13/08/2025

Phase-1 Code-A

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

Fortnightly Test for NEET-2026_RM(P1)_FT-04A

Time : 180 Min.

PHYSICS

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CHEMISTRY

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Hints and Solutions

PHYSICS

(1) **Answer :** (1)
Hint:
Variation of acceleration due to gravity with height, $g' = g\frac{R^2}{(R+h)^2}$
Solution:
$g' = g\frac{R^2}{(R+h)^2}$
$\frac{g}{4} = g\frac{R^2}{(R+h)^2} \Rightarrow 2R = R+h$
$\boxed{h = R}$

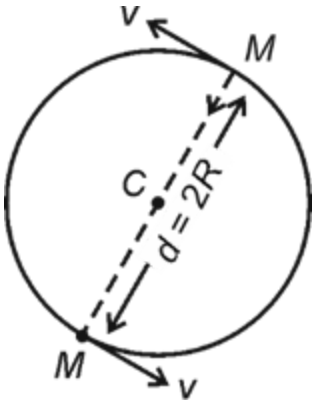
(2) **Answer :** (1)
Solution:
$g = \frac{GM}{R^2}$
$M = \frac{4}{3}\pi R^3\rho \Rightarrow g = \frac{G}{R^2} \times \frac{4}{3}\pi R^3\rho$
Thus, $\rho = \frac{3g}{4\pi GR}$

(3) **Answer :** (3)
Solution:
$F = \frac{Gm_1m_2}{r^2}, \quad F' = \frac{G\times 3m_1\times 3m_2}{4r^2}$
$\Rightarrow F' = \frac{9F}{4} \Rightarrow$ 125% increase

(4) **Answer :** (2)
Solution:
$\Rightarrow T^2 \propto R^3 \Rightarrow \frac{T^2}{64\times 64T^2} = \frac{R^3}{r^3}$
$\Rightarrow r^3 = 64R^3 \times 64$
$\Rightarrow r = 16R$

(5) **Answer :** (1)
Hint:
Work done by external force = change in potential energy
Solution:
$W = U_f - U_i$
$\frac{mgR}{2} = \frac{-GMm}{R+h} - \left(-\frac{GMm}{R}\right) = \frac{-GMm}{R+h} + mgR$
$-\frac{mgR}{2} = \frac{-GMm}{R+h}$
$\frac{mgR}{2} = \frac{mgR^2}{R+h}$
$2R = R + h$
$R = h$

(6) **Answer :** (2)
Solution:



$F = \frac{G \cdot M \cdot M}{d^2} = \frac{GM^2}{(2R)^2} = \frac{GM^2}{4R^2}$

(7) **Answer :** (1)
Hint:
Use escape velocity
$v_e = \sqrt{\frac{2GM}{R}}$
and
$U = \frac{-GMm}{R}$
Solution:
$v_e = \sqrt{\frac{2GM}{R}} = 50 \text{ m s}^{-1}$

$\Rightarrow \quad \frac{2GM}{R} = 2500$
$\Rightarrow \quad U = \frac{-GMm}{R} = -\frac{2500 \times 1}{2} = -1250 \text{ J}$

(8) **Answer :** (2)
Solution:
Potential at the centre of uniform solid sphere is given by $-\frac{3}{2}\frac{GM}{R}$

(9) **Answer :** (4)
Solution:
a $\rightarrow F = \frac{GM_em}{r^2}$, b $\rightarrow \frac{-Gm_1m_2}{r}$
c → F_{net} = 0 (on isolated system)
d → $W_{ext} = \frac{-GM_em}{r_2} + \frac{GM_em}{r_1} = \frac{-GmM_e(r_1 - r_2)}{r_1 r_2}$

(10) **Answer :** (4)
Hint:
Use conservation of energy.
Solution:
Work done = ΔU as ΔK.E = 0 because it is moved slowly.
$\Rightarrow W = \Delta U = U_F - U_i = -\frac{GMm}{R} + \frac{GMm}{R} = 0$

(11) **Answer :** (3)
Solution:
Let V_0 = orbital velocity $= \sqrt{\frac{Gm}{R+h}}$ and V_e = escape velocity $= \sqrt{\frac{2Gm}{R+h}}$
If $V_0 < v < V_e$, then the shape of trajectory will be elliptical.

(12) **Answer :** (4)
Solution:
Gravitational force is a conservative force because the work done by gravitational force between two points depends upon initial and final position.

(13) **Answer :** (4)
Solution:
Law of orbit and law of areas are the Kepler's laws.

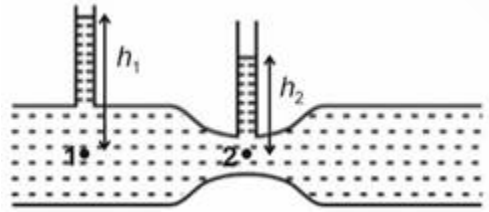
(14) Answer : (3)
Hint:
In an elliptical orbit, angular momentum of a satellite is conserved.
Solution:
$m_0v_1r_1 = m_0v_2r_2$, so the speed of satellite changes with position and its potential energy also changes. The total energy remains constant, because only conservative force (gravitational force) is acting.

