08/04/2026

Code-B Phase-1

Aakash
Medical | IIT-JEE | Foundations

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

MM : 720 Final Test Series(P1)_NEET2026_Test-07B **Time : 180 Min.**

PHYSICS

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CHEMISTRY

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ZOOLOGY

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179. (3)

157. (3)

158. (4)

180. (1)

Hints and Solutions

PHYSICS

(1) **Answer :** (2)
Solution:
Current and voltages are in phase.

(2) **Answer :** (3)
Solution:
A transformer operates on the principle of mutual inductance. It consists of two coils, the primary and the secondary, which are magnetically linked. When an alternating current flows through the primary coil, it creates a changing magnetic field, which induces an electromotive force (EMF) in the secondary coil due to mutual inductance.

(3) **Answer :** (3)
Solution:
The formula for the rms value of a sinusoidal current is:
$I_{rms} = \frac{I_0}{\sqrt{2}}$
where I_0 is the peak current. Here, I_0 = 100 A. Substituting the value of I_0:
$I_{rms} = \frac{100}{\sqrt{2}} = 50\sqrt{2}\ A$

(4) **Answer :** (2)
Solution:
$P = \frac{20}{\sqrt{2}} \times \frac{10}{\sqrt{2}} \times \cos\left(\frac{\pi}{3}\right)$ = 50 W

(5) **Answer :** (2)
Solution:
$X_C = \frac{1}{\omega C} = \frac{1}{2\pi fC}$
$X_C \propto \frac{1}{f}$

(6) **Answer :** (4)
Solution:
Given that,
Area $A = \frac{A}{2}$
Separation between the plates = *d*
Constant current = *i*
Now, the electric field between plates of the capacitor
$E = \frac{q}{\varepsilon_0 A}$
Now, the flux through the area
$\phi E = \frac{q}{\varepsilon_0 A} \times \frac{A}{2}$
$\phi E = \frac{q}{2\varepsilon_0}$
Now, the displacement current is
$I_d = \varepsilon_0 \times \frac{d\phi_E}{dt}$
$I_d = \varepsilon_0 \times \frac{d\left(\frac{q}{2\varepsilon_0}\right)}{dt}$
$I_d = \frac{1}{2}\left(\frac{dq}{dt}\right)$
$I_d = \frac{i}{2}$
Hence, the displacement current is $\frac{i}{2}$

(7) **Answer :** (1)
Solution:
$\frac{E_0}{B_0} = c$

$B_0 = \frac{E_0}{c} = \frac{10^3}{3\times10^8}$

= 0.33 × 10^{-5} T

$\overrightarrow{B_0} = 0.33 \times 10^{-5}\hat{k}$ T

(8) **Answer :** (1)
Solution:
Conduction current = displacement current
1 A = displacement current

(9) **Answer :** (2)
Solution:
The correct order of decreasing frequency:
x-rays > UV > Infrared > Microwaves

(10) **Answer :** (4)
Hint:
Properties of γ-rays.
Solution:
γ-rays are produced in nuclear reactions.
γ-rays have wavelength from about 10^{-10} m to 10^{-14} m

(11) **Answer :** (3)
Solution:
$P = \frac{2I}{c}$ [Perfect reflection]
$= \frac{2\times E}{Atc}$
$\therefore\ P = \frac{2E}{Atc}$

(12) **Answer :** (1)
Hint:
$I = \frac{P}{4\pi r^2}, \quad I = \frac{1}{2}\frac{{B_0}^2}{\mu_0}c$
Solution:
$P = \frac{20}{100}\times 100$
P = 20 W
$\frac{P}{4\pi r^2} = \frac{1}{2}\frac{{B_0}^2}{\mu_0}c$
$\frac{20}{4\pi(1)^2} = \frac{1}{2}\frac{{B_0}^2}{4\pi\times10^{-7}}\times 3\times10^8$
$\boxed{B_0 = \sqrt{\frac{4}{3}}\times10^{-7}T}$

(13) **Answer :** (4)
Hint:
$P = P_1 + P_2$
Solution:
$\frac{1}{f} = P_1 + P_2$
$f = \frac{1}{P_1+P_2}$

(14) **Answer :** (4)
Hint:
$d_{app} = \frac{d_{real}}{\mu}$
Solution:
Sol. : Apparent depth = $20 + \frac{20}{5/3}$
= 32 cm

(15) **Answer :** (1)
Solution:
For formation of real image through convex lens, $d \geq 4f$
d = 40 cm

(16) **Answer :** (1)
Solution:
$\because \frac{360}{\theta} = \frac{360}{60} = 6$ (even)
$\therefore$ No. of images formed = 6 – 1 = 5

(17) **Answer :** (1)
Solution:
Due to different refractive indices, the deviation of each ray is different and thus dispersion occurs.

(18) **Answer :** (1)
Solution:
For constructive interference on the screen path difference $\Delta x = n\lambda$
$\therefore \Delta x = 2\lambda$ corresponds for constructive interference

(19) **Answer :** (1)
Solution:
$\sin\theta = \frac{2\lambda}{a}$
$\Rightarrow a = \frac{2\lambda}{\sin\theta}$
$= 2 \times \sqrt{2} \times 5500 \times 10^{-10}$
$= 1.6 \times 10^{-6}$ m

(20) **Answer :** (1)
Solution:
The distance of third bright fringe from centre
$y = \frac{3\lambda D}{d}$
$y = \frac{3\times5\times10^{-7}\times2}{1\times10^{-3}}$
= 3 mm

(21) **Answer :** (3)
Solution:
$A_1 : A_2 = 3 : 5$ then $I_1 : I_2 = 9 : 25$
$\frac{I_{max}}{I_{min}} = \frac{(\sqrt{I_1}+\sqrt{I_2})^2}{(\sqrt{I_1}-\sqrt{I_2})^2} = \left(\frac{3+5}{3-5}\right)^2$
$= \frac{16}{1}$

(22) **Answer :** (4)
Solution:
$\beta' = \frac{\lambda D}{\mu d} = \frac{\beta}{\mu}$
$= \frac{8}{\left(\frac{4}{3}\right)} = 6$ mm

(23) **Answer :** (3)
Hint:
For relaxed eye (Image at infinity)
$m = \frac{v_0}{u_0}\left(\frac{D}{f_e}\right)$ and $L = v_0 + f_e$
Solution:
$\frac{1}{v_0} - \frac{1}{u_0} = \frac{1}{f_0}$
$\frac{1}{v_0} + \frac{1}{2.4} = \frac{1}{2}$
$\frac{1}{v_0} = \frac{1}{2} - \frac{1}{2.4} = \frac{6-5}{12}$
$v_0 = 12$ cm
$m = \frac{v_0}{u_0}\left(\frac{D}{f_e}\right) = -\frac{12}{2.4}\left(\frac{25}{5}\right) = -25$
$L = v_0 + f_e = 12 + 5 = 17$ cm

(24) **Answer :** (2)
Solution:
For dc, $H_1 = I^2Rt = (2)^2(2)t = 8t$

For ac, $i_{ims} = \frac{i_0}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}\,\text{A}$

$H_2 = i^2_{\text{rms}} Rt = \left(\sqrt{2}\right)^2 \left(1\right) t = 2t$

$\frac{H_1}{H_2} = \frac{8t}{2t} = 4$

(25) **Answer : (1)**
Solution:
$B = B_0 \sin(Kx + \omega t)$
$\lambda = \frac{2\pi}{K} = \frac{2\pi}{\pi \times 10^3} = 2mm$
$f = \frac{\omega}{2\pi} = \frac{2\pi \times 10^{11}}{2\pi} = 10^{11} Hz$
$E_0 = B_0 C$
$= 60 N/C$
Direction of $E = Z$-direction
$E_z = \left(60 N/C\right) \sin\left(\pi \times 10^3 x + 2\pi \times 10^{11} t\right)$

(26) **Answer :** (1)
Solution:
Microwave oven heats up a food item containing water molecules more efficiently because frequency of microwave match the frequency of water molecules.

