD and NADP.

(167) Answer : (1)
Solution:
Phospholipids are conjugated lipids. Phospholipids are found in cell membrane. Fibroin protein is found in natural silk. Chitin is homopolymer present in exoskeleton of arthropods.

(168) Answer : (2)
Solution:
Contraction of external inter-costal muscles lifts up the ribs and the sternum causing an increase in the volume of the thoracic chamber in the dorso-ventral axis.

(169) Answer : (2)
Hint:
FRC = ERV + RV
Solution:
IC = TV + IRV
TLC = RV + ERV + TV + IRV; TLC = IC + FRC
TLC = 5800 mL ≅ 6 L

(170) Answer : (1)
Solution:
CO_2 is carried by haemoglobin as carbamino-haemoglobin (about 20-25 percent).

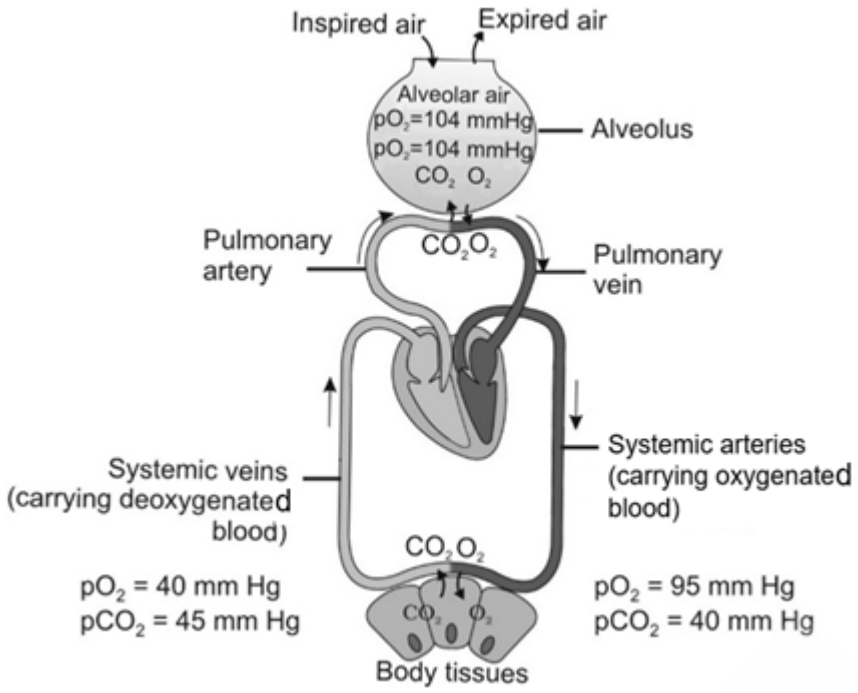
(171) Answer : (1)

(172) Answer : (3)
Solution:
Pleura is a double layer which covers both the lungs.

(173) Answer : (3)
Solution:
The volume of air that remains in lungs even after a forcible exhalation is called Residual volume (1100 mL to 1200 mL).

(174) Answer : (1)
Solution:
A specialised centre present in the medulla region of the brain called respiratory rhythm centre is primarily responsible for this regulation. Another centre present in the pons region of the brain called pneumotaxic centre can moderate the functions of the respiratory rhythm centre. Neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate.

(175) Answer : (4)
Solution:



(176) Answer : (2)

Solution:

O_2 crosses two cellular layers which are alveolar membrane and endothelial membrane and one non-cellular layer present is basement membrane.

(177) Answer : (2)

Solution:

The blood flows strictly by a fixed route through blood vessels—the arteries and veins. Basically, each artery and vein consists of three layers: an inner lining of squamous endothelium, the tunica intima, a middle layer of smooth muscle and elastic fibres, the tunica media, and an external layer of fibrous connective tissue with collagen fibres, the tunica externa.

(178) Answer : (4)

Solution:

The entire heart is made of cardiac muscles. The walls of ventricles are much thicker than that of the atria.

(179) Answer : (3)

Solution:

Blood is a fluid connective tissue composed of the fluid matrix called plasma and blood cells (formed elements).