(15) Answer : (3)
Solution:
The law of conservation of angular momentum can be used to explain Kepler's 2nd law because the areal velocity of a planet $\left(\frac{dA}{dt}\right)$ is related to its angular momentum (L).
$\frac{dA}{dt} = \frac{L}{2m}$

(16) Answer : (1)
Solution:
From equation of continuity, we know that
$A_1V_1 = A_2V_2 + A_3V_3$
$\Rightarrow 16 = 12 + V_3 \Rightarrow V_3 = 4$ m/s

(17) Answer : (2)
Solution:
From volume conservation,
$\frac{4}{3}\pi R^3 = n \times \frac{4}{3}\pi r^3 \Rightarrow R = (n)^{\frac{1}{3}} r$
Now, excess pressure in big drop
$= \frac{2T}{R} = \frac{2T}{(n)^{\frac{1}{3}} r}$

(18) Answer : (2)
Solution:
Applying equation of continuity:
$A_1v_1 = A_2v_2$
If $A_2 < A_1$, then $v_2 > v_1$
Applying Bernoulli's equation:
$P_1 + \frac{1}{2}\rho v_1^2 = P_2 + \frac{1}{2}\rho v_2^2$
$P_1 - P_2 = \frac{1}{2}\rho\left(v_2^2 - v_1^2\right) > 0$
$\Rightarrow P_1 > P_2 \Rightarrow \rho g h_1 > \rho g h_2$
$\therefore h_1 > h_2$



(19) Answer : (3)
Solution:
For a hydraulic lift:
$\frac{F_1}{A_1} = \frac{F_2}{A_2} \Rightarrow \frac{F_1}{\pi(10)^2} = \frac{1500 \times 10}{\pi(20)^2}$
$F_1 = \frac{1500 \times 10 \times 100}{400} = 3.75 \times 10^3$ N

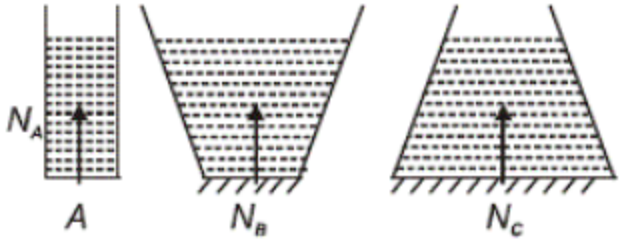
(20) Answer : (4)
Solution:
We know that, $h = \frac{2T\cos\theta}{R\rho g}$, if θ = 0° then liquid will rise. Liquid will not rise or fall when θ = 90°.
Venturimeter is based on Bernoulli's principle.

(21) Answer : (1)
Solution:
The pressure at the bottom must be same,

$\rho_A \times g \times 15 = \rho_B \times g \times 20 \quad \Rightarrow \quad \frac{\rho_B}{\rho_A} = \frac{15}{20} = \frac{3}{4}$

(22) Answer : (2)
Solution:
Speed of efflux, $v = \sqrt{2gh}$
h = 80 cm
= 0.8 m
$\therefore\ v = \sqrt{2 \times 10 \times \frac{8}{10}}$
v = 4 m/s

(23) Answer : (1)
Hint:
Draw free body diagram.
Solution:



Normal reaction of base = P × area
$P_A = P_B = P_C$
But area of base is maximum for C
$\therefore N_A < N_B < N_C$ (Increasing order)

(24) Answer : (1)
Hint:
Use velocity of efflux
Solution:
$v = \sqrt{2g\,(H-h)} \ = \sqrt{2 \times 10 \times 2} = \sqrt{40}\,\text{m s}^{-1}$
time $t = \sqrt{\frac{2h}{g}} = \sqrt{\frac{4}{10}}$ s
Range(x) = vt
$= \sqrt{40} \times \sqrt{\frac{4}{10}}$
$= \sqrt{\frac{40}{10}}\sqrt{4}$
= 2 × 2 = 4 m

(25) Answer : (4)
Hint:
Use bernoulli's theorem.
Solution:
Let tube is at a depth x below free surface. Then.
$P_0 + \rho g x + \frac{1}{2}\rho v^2 = P_0 + \rho g\left(h + h_0 + x\right)$
or, $\frac{1}{2}\rho v^2 = \rho g\left(h + h_0\right)$
$h = \frac{v^2}{2g} - h_0 = \frac{25}{2\times 10} - 0.25$
= 1.25 – 0.25
= 1 m

(26) Answer : (2)
Hint:
Use concept of Buoyancy.
Solution:
Let volume of copper = V_{cu}
Let volume of cavity = V_{ca}
$V_{cu} = \frac{m_{cu}}{\rho_{cu}} = \frac{20}{9000}\ \text{m}^3$
Weight of sphere in water reduces by 0.2 × m_{cu} g = 40 N

Buoyancy = weight reduction

$\rho_{\text{water}}\left(V_{cu}+V_{ca}\right)g = 40\,\text{N}$

$1000\left(\frac{20}{9000}+V_{ca}\right)\times 10 = 40$

$V_{Ca} = \frac{\left(4-\frac{20}{9}\right)}{1000}$

$= 1.77 \times 10^{-3}\ \text{m}^3$

(27) Answer : (3)
Solution:
Hydraulic lift works on Pascal's law

(28) Answer : (3)
Solution:
Bernoulli's theorem holds good for only ideal liquid.

(29) Answer : (2)
Solution:

Capillary rise $h = \frac{2\,s\cos\theta}{r\rho g}$

Hydrostatic pressure $\Delta P = \rho g h$

Bernoulli's Theorem $\Rightarrow$ $P+\frac{1}{2}\rho v^2+\rho g h$ = constant

Stoke's law $\Rightarrow F = 6\pi\eta r v$

(30) Answer : (1)
Solution:
A water drop spreads on a glass plate because the angle of contact is acute.

(31) Answer : (1)
Solution:
The liquid surfaces have a tendency to contract due to surface tension.

(32) Answer : (4)
Solution:
Since the ball is moving with constant velocity, hence the net force on ball would be zero.