(27) **Answer :** (4)
Solution:
f_L = 15
$\frac{1}{f_{\text{eff}}} = \left|\frac{2}{f_L}\right| + \frac{1}{f_m}$
$f_{\text{eff}} = -\frac{15}{2}$
For spherical mirror.
$\frac{1}{V} = \frac{-2}{15} + \frac{1}{20} = \frac{-40+15}{15 \times 20}$
$\frac{1}{V} = \frac{-25}{15 \times 20} = \frac{-1}{12}$
V = – 12 cm

(28) **Answer :** (1)
Solution:
$\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$ (refraction will take place at curved surface)
$\frac{1}{\frac{25}{8}} - \frac{(4/3)}{(-4)} = \frac{1 - 4/3}{(-R)}$
R = 25 cm

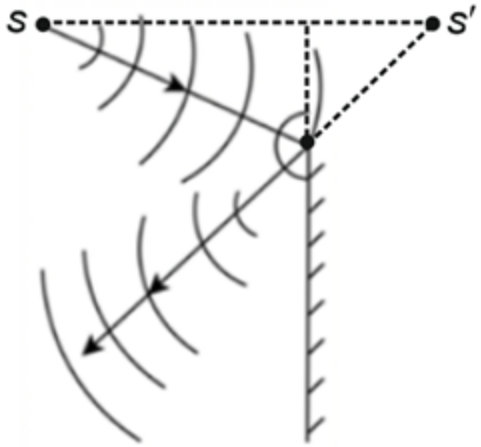
(29) **Answer :** (1)
Solution:
$d\sin\theta = n\lambda$ ...(1)
for small θ : $\sin\theta = \theta = \frac{y}{D}$ ...(2)
$d\left(\frac{y}{D}\right) = n\lambda$
i.e. $y = \frac{D}{d}\left(n\lambda\right)$
$y_3 - y_1 = \frac{D}{d}\left(3\lambda - \lambda\right)$
$= \frac{D}{d}\left(2\lambda\right)$
$d = \frac{0.50 \times \left(2 \times 6^{-7}\right)}{3 \times 10^{-3}}$
= 0.2 mm

(30) **Answer :** (4)
Solution:
Polaroids reduces the intensity due to polarisation of light.

(31) **Answer :** (1)
Solution:

For concave mirror
$u = -15\,\text{cm}$
$f = -10\,\text{cm}$
$v = -30\,\text{cm}$
For convex mirror the image I_1 will act as an object and so for u = – 10 cm and $f = 15\,\text{cm}$
v = + 6cm

(32) Answer : (3)
Solution:



When spherical wavefronts strike a plane mirror, they reflect as spherical wavefronts that appear to originate from a virtual source behind mirror with same curvature but opposite sign as according to Huygen's principle Ray of light is $\perp$to wavefront.

(33) Answer : (3)
Solution:
$I = I_0 \cos^2\theta$
$\left(\cos^2\theta\right)_{av}$ from 0to $2\pi = \frac{1}{2}$
$I = \frac{I_0}{2}$
If two polaroids have their transmission axes parallel to each other $\theta' = 0^\circ$
$I_2 = I_1 \cos^2\theta' = I_1$
If two polaroids are crossed
$I_2 = I_1 \cos^2 90^\circ = 0$

(34) Answer : (2)
Solution:
When capacitance is removed, the circuit is LR
$\tan\phi = \frac{X_L}{R}$
$X_L = 100\sqrt{3}\Omega$
and when inductance is removed, the circuit is RC
$\tan\phi = \frac{X_C}{R}$
$X_C = 100\sqrt{3}\Omega$
$X_L = X_C$
$Z = R$
$I_{rms} = \frac{V_{rms}}{Z} = 2A$

(35) Answer : (4)
Solution:
When sources are coherent, intensity at mid-point is $I_{\max} = 4a^2$
When sources are incoherent, no interference occurs. Intensity at mid-point is $I = I_1 + I_2$
$= a_1^2 + a_2^2 = 2a^2$
$\frac{I_{\max}}{I} = \frac{2}{1}$

(36) Answer : (3)
Solution:
An alternating current changes its direction at regular interval of time i.e. periodically.

(37) Answer : (2)
Solution:

For R-L circuit $Z = \sqrt{R^2 + x_L^2}$ as $f \uparrow, Z \uparrow$

For R-C circuit $Z = \sqrt{R^2 + (x_c)^2}$ as $f \uparrow, Z \downarrow$

For L-C circuit $Z = |x_L - x_c|$ as $f \uparrow, Z$ first $\downarrow$ then $\uparrow$.

(38) Answer : (3)
Solution:

$V = \sqrt{V_R^2 + V_L^2}$

$V_L = 80V$

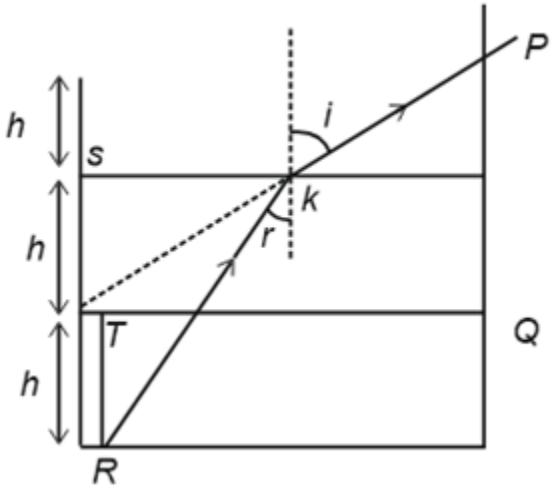
$IX_L = 80$

$80 = \left[\frac{100}{\sqrt{(360)^2 + X_L^2}}\right] X_L$

$X_L = 480\Omega$

$L = \frac{4}{\pi}$ Henry

(39) Answer : (4)
Solution:



$PQ = QR = 2h$
$\angle i = 45^\circ$
$ST = RT = h$
$KR = \sqrt{h^2 + 4h^2} = h\sqrt{5}$
$\sin r = \frac{h}{h\sqrt{5}} = \frac{1}{\sqrt{5}}$
$\mu = \frac{\sin i}{\sin r} = \sqrt{\frac{5}{2}}$

(40) Answer : (1)
Hint:

$y'_n = \frac{(2n-1)}{2} \frac{\lambda D}{d}$ & $\beta = \frac{\lambda D}{d}$
Solution:

For 5th minima.