(180) Answer : (3)

Solution:

Chordae tendineae connect AV valves to the wall of ventricles.

(181) Answer : (1)

Solution:

A person having only anti-B antibodies in his plasma, should have antigen A on his/her RBCs. Therefore, he/she can donate blood to people with blood groups A and AB.

(182) Answer : (3)

Solution:

QRS complex indicates ventricular depolarisation hence number of QRS complexes represents number of heartbeats.

(183) Answer : (2)

Solution:

Birds and mammals	– Complete double circulation
Fishes (Shark)	– Single circulation
Amphibians and reptiles	– Incomplete double circulation

(184) Answer : (2)

Solution:

Annelids and chordates have a closed circulatory system. Closed circulatory system is considered to be more advantageous as the flow of fluid can be more precisely regulated.

(185) Answer : (2)

Solution:

Atherosclerosis of coronary artery may leads to angina characterized by acute chest pain. Atherosclerosis may also results in heart attack.

SECTION-B

(186) Answer : (3)
Solution:
The epithelial tissue faces either a body fluid or the outside environment and thus provides a covering or lining for some parts of the body.

(187) Answer : (2)
Solution:
Adipose tissues are located beneath the skin and also around the heart, kidneys, eyeballs *etc*. where fat is stored.

(188) Answer : (2)
Solution:
Areolar and adipose tissues are the examples of loose connective tissue.

(189) Answer : (2)
Solution:
The enzyme releases the products of the reaction and the free enzyme is ready to bind to another molecule of the substrate and run through the catalytic cycle once again.

(190) Answer : (3)
Solution:
Cholesterol is a lipid that is absorbed into lymph capillaries. Lipids are found in acid-insoluble fraction.

(191) Answer : (2)
Solution:
Enzymes are denatured or degraded at high temperature.

(192) Answer : (3)
Solution:
Glycogen is a polymer of glucose units and its right end is reducing whereas left end is non-reducing.

(193) Answer : (1)
Solution:

High pO_2, low pCO_2, low temperature, less H^+ ion concentration and high pH are responsible for shifting the O_2–dissociation curve towards left.

(194) Answer : (1)
Solution:

Receptors associated with aortic arch and carotid artery recognize changes in CO_2 and H^+ concentration.

(195) Answer : (3)
Solution:
Lungs are present in an air tight-chamber known as thoracic cavity in humans.
Such an arrangement is essential for breathing, as we cannot directly alter the pulmonary volume.

(196) Answer : (1)
Solution:
During swallowing glottis can be covered by a thin elastic cartilaginous flap called epiglottis to prevent the entry of food into the larynx.
Trachea is a straight tube extending up to the mid-thoracic cavity, which divides at the level of 5th thoracic vertebra into a right and left primary bronchi.
Each terminal bronchiole gives rise to a number of very thin, irregular-walled and vascularised bag-like structures called alveoli.
We have two lungs which are covered by a double layered pleura, with pleural fluid between them. It reduces friction on the lung-surface. The outer pleural membrane is in close contact with the thoracic lining whereas the inner pleural membrane is in contact with the lung surface.

(197) Answer : (2)
Solution:
In total, blood flows 72 times per minute both in pulmonary and systemic circulation in a normal resting human.

(198) Answer : (2)
Solution:
Neural signals through the sympathetic nerve fibres (part of ANS) can increase the rate of heart beat, the strength of ventricular contraction and thereby the cardiac output. On the other hand, parasympathetic neural signals (another component of ANS) decrease the rate of heart beat, speed of conduction of action potential and thereby the cardiac output.

(199) Answer : (2)
Solution:

Identify the most abundant WBCs.
Neutrophils and monocytes are phagocytic cells which destroy foreign organisms entering the body.

(200) Answer : (4)

Solution:

As the blood passes through the capillaries in tissues, some water along with many small water soluble substances move out into the spaces between the cells of tissues leaving the larger proteins and most of the formed elements in the blood vessels. This fluid released out is called the interstitial fluid or tissue fluid or lymph.