(33) Answer : (2)
Solution:

Relative density $= \frac{\text{Density of body}}{\text{Density of water at 4°C}}$

Density of body $= 0.75 \times 10^3\ \text{kg/m}^3$

$= 750\ \text{kg/m}^3$

(34) Answer : (3)
Hint:
Assume the whole mass to be concentrated at centre of mass.
Solution:

COM at distance $\frac{L}{2}$ from bottom $\Rightarrow$ $\Delta L = \frac{Mg\times\frac{L}{2}}{AY}$

$\Rightarrow$ elongation $= \frac{MgL}{2AY}$

(35) Answer : (4)
Hint:
Young's modulus is equal to slope of stress-strain graph.
Solution:

$\frac{Y_A}{Y_B} = \frac{\tan 30^\circ}{\tan 60^\circ}$

$\frac{Y_A}{Y_B} = \frac{1}{\sqrt{3}\times\sqrt{3}} = \frac{1}{3}$

$Y_B = 3Y_A$

(36) Answer : (4)
Solution:
Longitudinal strain $= \frac{\Delta L}{L}$
is a unitless quantity.

(37) Answer : (3)
Solution:
Breaking stress is the property of material of wire.

(38) Answer : (2)
Solution:
Elongation, $\Delta l = \frac{F \times L}{A \times Y}$

(39) Answer : (4)
Solution:
Bulk modulus is defined for all solids, liquids and gases.

(40) Answer : (2)
Solution:
Material with large plastic-region is ductile.

(41) Answer : (2)
Solution:

Young's Modulus = $\frac{\text{Normal stress}}{\text{Longitudinal strain}}$

(42) Answer : (4)
Hint:

Shear stress = $\frac{\text{Tangential force}}{\text{Area of cross-section}}$

Solution:
Shear stress = $\frac{F \sin\theta}{A}$

(43) Answer : (3)
Solution:

Stress $= \frac{\text{Force}}{\text{Area}}$ with unit $= \frac{\text{N}}{\text{m}^2}$

Pressure $= \frac{\text{Force}}{\text{Area}}$ with unit $= \frac{\text{N}}{\text{m}^2}$

Stress is a scalar quantity.

(44) Answer : (2)
Solution:
$B = \frac{-P}{\frac{\Delta V}{V}}$

$\frac{-\Delta V}{V} = \frac{P}{B}$ and $\frac{P}{B} = \frac{\Delta\rho}{\rho}$

$P = \frac{B\Delta\rho}{\rho} = = \frac{B \times 4}{10000} = \frac{B}{2500}$

(45) Answer : (1)
Solution:
$Y = \frac{FL}{A\Delta L}$

$F = \frac{YA}{L}\Delta L$ ...(i)

$F = kx$ ...(ii)

On comparing (i) and (ii), $k = \frac{YA}{L}$

CHEMISTRY

(46) Answer : (4)
Hint:

Mean bond enthalpy of $CH_4 = \frac{1}{4}\left(\Delta_a H^{\circ}_{C-H}\right)$

Solution:

$\Delta_{C-H}H^{\circ} = \frac{1}{4} \times 1665$ = 416.25 kJ mol^{-1}

In methane molecule, all four C – H bonds are identical in bond length but the breaking of successive bonds is as follow

$CH_4(g) \rightarrow CH_3(g) + H(g)$

$CH_3(g) \rightarrow CH_2(g) + H(g)$

$CH_2(g) \rightarrow CH(g) + H(g)$

$CH(g) \rightarrow C(g) + H(g)$

All the steps above will have different energy.

(47) **Answer :** (4)

Solution:

As the process is isothermal, i.e. temperature is constant (for ideal gas)

$\Delta T = 0$

$\Delta U = n C_{V,m} \Delta T = 0$ J

(48) **Answer :** (3)

Hint:

The reference state of an element in its most stable state of aggregation at 25°C and 1 bar pressure.

Solution:

Reference states are H_2 gas for dihydrogen, $O_2(g)$ for dioxygen, $C_{graphite}$ for carbon and $S_{rhombic}$ for sulphur.

(49) **Answer :** (2)

Solution:

$\Delta S = \frac{\Delta H}{T}$

$\Delta H = 300 \times 100$

= 30 kJ mol^{-1}

(50) **Answer :** (2)

Solution:

$\Delta H = \Delta E + \Delta n_g RT$

$\Delta E = \Delta H - \Delta n_g RT$

$= 176 - \frac{1 \times 8.314}{1000} \times 1240 = 165.7$ kJ

(51) **Answer :** (4)

Solution:

(A) Isothermal process ⇒ Temperature is constant throughout the process

(B) Isochoric process ⇒ Volume is constant throughout the process

(C) Isobaric process ⇒ Pressure is constant throughout the process

(D) Adiabatic process ⇒ No exchange of heat (q) between system and surrounding

(52) **Answer :** (2)

Solution:

$C_6H_{12}O_6(S) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

$\Delta H = \Delta U + \Delta n_g RT$

$\Delta n_g = 0$

$\Delta H = \Delta U$

ΔU = –651 kcal

(53) **Answer :** (1)

Solution:

$\Delta S = nR\ln \frac{V_f}{V_i}$

$= 2.303\, nR\log \frac{V_f}{V_i}$

$= 2.303 \times 2 \times 8.314 \times \log \frac{10}{1}$

= 2.303 × 2 × 8.314

= 38.29 J/K

(54) **Answer :** (2)

Solution:

$\Delta H^\circ = \Delta U^\circ + \Delta n_g RT$

= –20 + (0)RT = –20 kJ

$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ$

ΔG° = [–20 – (298 × 10^{-3} × (–80))]