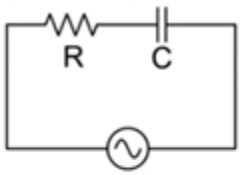
$y = \frac{9}{2} \frac{\lambda D}{d}$

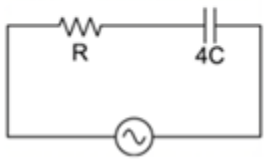
$\Rightarrow \frac{\lambda D}{d} = \frac{2y}{9}$

Now, $\beta = \frac{\lambda D}{d} = \frac{2 \times 3.6}{9} = 0.8$ mm

(41) Answer : (2)
Solution:

$Z = \sqrt{R^2 + \frac{1}{(\omega C)^2}}$





$I_{R_i} = \frac{V}{Z}$
$I_{R_2} = \frac{V}{Z^1}$
$I_{R_1} < I_{R_2}$

(42) Answer : (3)
Solution:
$L = \frac{10}{\pi}\,\mathrm{mH}$
$f = 50\,\mathrm{Hz}$
$Z = \omega L = 2\pi \times 50 \times \frac{10}{\pi} \times 10^{-3}$
= 1 Ω
$I_{\text{r.m.s}} = \frac{V_{r.m.s}}{z}$
= 50 A
$I_0 = 50\sqrt{2}$

(43) Answer : (3)
Solution:
Capacitor and resistor are under series combination so $I_C = I_R$ ∴they will be having no phase difference.

(44) Answer : (4)
Solution:
Total Energy Density
$U = \frac{1}{2}\epsilon_0 E^2 + \frac{1}{2}\frac{B^2}{\mu_0}$

(45) Answer : (1)
Solution:
Larger the diameter, larger is the resolving power.

CHEMISTRY

(46) Answer : (3)
Solution:
HCl + NaOH → NaCl + H_2O + x cal
where x cal is the heat released due to neutralisation of 1 g equivalent of acid by 1 g equivalent base.
In the 2nd reaction,
H_2SO_4 + 2NaOH → Na_2SO_4 + 2H_2O + y cal
Now, 2 g equivalents of strong acid reacts with 2 g equivalent of strong base, thus releasing double of energy released in the 1st reaction.
∴ y = 2x

(47) Answer : (2)
Solution:

The crystalline solid state is the state of lowest entropy.

(48) **Answer :** (4)
Hint:
At equilibrium, entropy of a system is maximum.
Solution:
At equilibrium, free energy of a system is minimum.

(49) **Answer :** (2)
Hint:
The process is adiabatic, hence, q = 0
Solution:
Process is irreversible
$W = -P_{ext}(V_{final} - V_{initial})$
$W = -3.2(4.3 - 1.3)$
$W = -9.6$ L atm
$W = -9.6 \times 101.3 = -972.5$ J
From first law, $\Delta U = q + W$
q = 0 for adiabatic process
$\Delta U = -972.5$ J

(50) **Answer :** (1)
Hint:
Expansion of a gas in vacuum ($P_{ex} = 0$) is called free expansion.
Solution:
$\Delta U = q + w$
In free expansion, w = 0
And for isothermal process $\Delta T = 0$
$\Delta U = nC_V\Delta T = 0$
So q = 0

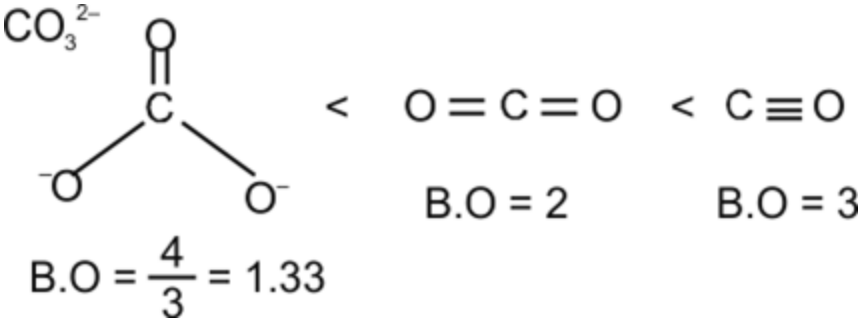
(51) **Answer :** (1)
Solution:
Bomb calorimeter is used to determine change in internal energy.

(52) **Answer :** (1)
Solution:
$\Delta U = q + w$
For adiabatic process; q = 0
$\Delta U = w$
For expansion ω is negative

(53) **Answer :** (2)
Hint:
$\Delta S = nR\ln\frac{V_2}{V_1}$
Solution:
$\Delta S = 5 \times 2 \times 2.303 \log\frac{V_2}{V_1} = 5 \times 2 \times 2.303 \log\frac{40}{5}$
$= 5 \times 2 \times 2.303 \log 8 = 5 \times 2 \times 2.303 \times 3 \log 2$
$= 5 \times 2 \times 2.303 \times 3 \times 0.301 = 20.8$ cal K^{-1}

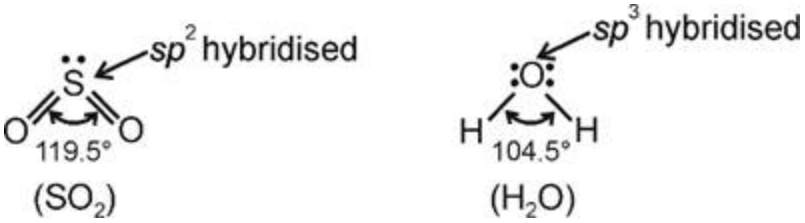
(54) **Answer :** (2)
Solution:
Bond order $O_2^+ = 2.5$, $O_2 = 2$, $O_2^- = 1.5$, $O_2^{2-} = 1$ and bond length $\propto \frac{1}{\text{bond order}}$

(55) **Answer :** (2)
Solution:

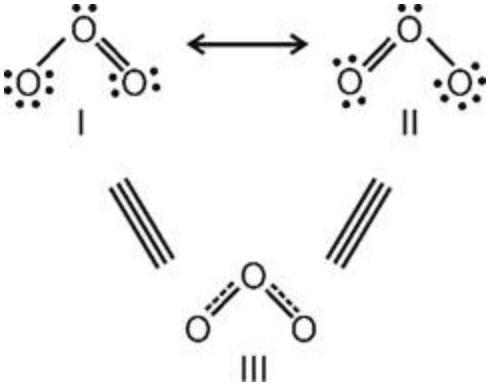


(56) Answer : (4)

Hint:



Solution:



• Ozone has two canonical forms only

• **Bond type** **Bond length**

C ≡ C 120 pm

N ≡ N 109 pm

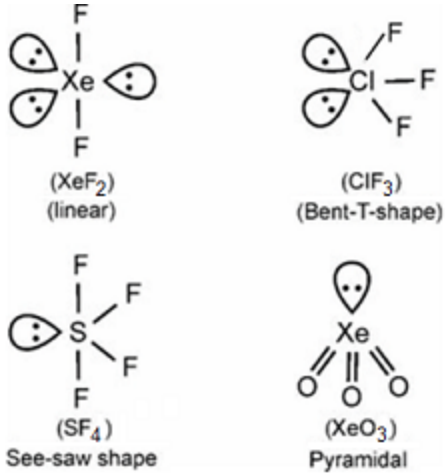
• $H_2O(g) \rightarrow H(g) + OH(g)$; $\Delta_a H_1^{\ominus} = 502$ kJ mol^{-1}

• $OH(g) \rightarrow H(g) + O(g)$; $\Delta_a H_2^{\ominus} = 427$ kJ mol^{-1}

In case of H_2O molecule, the enthalpy needed to break the two O–H bonds is not the same.