= 3.84 kJ

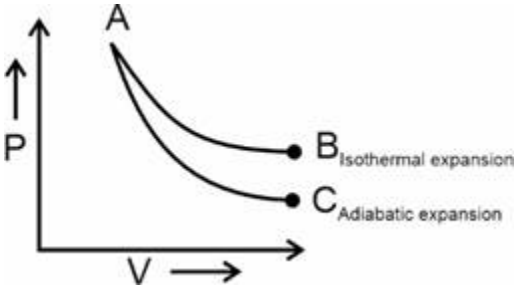
(55) Answer : (4)
Solution:
$\Delta H = \Sigma(BE)_R - \Sigma(BE)_P$

$\Delta H = \frac{1}{2} \times BE_{X-X} + \frac{1}{2} BE_{Y-Y} - BE_{X-Y}$

$-100 = \frac{1}{2} \times 20 + \frac{1}{2} \times 40 - BE_{X-Y}$

BE_{X-Y} = 130 kJ/mol

(56) Answer : (2)
Solution:



During adiabatic expansion, cooling takes place.

(57) Answer : (1)
Hint:
Intensive property is independent of amount of matter present.

(58) Answer : (4)
Solution:

P_4(white) + $5O_2(g) \rightarrow P_4O_{10}(s)$ $\Delta H = -x$ kJ mol^{-1}

Heat released for the formation of

1 mol of P_4O_{10} is $-x \times 10^3$J

So, heat released for the formation of $\frac{142}{284}$

of P_4O_{10} is = $\frac{142}{284} \times x \times 10^3$J

$= \frac{x \times 10^3}{2}$

= 500 xJ

(59) Answer : (4)
Solution:
During boiling of egg, denaturation of protein occur, so entropy increases.

(60) Answer : (2)
Hint:
For spontaneous process,
ΔG = –ve
Solution:
$\Delta G = \Delta H - T\Delta S$
When ΔH and ΔS both are greater than zero, reaction is spontaneous at high temperature.

(61) Answer : (2)
Hint:
Slope of PV graph is higher for adiabatic process.
Solution:
Magnitude of work done in adiabatic expansion is less than work done in isothermal expansion.

(62) Answer : (1)
Solution:

$n_{C_4H_{10}} = \frac{w_{C_4H_{10}}}{m_{C_4H_{10}}} = \frac{5.8}{58} = 0.1$ mol

Heat released during combustion
= $n_{C_4H_{10}} \times 2658$ kJ $= 265.8$ kJ

(63) Answer : (3)

Hint:
Enthalpy of hydrogenation of benzene = (3 × enthalpy of hydrogenation of cyclohexene – resonance energy)
Solution:
Enthalpy of hydrogenation of benzene = $3 \times (-x) - (-y) = (-3x + y)$ kJmol^{-1}

(64) Answer : (3)
Solution:
Standard enthalpy of formation is the enthalpy change in the formation of one mole of a compound from its elements in their most stable states of aggregations.

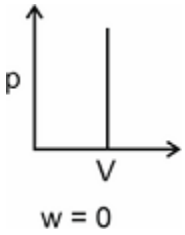
(65) Answer : (3)
Hint:
q and w are path functions.
Solution:
$\Delta U = q + w$; ΔU is a state function

(66) Answer : (4)
Hint:
ΔG is the net energy available to do useful work.
Solution:
$T\Delta S_{system}$ is the energy which is not available to do useful work

(67) Answer : (2)
Hint:
$\Delta H° = \sum$BE of reactants – $\sum$BE of products
Solution:
$H_2(g) + I_2(g) \rightarrow 2HI(g)$
$\Delta H° = (x + y - 2z)$ kJ mol^{-1}

(68) Answer : (1)
Hint:
The enthalpy change that occurs when one mole of the substance is formed from its constituent elements in their standard states is enthalpy of formation.
Solution:
$C(graphite) + O_2(g) \rightarrow CO_2(g)$ ...(i), $\Delta_r H° = -393.5$ kJ mol^{-1}
$H_2(g) + \frac{1}{2}O_2(g) \rightarrow H_2O(l)$ ...(ii), $\Delta_r H° = -285.8$ kJ mol^{-1}
$CO_2(g) + 2H_2O(l) \rightarrow CH_4(g)$ ...(iii), $\Delta_r H° = +890.3$ kJ mol^{-1}
(i) + 2 × (ii) + (iii) we have,
$C(graphite) + 2H_2(g) \rightarrow CH_4(g)$
$\Delta_r H° = -393.5 + 2(-285.8) + 890.3$
$= -74.8$ kJ/mol

(69) Answer : (4)
Solution:
Work done under any thermodynamic process can be determined by area under the 'p-V' graph.
As it can be observed maximum area is covered in option '4'.

1. 

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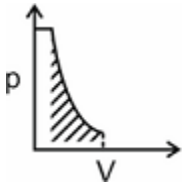
2. 