(57) Answer : (2)

Solution:

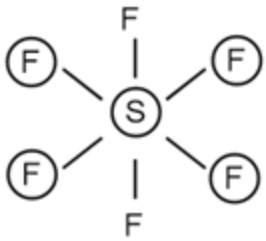


(58) **Answer :** (3)
Solution:

BF_3	120°
XeF_4	180° and 90°
PCl_5	120°, 90°, 180°
CO_2	180°

(59) **Answer :** (3)
Solution:
I and III represents zero overlap
II represents negative overlap

(60) **Answer :** (4)
Solution:



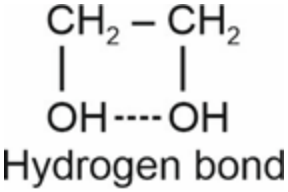
Encircled atoms are in same plane

(61) **Answer :** (1)
Solution:

% of ionic character = $\frac{\mu_{obs}}{\mu_{cal}} \times 100$; $\mu_{cal} = e \times d$

$\Rightarrow$ Ionic character $= \frac{1.2\times3.33\times10^{-30}}{1.2\times10^{-10}\times1.6\times10^{-19}} \times 100 = 20.8\%$

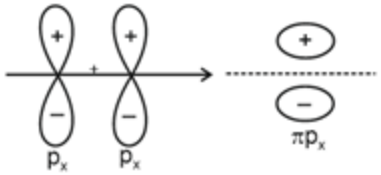
(62) **Answer :** (2)
Solution:



Hydrogen bond

(63) **Answer :** (2)
Solution:
A → B, $\Delta H_1 = x_1$ ... (1)
2B → C, $\Delta H_2 = x_2$ ... (2)
C → D, $\Delta H_3 = x_3$ ... (3)
Multiply equation (1) by 2 and then add equation (1), (2) and (3)
Hence, $\Delta H = 2x_1 + x_2 + x_3$

(64) **Answer :** (4)
Solution:



(65) **Answer :** (4)
Hint:

The hybridisation of N is sp^2 in $N(SiH_3)_3$

Solution:
In $N(SiH_3)_3$, nitrogen donates its lone pair to vacant 3*d* orbital of Si.

(66) **Answer :** (4)
Hint:
$\Delta H = \Delta U + \Delta n_g RT$
Δn_g = The number of moles of gaseous products minus the number of moles of gaseous reactants.
Solution:
$CO_2(g) + H_2(g) \rightarrow CO(g) + H_2O(l)$
$\Delta n_g = 1 - 2 = -1$
$\Delta H = \Delta U - RT$
$N_2(g) + 3H_2(g) \rightarrow 2NH_3(g)$
$\Delta n_g = 2 - 4 = -2$
$H_2(g) + I_2(g) \rightarrow 2HI(g)$
$\Delta n_g = 2 - 2 = 0$
$\Delta H = \Delta U$
$CCl_4(g) + 2H_2O(g) \rightarrow CO_2(g) + 4HCl(g)$
$\Delta n_g = 5 - 3 = 2$
$\Delta H = \Delta U + 2RT$

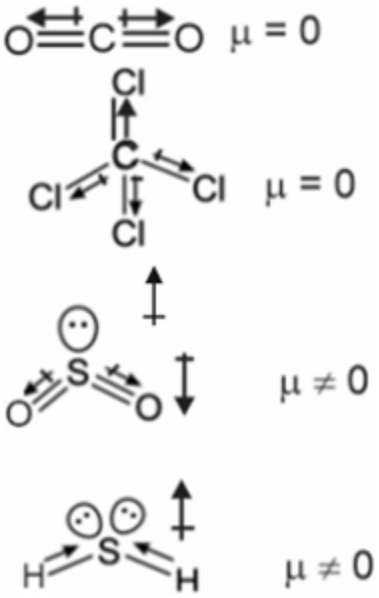
(67) **Answer :** (4)
Solution:
Molecular orbitals obtained form 2px and 2py orbitals are unsymmetrical around the bond axis.

(68) **Answer :** (3)
Solution:
$\Delta G^\circ = -2.303\ RT \log K$
$-2.303 = -2.303\ RT \log K$
$\frac{1}{RT} = \log K$
$K = 10^{1/RT}$

(69) **Answer :** (1)
Hint:
Born Haber cycle is based on Hess's law.
Solution:
$Na(s) + \frac{1}{2}Cl_2(g) \rightarrow NaCl(s)$
$\Delta_f H°NaCl = \Delta_{sub} H°(Na) + \Delta_i H°(Na)$
$+\frac{1}{2}\Delta_{bond}H^\circ(Cl_2) + \Delta_{eg}H^\circ(Cl) - \Delta_{lattice}H^\circ(NaCl)$
$\Delta_{lattice}H^\circ(NaCl(s)) = 788\ kJ\ mol^{-1}$

(70) **Answer :** (1)
Solution:
For F_2 molecule: $\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \sigma 2p_z^2, \pi 2p_x^2 = \pi 2p_y^2$
$\pi^* 2p_x^2 = \pi^* 2p_y^2$
Diamagnetic species
$B_2 : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma^* 2s^2, \pi 2p_x^1 = \pi 2p_y^1$
Paramagnetic species
$Li_2 : \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2$
$B.O. = \frac{1}{2}(4-2) = 1$

(71) **Answer :** (2)
Solution:



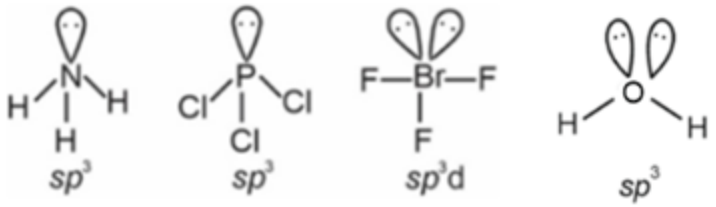
(72) **Answer :** (2)
Solution:
$\mathrm{Q} = \mathrm{nC_p} \triangle \mathrm{T}$

$= 5 \times 20 \times (373 - 273)$

$= 5 \times 20 \times 100 = 10,000\ \mathrm{J}$

$= 10\ \mathrm{kJ}$

(73) **Answer :** (1)
Solution:



On Br atom of BrF_3, there are two lone pairs of electrons.