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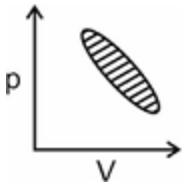

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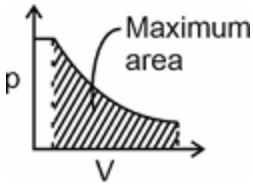


(70) **Answer :** (1)
Solution:
The process is adiabatic hence, q = 0
W = –PΔV
= –4 × (6.75 – 0.75) = –24 L atm
= –24 × 101.3
W = –2.43 kJ
ΔU = q + W
ΔU = W $[\because q = 0]$
ΔU = –2.43 kJ

(71) **Answer :** (3)
Solution:
At constant volume, $q_V = C_V\Delta T = \Delta U$
At constant pressure, $q_P = C_P\Delta T = \Delta H$
For a mole of an ideal gas,
ΔH = ΔU + Δ(PV)
= ΔU + Δ(RT)
= ΔU + RΔT
On putting the values of ΔH and ΔU, we have
$C_P\Delta T = C_V\Delta T + R\Delta T$
$C_P = C_V + R$
$C_P - C_V = R$

(72) **Answer :** (1)
Hint:
$\Delta_r H^o = \sum (BE)_{Reactants} - \sum (BE)_{Products}$
Solution:
$N_2H_2\,(g) + H_2\,(g) \rightarrow N_2H_4\,(g)$
$\Delta_r H^o = \{BE_{N=N} + 2\ BE_{N-H} + BE_{H-H}\} - \{BE_{N-N} + 4\,BE_{N-H}\}$
$-109 = \{400 + 2 \times 391 + 436\} - \{BE_{N-N} + 4 \times 391\}$
$-109 = 400 + 782 + 436 - BE_{N-N} - 1564$
BE_{N-H} = 163 kJ/mol

(73) **Answer :** (4)
Solution:
q = mCΔT
1000 J = $\frac{100}{18} \times 75 \times \Delta T$
$\frac{10 \times 18}{75} = \Delta T$
2.4 K = ΔT

(74) **Answer :** (2)
Hint:
Enthalpy change for the following reaction corresponds to $\Delta_f H$ of CO(g)
$C_{(graphite)} + \frac{1}{2}O_2(g) \rightarrow CO(g)$
Solution:
Applying (i) – $\frac{(ii)}{2}$, we get

$C_{(graphite)} + \frac{1}{2}O_2(g) \rightarrow CO(g)$

So, $\Delta_f H$ of CO(g) = $\frac{y}{2} - x = \frac{y-2x}{2}$

(75) **Answer :** (3)
Solution:
Molar heat capacity = $\frac{q}{n\Delta T}$
Heat = $24 \times 10 \times \frac{54}{27} = 480\ J = 0.48\ kJ$

(76) **Answer :** (3)
Hint:
$\Delta H = \Delta U + \Delta n_g RT$
Solution:
$\Delta H - \Delta U = \Delta n_g RT$
$2C_6H_6(l) + 15O_2(g) \rightarrow 12CO_2(g) + 6H_2O(l)$
$\Delta n_g = -3$
$\Delta H - \Delta U = \frac{-3 \times 8.314}{1000} \times 298 = -7.43\ kJ$

(77) **Answer :** (4)
Solution:
$\Delta U = q + w$
= 1000 – 2000
= –1000 cal

(78) **Answer :** (4)
Solution:
Bomb calorimeter is used to measure change in internal energy.

(79) **Answer :** (3)
Solution:
Heat of neutralisation of strong acid and strong base is nearly –57.1 kJ eq^{-1} hence on neutralisation of 0.1 mol HCl with 0.1 mol NaOH heat evolved will be 5.71 kJ.

(80) **Answer :** (2)
Solution:
$\Delta G = \Delta H - T\Delta S$, if $\Delta H > 0$ and $\Delta S < 0$ then ΔG of system is always positive so reaction is always non spontaneous.

(81) **Answer :** (3)
Hint:
$\Delta S = \frac{Q}{T}$
Solution:
$\Delta S = \frac{11200}{320}$ = 35 J/mol K

(82) **Answer :** (2)
Solution:
As per Hess's law,
$\Delta H_1 + \Delta H_2 + \Delta H_4 = \Delta H_3$
$\Delta H_1 + \Delta H_2 = \Delta H_3 - \Delta H_4$

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

(84) **Answer :** (1)
Solution:
In free expansion, w = 0.
In an adiabatic process q = 0
$\Delta U = q + w = 0 + 0 = 0$

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

$\Delta U = q + \omega$
For adiabatic process; $q = 0$
$\Delta U = \omega$
For expansion ω is negative

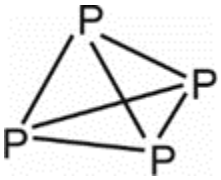
(86) **Answer :** (1)
Solution:
For reversible process, system and surrounding are always in near equilibrium with each other.

(87) **Answer :** (3)
Solution:
Heat required to raise 1 mol of gas by 1°C
$= \frac{12}{0.2} \times \frac{1}{10} = 6 \underset{(C_v)}{\text{cal}}$

$C_P = C_V + R = 6 + 2 = 8$ cal

(88) **Answer :** (1)
Solution:
$q = nC_p dT$
If Q = 0 (Adiabatic) molar heat capacity = 0
→ if dT = 0, molar heat capacity → ∞

(89) **Answer :** (3)
Solution:
Hint : P_4 is



Sol. : $4P(g) \rightarrow P_4(g)\ \Delta_r H = -x$ kJ mol^{-1}

$P_4(g) \rightarrow 4P(g)\ \Delta_r H' = x$ kJ mol^{-1}

$x = \Delta_r H' = 6 \times BE_{P-P} \Rightarrow BE_{P-P} = \frac{x}{6}\ \text{kJ mol}^{-1}$

(90) **Answer :** (4)
Hint:
Heat added to the system can influence molecular motions and hence randomness.
Solution:
As entropy is inversely proportional to the temperature $\Delta S = \frac{q_{rev}}{T}$,
so, at low temperature, there is more randomness caused when heat is added to system.

BOTANY

(91) **Answer :** (2)
Hint:
Colchicine producing plant belongs to family Liliaceae.
Solution:
Liliaceae has tricarpellary superior ovary.