(74) **Answer :** (2)
Solution:
$\triangle \mathrm{H}^\circ = \triangle \mathrm{U}^\circ + \triangle \mathrm{n}_g \mathrm{RT} = -5 + 0(\mathrm{RT}) = -5\mathrm{kJ}$
$\Delta \mathrm{G}^\circ = \Delta \mathrm{H} - T\,\Delta\,\mathrm{S}$
$= -5000 - (298 \times (-5))$
$= -5000 + 1490$
$= -3510\ \mathrm{J} = -3.51\ \mathrm{kJ}$

(75) **Answer :** (4)
Solution:
(i) $C(s) + O_2(g) \rightarrow CO_2(g)$ $\Delta_f H° = -400\ kJ\ mol^{-1}$

(ii) $H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ $\Delta_f H° = -300\ kJ\ mol^{-1}$

(iii) $6C(s) + 6H_2(g) + 3O_2(g) \rightarrow C_6H_{12}O_6(s)$ $\Delta_f H° = -1300\ kJ\ mol^{-1}$

$\Rightarrow \mathrm{C_6H_{12}O_6(s)} + 6\mathrm{O_2} \rightarrow 6\,\mathrm{CO_2(g)} + 6\mathrm{H_2O(l)}$

$\therefore\ \Delta_r \mathrm{H} = 6\mathrm{x}(-400) + 6(-300) - (-1300) = -2900\ \mathrm{kJmol^{-1}}$

(76) **Answer :** (4)
Solution:
Soln: Negative value of ΔH is one of the criteria of spontaneity but all endothermic reactions are not non-spontaneous.
eg. $\frac{1}{2}N_2(g) + O_2(g) \rightarrow NO_2(g)$
$\Delta_r H = +33.2\ kJ\ \Delta\ mol^{-1}$
It is a spontaneous reaction.

(77) **Answer :** (2)
Solution:
$\Delta U = nC_V\Delta T$
$300 = C_V \times 5 \times 2$
$C_V = 30\ JK^{-1}\ mol^{-1}$

(78) **Answer :** (3)
Solution:
$\Delta H = \sum BE_{reactant} - \sum BE_{Product}$

$= \left(\frac{1}{2} \times BE_{A-A} + \frac{1}{2}BE_{B-B}\right) - BE_{A-B}$

$-200 = \left(\frac{1}{2} \times 40\right) + \left(\frac{1}{2} \times 80\right) - BE_{A-B}$

$-200 = 20 + 40 - BE_{A-B} \Rightarrow \therefore BE_{A-B} = 260\ KJ\ \ mol^{-1}$

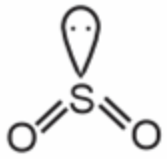
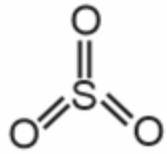
(79) **Answer :** (3)
Solution:
Li_2 = $\sigma 1s^2\ \ \sigma^* 1s^2\ \ \sigma 2s^2$
B_2 = $\sigma 1s^2\ \ \sigma^* 1s^2\ \ \sigma 2s^2\ \ \sigma^* 2s^2\ \ \pi 2p_x^1 = \pi 2p_y^1$
N_2 = $\sigma 1s^2\ \ \sigma^* 1s^2\ \ \sigma 2s^2\ \ \sigma^* 2s^2\ \ \pi 2p_x^2 = \pi 2p_y^2\ \ \sigma 2p_z^2$
O_2 = $\sigma 1s^2\ \ \sigma^* 1s^2\ \ \sigma 2p^2\ \ \sigma^* 2s^2\ \ \sigma 2p_z^2\ \ \pi 2p_x^2 = \pi 2p_y^2\ \ \pi^* 2p_x^1 = \pi^* 2p_y^1$

(80) **Answer :** (2)
Solution:

Extensive Properties	Intensive Properties
Volume	Density
Internal Energy	Temperature
Heat Capacity	Pressure

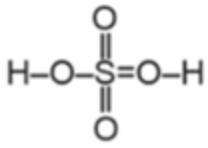
(81) **Answer :** (1)
Solution:
As there is the formation of Cl–Cl bond, hence, entropy is decreasing and Enthalpy will be negative $\Delta H = -ve\ \ \Delta S = -ve$

(82) **Answer :** (4)
Solution:

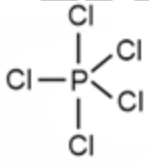
	σ bonds	π bonds
O=C=O	2	2
	2	2
	3	3
H–C≡C–H	3	2

(83) **Answer :** (2)
Solution:
393.5 kJ of heat is released when 44 g of CO_2 is formed.
So, heat released during the formation of 2.2 g CO_2 is
$= \frac{393.5}{44} \times 2.2 = 19.675$ kJ $\approx$ 19.68 kJ

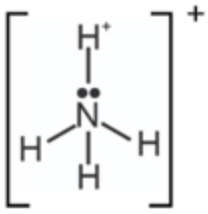
(84) **Answer :** (3)
Solution:


12 e⁻ on S atom


12 e⁻ on central S atom


10 e⁻ on central P atom

(85) **Answer :** (1)
Solution:



N atom has formal charge = 1

(86) **Answer :** (4)
Solution:
The species with zero bond order does not exist as per molecular orbital Theory. Bond order of He_2 =0

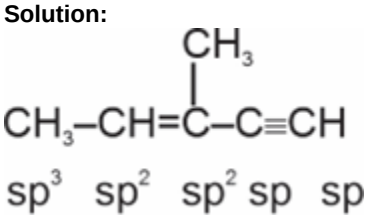
(87) **Answer :** (3)
Hint:
Strength of hydrogen bonding depends upon electronegativity of atom attached to hydrogen.
Solution:
The magnitude of H-bonding is maximum in the solid state and minimum in the gaseous state.

(88) **Answer :** (1)

Solution:
Hybridisation of Be in $BeCl_2$ is sp and it is linear in shape.

(89) **Answer :** (4)
Solution:
Enthalpy of formation is zero for rhombic sulphur not for monoclinic sulphur.

(90) **Answer :** (4)
Solution:



BOTANY

(91) **Answer :** (4)
Solution:
Ground tissue system consists of simple tissues such as parenchyma, collenchyma and sclerenchyma.

(92) **Answer :** (1)
Solution:
The direct elongation of the radicle leads to the formation of primary root.

(93) **Answer :** (1)
Hint:
Albuminous cells are found in the phloem of gymnosperms.
Solution:
Gymnosperms have albuminous cells and sieve cells. They lack sieve tubes and companion cells

(94) **Answer :** (3)
Solution:
In epiphyllous condition, stamens are attached to the perianth. Tomato lacks perianth, thus, epiphyllous condition is absent in it. Rather, it shows epipetalous stamens.

(95) **Answer :** (4)
Hint:
Pea flowers can be divided into equal halves by one plane only.
Solution:
Pea flowers are zygomorphic (bilateral symmetry).

(96) **Answer :** (3)
Hint:
Ground tissue of dicot stem is differentiated into cortex and pith.
Solution:
Monocot stem lacks endodermis, pericycle and pith. Ground tissue in monocot stem is not differentiated.

(97) **Answer :** (4)
Solution:
Root hair are found in the region of maturation.

(98) **Answer :** (1)
Solution:
A floral diagram does not provide the information about the arrangement of flowers on the floral axis.

(99) **Answer :** (2)
Solution:
In grasses, certain adaxial epidermal cells along the veins, modify themselves into large, empty, colorless cells. These are called bulliform cells. When the bulliform cells in the leaves have absorbed water and are turgid, the leaf surface is exposed. When they are flaccid due to water stress, they make the leaves curl inwards to minimise water loss.

(100) **Answer :** (3)
Solution:
In some flowers like lily, the calyx and corolla are not distinct and are termed as perianth.

(101) Answer : (1)
Solution:
Fruit of coconut is a drupe. Its mesocarp is fibrous and endocarp is hard and stony.

(102) Answer : (3)
Solution:
A - Cortex, B - Endodermis, D - Pith, E - Xylem

(103) Answer : (2)
Solution:
Trichomes help in preventing water loss due to transpiration.

(104) Answer : (3)
Solution:
A typical flower has four different kinds of whorls arranged successively on the swollen end of the stalk or pedicel, called thalamus or receptacle.

(105) Answer : (4)
Solution:
Monocot roots show the following features:
(a) Usually more than six (polyarch) xylem bundles
(b) Many of the cells of epiblema protrude in the form of unicellular epidermal appendages
(c) Parenchymatous cells are present between the patches of xylem and phloem
(d) Large and well-developed pith
(e) Parenchymatous pericycle

(106) Answer : (1)
Solution:
A flower is a modified shoot, wherein the shoot apical meristem changes to floral meristem. Internodes of the shoot gets condensed to produce different kinds of floral appendages laterally at successive nodes instead of leaves.

(107) Answer : (1)
Solution:
China rose and tobacco show axile placentation and possess superior ovary.

(108) Answer : (1)
Solution:
Bundle sheath is found in both dorsiventral leaves and monocot stems.

(109) Answer : (3)
Hint:
Aleurone layer is a proteinaceous layer.
Solution:
In monocot seeds (Maize), the outer covering of endosperm separates the embryo by a proteinaceous layer called aleurone layer.
The root is covered at the apex by a thimble-like structure called the root cap.

(110) Answer : (1)
Solution:
Long, thin and flexible petioles allow leaf blades to flutter in wind, thereby cooling the leaf and bringing fresh air to the leaf surface. Dicotyledonous plants generally possess reticulate venation.

(111) Answer : (1)
Solution:
Hint: Pericycle is outer most layer of stele.
Sol.: In monocots, pericycle forms lateral roots only. Monocots lack cambium.

(112) Answer : (4)
Solution:
The correct arrangement is as follows:
e. A large number of rounded, parenchymatous cells with large intercellular spaces which occupy the central portion (medulla)
c. This structure is in the form of semi-lunar patches of sclerenchyma (pericycle)
d. The cells of this structure are rich in starch grains (endodermis)
b. This structure consists of a few layers of collenchymatous cells (hypodermis)
a. This layer is covered with cuticle (epidermis)

(113) Answer : (2)
Solution:
Some stems perform the function of storage of food, support, protection and of vegetative propagation. Leaves originate from shoot apical meristems and are arranged in an acropetal order. In some leguminous, the leafbase may become swollen,

which is called the pulvinus.

(114) Answer : (1)
Hint:
These are thin-walled cells.
Solution:
Monocots generally lack phloem parenchyma.

(115) Answer : (3)
Solution:
Phloem is the part of the vascular tissue system.

(116) Answer : (3)
Solution:
The Anatomy of Seed Plants by Katherine Esau was published in 1960. It was referred to as Webster's of plant biology .

(117) Answer : (3)
Solution:
Fruit is a mature or ripened ovary. Its wall is called pericarp that can be differentiated into epicarp, mesocarp and endocarp.

(118) Answer : (2)
Solution:
Mesophyll cells are present in both dicot leaf as well as monocot leaf.

(119) Answer : (2)
Solution:
Monocots have closed vascular bundles because the cambium is absent between xylem and phloem.

(120) Answer : (1)
Solution:
In brinjal, stamens are epipetalous.

(121) Answer : (2)
Solution:
In beans, seeds are non-endospermic.

(122) Answer : (2)
Solution:
Dianthus shows free-central placentation.

(123) Answer : (3)
Solution:
The plant tissues are broadly classified into meristematic (apical, lateral and intercalary) and permanent (simple and complex).

(124) Answer : (3)
Solution:
Subsidiary cells do not possess chloroplasts and do not carry out photosynthesis.

(125) Answer : (3)
Solution:
The floral diagram (Plant A) is of mustard and floral diagram (Plant B) is of makoi. Inflorescence in mustard is racemose and in makoi, it is cymose.

(126) Answer : (1)
Solution:

I.	Valvate	b.	*Calotropis*
II.	Twisted	d.	Lady finger
III.	Imbricate	a.	*Cassia*
IV.	Vexillary	c.	Bean

(127) Answer : (3)
Hint:
Wall of guard cells which is towards the pore is thick.
Solution:
Inner wall of guard cells is thick while outer wall is thin.

(128) Answer : (3)

Solution:
In false fruits, thalamus also contributes in fruit formation. The roots that originate from the base of the stem are fibrous roots. Citrus possesses polyadelphous stamens.

(129) Answer : (4)
Solution:
This figure is of a monocot seed, in which a proteinaceous layer covers the endosperm.

(130) Answer : (1)
Solution:
In cymose type of inflorescence, the main axis terminates into a flower, hence is limited in growth.

(131) Answer : (4)
Solution:
Neem – Possesses pinnately compound leaves
Chilli – Shows the similar floral symmetry as petunia (actinomorphic)
Mango – The fruit is drupe
Banyan tree – Shows adventitious root
Gulmohur – Shows imbricate aestivation of petals

(132) Answer : (1)
Solution:
In potato, bicarpellary, syncarpous, superior ovary with oblique septa and swollen placenta with many ovules are seen.

(133) Answer : (2)
Hint:
Many cells of this layer protrude to form unicellular root hairs.
Solution:
The outermost layer of sunflower root is epiblema.
• Cuticle is absent in roots.
• Endodermis is the innermost layer of cortex.
• Pericycle is the outermost layer of stele.

(134) Answer : (1)
Solution:
In *Alstonia,* whorled phyllotaxy is found.

(135) Answer : (2)
Solution:
Water containing cavities are seen inside the vascular bundles of monocot stem.

ZOOLOGY

(136) Answer : (2)
Solution:
Tetanus, pneumonia and diphtheria are bacterial diseases. Common cold and AIDS are viral diseases. Elephantiasis is caused by helminths. Malaria is caused by a protozoan.