(92) **Answer :** (4)
Solution:
In arid regions, a fleshy cylindrical modified stem, which carries out photosynthesis can be found in *Euphorbia.*

(93) **Answer :** (4)
Solution:
Pneumatophores are modified tap roots, that grow vertically upwards to get oxygen for respiration.

(94) **Answer :** (1)
Solution:
Datura has actinomorphic flowers. In *Cassia*, gulmohur and bean, zygomorphic flowers are observed.

(95) **Answer :** (2)

Solution:
Petunia is the ornamental plant of solanaceae family

(96) Answer : (4)
Solution:

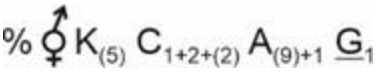

represents epipetalous stamens.

(97) Answer : (2)
Solution:
Mango exemplifies drupe type of fruit.

(98) Answer : (2)
Solution:
Testa and tegmen are the outer and inner layer of seed coat respectively.

(99) Answer : (4)
Solution:
In alternate phyllotaxy, a single leaf is present at each node in an alternate fashion, *e.g.*-China rose, mustard, sunflower.

(100) Answer : (1)
Hint:
Mango and coconut both are one seeded drupe fruits.
Solution:
Both develop from monocarpellary superior ovary.

(101) Answer : (1)
Solution:
The floral formula of Fabaceae family is

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(102) Answer : (1)
Solution:
In family Brassicaceae, short stamens are at periphery and calyx show imbricate aestivation.

(103) Answer : (2)
Solution:
Valvate aestivation – *Calotropis*
Twisted aestivation – Lady's finger
Imbricate aestivation – Gulmohur
Vexillary aestivation – Bean

(104) Answer : (4)
Solution:
In racemose type of inflorescence, the main axis continues to grow, as it does not get terminated into flower. The flowers are borne laterally in an acropetal succession**.**

(105) Answer : (2)
Hint:
Thorns and spines are analogous structures.
Solution:
Thorns are modified axillary buds whereas spines are modified leaves. Both are the structures for self defence.

(106) Answer : (3)
Solution:
In monocotyledons, leaf base expands into a sheath covering the stem partially or wholly.

(107) Answer : (1)
Solution:
In wheat, primary root is short lived and is replaced by a large number of roots, called fibrous roots.

(108) Answer : (2)
Solution:
In monocot seeds, the seed coat is membranous and generally fused with the fruit wall. Bean and pea are non-endospermic. In dicots, hilum is a scar on the seed coat through which the developing seeds were attached to the fruit.

(109) Answer : (3)

Solution:
In silk cotton, leaflets are attached to a common point, *i.e.,* at the tip of the petiole.

(110) Answer : (4)
Solution:
Endosperm in angiosperm is triploid and aleurone layer is the part of it.

(111) Answer : (3)
Solution:

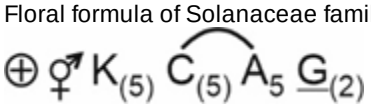
Types of placentation	Example
Marginal	Pea
Axile	Lemon
Parietal	*Argemone*
Free-central	*Dianthus*

(112) Answer : (2)
Solution:
Parthenocarpic fruits develop from ovary without fertilization.

(113) Answer : (1)
Solution:
In monocotyledonous seeds, the plumule and radicle are enclosed in sheath which are called coleoptile and coleorhiza respectively.

(114) Answer : (1)
Solution:
In mustard, china rose, brinjal and *Petunia* hypogynous flowers are present.

(115) Answer : (4)
Solution:
Floral formula of Solanaceae family is



In this family, placenta is swollen with many ovules and show axile placentation. Seeds are endospermous.

(116) Answer : (2)
Solution:
Photosynthesis is the main function of leaf.

(117) Answer : (1)
Solution:
Zone proximal to region of elongation in a tap root is region of maturation.

(118) Answer : (2)
Solution:
Stamens are united into two bundles in pea.

(119) Answer : (1)
Solution:
Free central placentation is found in *Primrose*.

(120) Answer : (2)
Hint:
In cymose inflorescence, the peduncle terminates into a flower.
Solution:
Plants of Solanaceae show cymose type of inflorescence in which basipetal arrangement of flowers is seen.

(121) Answer : (2)
Solution:
Keel, wings and standard petals are seen in the members of Fabaceae family.

(122) Answer : (4)
Solution:
A flower is a modified shoot wherein the shoot apical meristem changes to floral meristem. Internodes do not elongate and the axis gets condensed. When a shoot tip transforms into a flower, it is always solitary.

(123) Answer : (1)

Solution:
When stamens are united in a single bundle then it is called monoadelphous.

(124) Answer : (3)
Solution:
Sterile stamen is called staminode.

(125) Answer : (4)
Solution:
The placentation in which ovules are borne on central axis and septa are absent in the ovary is free central placentation.

(126) Answer : (3)
Solution:
Members of Solanaceae have berry fruits with persistent calyx.

(127) Answer : (1)
Solution:
In mustard plant, flowers are borne in acropetal succession - Racemose inflorescence.
Solanum and *Dianthus* - Cymose inflorescence

(128) Answer : (3)
Solution:
Non-endospermous seeds lack endosperm at maturity.

(129) Answer : (2)
Solution:
In a floral formula K stands for calyx.

(130) Answer : (1)
Solution:
The sepals and petals are sterile and referred to as the non-essential or accessory parts of the flower because they do not directly participate in the process of sexual reproduction.

(131) Answer : (2)
Solution:
The standard petal of a papilionaceous corolla is also called vexillum

(132) Answer : (4)
Hint:
All leaves have axillary buds.
Solution:
A leaf is said to be simple, when its lamina is entire or when incised, the incisions do not touch the midrib, thus, not divided into leaflets.