(137) Answer : (3)
Solution:
Each monomeric antibody has two antigen binding sites.

(138) Answer : (3)
Hint:
Malaria is caused by a sporozoan.
Solution:
Dengue is a viral disease which spreads *via* the bite of *Aedes* mosquito. Filariasis is a helminthic disease that spreads *via* bite of *Culex* mosquito and malaria is a protozoan disease that spreads *via* bite of *Anopheles* mosquito.

(139) Answer : (2)
Solution:
Bone marrow is a primary lymphoid organ. This organ provides the site where immature lymphocytes differentiate into antigen sensitive lymphocytes.

(140) Answer : (4)
Solution:

Our skin is the main physical barrier which prevents entry of microorganism. Interferon-cytokine barrier; PMNL, macrophages, cellular barriers; saliva – physiological barrier.

(141) Answer : (3)
Solution:
Haemozoin – Malarial parasite digests haemoglobin and releases high quantities of free heme. This free heme is converted it into an insoluble crystalline form called haemozoin.
Haemotoxin – Toxic substances in animal's venom, such as snake's venom.
Haemoglobin – Iron containing metalloprotein in red blood cells.
Sporozoites – Infectious form of malarial parasite.

(142) Answer : (4)
Solution:
Interferons are antiviral glycoproteins (signaling proteins) secreted by virus-infected cells, as well as immune cells like lymphocytes (specifically T cells and B cells). They act as a defense mechanism by signaling neighboring, uninfected cells to heighten their antiviral defenses, thus inhibiting further viral replication

(143) Answer : (2)
Hint:
Thrice the number of eyes present in humans
Solution:
Smoking is associated with increased incidences of cancer of lungs, throat and urinary bladder. Bronchitis, emphysema and coronary heart diseases are also the consequences of smoking.

(144) Answer : (2)
Hint:
Recall the symptoms of ascariasis
Solution:
Dependence is the tendency of the body to manifest a characteristic and unpleasant withdrawal syndrome if regular dose of drugs/alcohol is abruptly discontinued. This is characterised by anxiety, shakiness, nausea and sweating, which may be relieved when drug use is resumed again.

(145) Answer : (4)
Solution:
Mary Mallon was a cook by profession and was a typhoid carrier who continued to spread typhoid for several years through the food she prepared.

(146) Answer : (3)
Solution:
ATS contains preformed antibodies that is injected in injury as pathogen, *i.e.*, *Clostridium tetani* produces a neurotoxin-tetanospasmin and a quick response is required to stop the action of antigen which is not done by the formation of our own antibodies as it takes time.
Weakened germs and dead germs are used in vaccine to develop immunity against them.

(147) Answer : (3)
Solution:
AIDS (Acquired Immuno Deficiency Syndrome) is caused by the HIV, which attacks and destroys CD4 T cells, leading to a severely compromised immune system. This is a classic example of immune system underactivity.
ADA (Adenosine Deaminase) deficiency is a genetic disorder that results in a severe combined immunodeficiency (SCID), where the immune system is unable to produce functional T and B lymphocytes. This also leads to severe underactivity of the immune system.
Therefore, both AIDS and ADA deficiency are characterized by the underactivity of the immune system.

(148) Answer : (1)
Solution:
Cell-mediated immunity is mainly responsible for graft rejection in humans.

(149) Answer : (4)
Solution:
A large number of infectious diseases like polio, diphtheria, pneumonia and tetanus have been controlled to a large extent by the use of vaccines.

(150) Answer : (1)
Solution:
AIDS is caused by HIV, a retrovirus, which replicates in the human body. Viral DNA is produced by reverse transcriptase.

(151) Answer : (2)
Hint:
Opioid
Solution:

Heroin commonly called smack, is chemically diacetylmorphine which is a white, odourless, bitter crystalline compound. This is obtained by acetylation of morphine, which is extracted from the latex of poppy plant, *Papaver somniferum*.
Cocaine is commonly known as coke or crack which is obtained from the coca plant, *Erythroxylum coca*.

(152) Answer : (1)
Hint:
AIDS is a blood-borne disease.
Solution:
Transmission of HIV infection generally occurs by
(a) Transfusion of contaminated blood and blood products.
(b) Sexual contact with infected person.
(c) By sharing infected needles as in the case of intravenous drug abusers or during ear piercing.
(d) From infected mother to her child through placenta.

(153) Answer : (4)
Hint:
Typhoid fever
Solution:
Typhoid fever is confirmed by Widal test.
Salmonella typhi is a pathogenic bacterium which causes typhoid fever in human beings.
Bacteria like *Streptococcus pneumoniae* and *Haemophilus influenzae* are responsible for the disease pneumonia in humans.
Entamoeba histolytica is the causative agent of amoebiasis.
Wuchereria malayi is the causative agent of filariasis.

(154) Answer : (2)
Solution:
When a host is exposed to antigens, which may be in form of a living or dead microbe or other proteins, antibodies are produced in host body. This type of immunity is called active immunity.

(155) Answer : (2)
Solution:
Cocaine interferes with the transport of neurotransmitter, dopamine.

(156) Answer : (2)
Solution:
Discovery of blood circulation by William Harvey using experimental method and the demonstration of normal body temperature in persons with blackbile using thermometer disproved the good humor hypothesis. Fever is caused by immune responses to pathogens, not temperament.