(133) Answer : (4)
Solution:
Lateral roots arise from pericycle and are endogenous in origin.

(134) Answer : (3)
Solution:
When the sepals are fused it is called gamosepalous condition

(135) Answer : (3)
Solution:
The calyx is the outermost whorl of flower and its members are called sepals. Sepals are green, leaf like and protect the flower in bud stage. In calyx, valvate type of aestivation is observed in *Solanum*.

ZOOLOGY

(136) Answer : (4)
Solution:
Descending limb of loop of Henle is permeable to water and almost impermeable to electrolytes.

(137) Answer : (1)
Solution:
Kidneys are located between the levels of last thoracic and third lumbar vertebra.

(138) Answer : (4)

Solution:

During muscle contraction, the increase in Ca++ level leads to the binding of calcium with a subunit of troponin on actin filaments and thereby remove the masking of active sites for myosin. Utilising the energy from ATP hydrolysis, the myosin head now binds to the exposed active sites on actin to form a cross bridge.

(139) Answer : (4)

Hint:

It promotes loss of Na^+ from the body.

Solution:

ANF increases Na^+ excretion causing water to be lost along with Na^+, hence its secretion will not occur in case of dehydration. All other hormones given in the options increase absorption of Na^+ directly or indirectly.

(140) Answer : (3)

Solution:

Animals accumulate ammonia, urea, uric acid, CO_2, water and ions like Na^+, K^+, Cl^-, phosphate, sulphate, *etc*., either by metabolic activities or by other means like excess ingestion. Ammonia, as it is readily soluble, is generally excreted by diffusion across body surfaces or through gill surfaces (in fish) as ammonium ions. Kidneys do not play any significant role in its removal.

(141) Answer : (2)

Solution:

Glucose and amino acids are absorbed by active transport.

(142) Answer : (2)

Solution:

In humans, osmolarity gradient in the medullary interstitium is maintained by NaCl and urea.

(143) Answer : (1)

Solution:

Urinary bladder has smooth muscles.

The CNS passes on motor messages to initiate the contraction of smooth muscles of the bladder and simultaneous relaxation of the urethral sphincter causing the release of urine.

(144) Answer : (2)

Solution:

Nearly, all of the essential nutrients, and 70-80 per cent of electrolytes and water are reabsorbed by PCT. It helps to maintain the pH and ionic balance of body fluids.

ADH causes reabsorption of water from latter part of DCT and CD.

(145) Answer : (2)

Solution:

Collecting duct extends from the cortex of the kidney to the inner parts of the medulla. Large amounts of water could be reabsorbed from this region to produce a concentrated urine. This segment allows passage of small amounts of urea into the medullary interstitium to keep up the osmolarity.

(146) Answer : (2)

Solution:

The movements that result in a change of place or location is termed as locomotion. Activities like search of food, shelter, mate, suitable breeding grounds, favourable climatic conditions, involve both locomotion and movement.

(147) Answer : (3)

Solution:

Under normal physiological conditions, the filtrate formed per day is 180 L and urine released per day is 1-1.5 L.

Hence, ratio between these two will be $\frac{180\text{ L/day}}{1.5\text{ L/day}} = 120:1$

(148) Answer : (4)

Solution:

On the basis of striations, muscles are classified as striated and unstriated. On the basis of their regulation, muscles are classified into two categories – voluntary and involuntary.

(149) Answer : (1)

Solution:

Juxta glomerular apparatus is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact.

(150) Answer : (3)

Solution:
On an average, 25-30 gm of urea is excreted out per day.

(151) Answer : (2)
Solution:
In counter current mechanism, the proximity between the Henle's loop and vasa recta, as well as the counter current in them, help in maintaining an increasing osmolarity towards the inner medullary interstitium, *i.e.*, from 300 mOsmolL^{-1} in the cortex to about 1200 mOsmolL^{-1} in the inner medulla. This gradient is mainly caused by NaCl and urea. NaCl is transported by the ascending limb of Henle's loop which is exchanged with the descending limb of vasa recta.

(152) Answer : (2)
Solution:
Ammonia (most toxic nitrogenous waste) produced by metabolic reactions is converted into urea in the liver of mammals and then released into the blood which is filtered and excreted out by the kidneys.

(153) Answer : (4)
Solution:
Each meromyosin has two important parts, a globular head with a short arm and a tail, the former being called the heavy meromyosin (HMM) and the latter is called the light meromyosin (LMM). The HMM component, *i.e*., the head and short arm projects outwards at regular distance and angle from each other from the surface of a polymerised myosin filament and is known as cross arm.

(154) Answer : (2)
Hint:
Also called visceral muscles
Solution:
Visceral muscles are located in the inner wall of hollow visceral organs.
Smooth muscles assist in the transportation of food through the digestive tract and gametes through the genital tract.
Skeletal muscles are voluntary in nature and striated in appearance.

(155) Answer : (3)
Solution:
The length of sarcomere decreases during muscle contraction.

(156) Answer : (2)
Solution:
Bundle of muscle fibres is called fasciculus.

(157) Answer : (2)
Solution:
'I' band contains only actin.
'A' band contains both actin and myosin.

(158) Answer : (2)
Solution:
Urea synthesis is not a step in urine formation. The first step is ultrafiltration or glomerular filtration.

(159) Answer : (4)
Solution:
There are two half 'I' bands made of thin actin filaments on either side of 'Z' lines attached to it.

(160) Answer : (4)
Solution:
During shortening of the muscle, *i.e.,* contraction, the 'I' bands get reduced, whereas the 'A' bands retain the length.