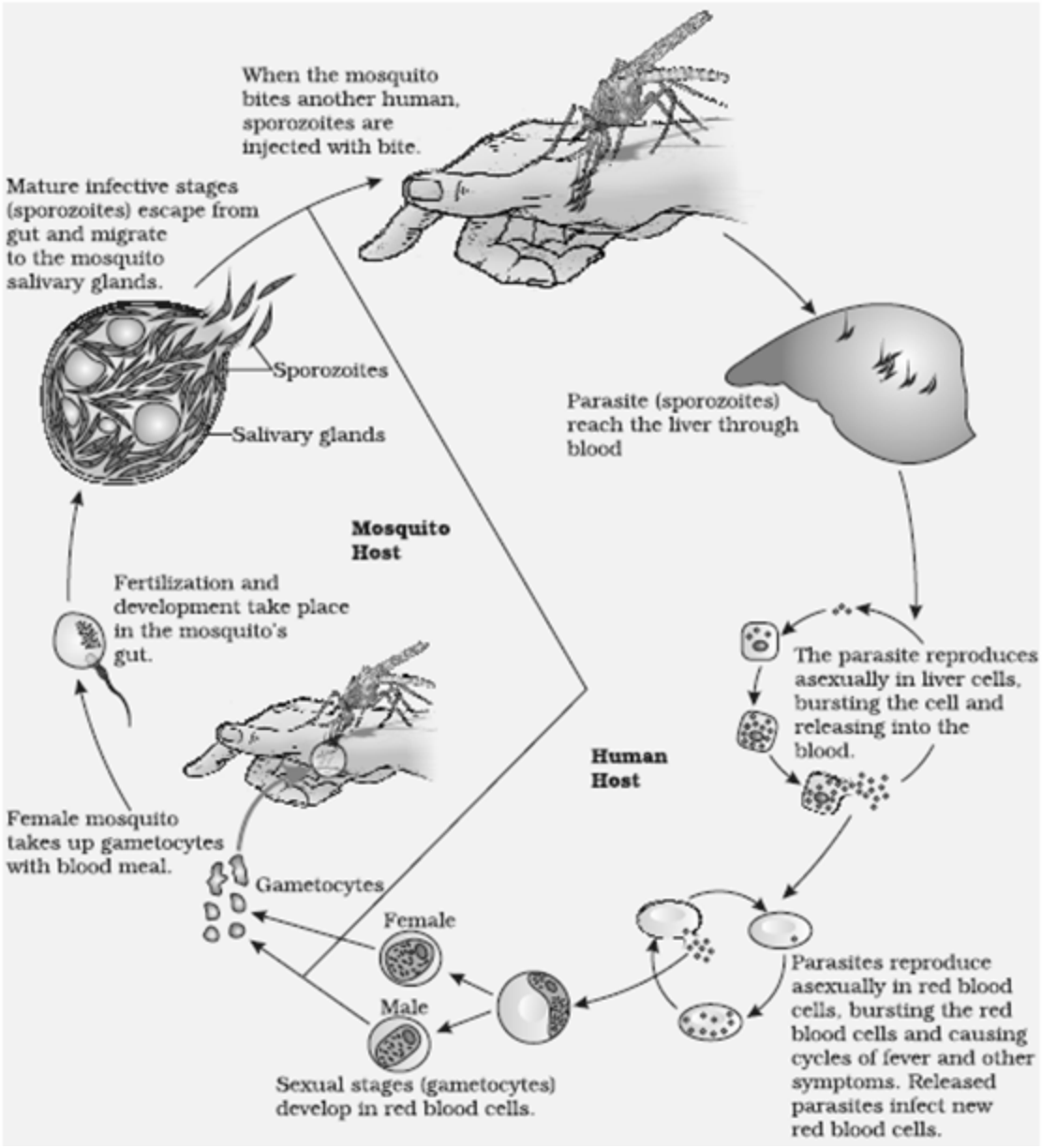
(157) Answer : (3)
Solution:
Health is affected by
(a) Genetic disorders
(b) Infections
(c) Lifestyle

(158) Answer : (4)
Solution:
Health does not simply mean 'absence of disease' or 'physical fitness'. It could be defined as a state of complete physical, mental and social well-being. When people are healthy, they are more efficient at work.

(159) Answer : (2)
Solution:
Most parasites are pathogens and can enter our body by various means, multiply and interfere with normal vital activities, resulting in morphological and functional damage. Pathogens have to adapt to life within the environment of the host. For example, the pathogens that enter the gut must know a way of surviving in the stomach at low pH and resisting the various enzymes.

(160) Answer : (2)
Solution:
The common cold is usually not fatal because it's a mild, self-limiting viral infection of the upper respiratory tract that our robust immune system easily fights off, resolves in about a week, with mild symptoms.

(161) Answer : (1)
Solution:



(162) Answer : (2)

Solution:

Dengue is transmitted by *Aedes*, which breeds in small, stagnant water collections. Environmental management combined with biological control is the most sustainable preventive measure.

(163) Answer : (4)

Solution:

Cancer detection techniques like radiography and computed tomography use X-rays. MRI uses strong magnetic fields and non-ionising radiations. In biopsy, a piece of the suspected tissue cut into thin sections is stained and examined under microscope by a pathologist.

(164) Answer : (1)

Solution:

Acquired immunity is pathogen specific. It is characterised by memory. This means when our body encounters a pathogen for the first time it produces a response called primary response which is of low intensity.

(165) Answer : (1)

Solution:

As child is suffering from allergy which is due to release of chemicals like histamine and serotonin from mast cells. Somehow modern-day life style has resulted in lowering of immunity and more sensitivity to allergens.

(166) Answer : (3)

Solution:
Vaccines produced using recombinant DNA technology allows large scale production and hence greater availability for immunisation, *e.g.*, Hepatitis-B vaccine is produced from yeast.

(167) Answer : (2)
Solution:
Higher vertebrates can distinguish foreign molecules as well as foreign organisms. Memory-based acquired immunity evolved in higher vertebrates based on the ability to differentiate foreign organisms from self cells.

(168) Answer : (3)
Solution:
WHO has started a number of programmes to prevent the spreading of HIV infection. Making blood (from blood banks) safe from HIV, ensuring the use of only disposable needles and syringes in public/private hospitals and clinics, free distribution of condoms, controlling drug abuse, advocating safe sex and promoting regular check ups for HIV.

(169) Answer : (4)
Solution:
Normal cells show a property called contact inhibition by virtue of which contact with other cells inhibits their uncontrolled growth.

(170) Answer : (2)
Solution:
Cancer causing viruses called oncogenic viruses have genes called viral oncogenes. Several genes called cellular oncogenes or proto oncogenes have been identified in normal cells which when activated under certain conditions, could lead to oncogenic transformation of the cells.

(171) Answer : (3)
Solution:
Techniques like Radiography (use of X-rays), CT (Computed Tomography) and MRI are useful to detect cancers of the internal organs.

(172) Answer : (3)
Solution:
Crack derived from *Erythroxylum coca* has a potent stimulating action on CNS.

(173) Answer : (4)
Solution:
In males, misuse of steroids can result in acne, aggressiveness, masculinisation, mood swings, depression, reduction in size of testicles, potential for kidney and liver dysfunction.

(174) Answer : (4)
Solution:
The use of drugs and alcohol during pregnancy is also known to adversely affect the foetus.

(175) Answer : (4)
Solution:
AIDS is caused by HIV which possesses a ssRNA whereas the hepatitis B is caused by dsDNA.
Both can be transmitted through sexual contact or infected blood.
Both AIDS and Hepatitis-B infections are chronic and ultimately fatal.

(176) Answer : (4)
Solution:
Tobacco contains a large number of chemical substances including nicotine, an alkaloid. Nicotine stimulates adrenal gland to release adrenaline and nor-adrenaline into blood circulation, both of which raise blood pressure and increase heart rate.

(177) Answer : (4)
Solution:
Many fungi belonging to the genera *Microsporum, Trichophyton* and *Epidermophyton* cause ringworm. This is transmitted from soil or by using towels, clothes or even comb of infected individuals

(178) Answer : (2)
Solution:
In case of air-borne diseases such as pneumonia and common cold close contact with the infected persons or their belongings should be avoided.

(179) Answer : (3)
Solution:
In AIDS, due to decrease in the number of helper T-lymphocytes, the person starts suffering from infections that could have been otherwise overcome such as those due to bacteria especially *Mycobacterium*, viruses, fungi and even parasites like *Toxoplasma*.

(180) Answer : (1)

Solution:

Addiction is a psychological attachment to certain effects such as euphoria and a temporary feeling of well-being associated with drugs and alcohol.