(161) Answer : (4)
Solution:
Liver, the largest gland in our body, secretes bile-containing substances like bilirubin, biliverdin, cholesterol, degraded steroid hormones, vitamins and drugs. Most of these substances ultimately pass out along with digestive wastes.

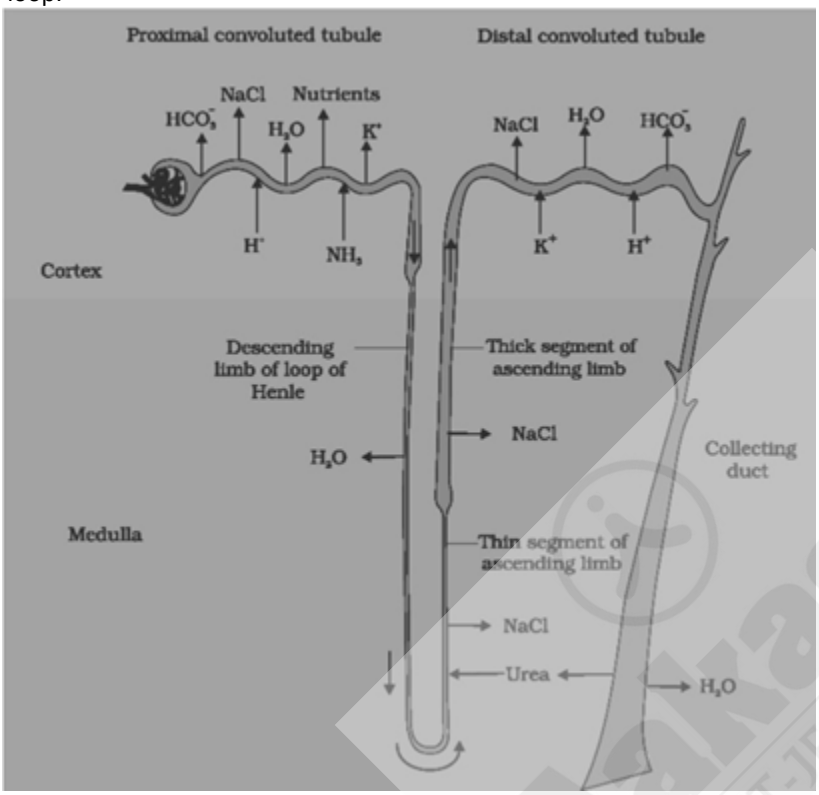
(162) Answer : (3)
Hint:
Composed of actin protein.
Solution:
Leucocytes *i.e*. macrophages and *Amoeba* show locomotion through pseudopodia formation.

(163) Answer : (1)
Solution:
Protonephridia or flame cells – Platyhelminths, rotifers, some annelids and cephalochordate – *Amphioxus*

Antennal glands – Prawn
Malpighian tubules – Terrestrial insects (cockroach)

(164) Answer : (3)
Solution:
Red muscle fibres are also known as aerobic muscle fibres. They have high amount of mitochondria and myoglobin but less amount of sarcoplasmic reticulum.

(165) Answer : (3)
Solution:
Sodium is actively reabsorbed in PCT and DCT but passively reabsorbed in thin segment of ascending limb of Henle's loop.



(166) Answer : (4)
Solution:
The globular head of heavy meromyosin is an active ATPase enzyme and has binding sites for ATP and active sites for actin.

(167) Answer : (1)
Solution:
Monomeric protein of F-actin is G-actin and monomeric protein of thick filament (myosin) is meromyosin.

(168) Answer : (3)
Solution:
Sperms move with the help of flagella.

(169) Answer : (3)
Hint:
Properties of skeletal muscle fibres
Solution:
Muscle fibres possess properties like excitability, contractility, extensibility, elasticity and contractility.

(170) Answer : (3)
Solution:
Minute spaces formed as a result of arrangement of podocytes in the filtration membrane are called filtration slits or slit pores.

(171) Answer : (4)
Solution:

Sweat produced by the sweat glands is a watery fluid containing NaCl, small amounts of urea, lactic acid, *etc*. Sebaceous glands eliminate certain substances like sterols, hydrocarbons and waxes through sebum.

(172) Answer : (2)
Solution:
Each organised skeletal muscle in our body is made of a number of muscle bundles held together by a common collagenous connective tissue layer called fascia.

(173) Answer : (2)
Solution:
The visceral muscles assist in the transport of food through digestive tract and gametes through the genital tract by peristalsis.

(174) Answer : (3)
Solution:
The globular head of myosin acts as an active ATPase enzyme and hydrolyses ATP molecules. The energy derived from the hydrolysis of ATP is used to bind to the exposed active site on actin filament to form a cross bridge. Subunit of troponin covers the active site on actin (thin filament).

(175) Answer : (4)
Solution:
Actin and myosin are contractile proteins. Troponin and tropomyosin are regulatory proteins.

(176) Answer : (4)
Solution:
Ketonuria – Presence of ketone bodies in urine
Tetany – Rapid spasm in muscles due to hypocalcemia
Renal calculi – Stone or insoluble mass of crystallised salts within the kidney.
Uremia – Accumulation of urea in blood.

(177) Answer : (3)
Solution:
Stimulation of renin secretion will increase the secretion of aldosterone by adrenal cortex, which causes increased reabsorption of sodium and water from the distal parts of the tubule.

(178) Answer : (2)
Solution:
Flame cells/protonephridia are excretory structures in platyhelminths *etc.,* while nephridia perform excretion in earthworms and other annelids.

(179) Answer : (4)
Hint:
Produced from atrial wall of heart.
Solution:
ADH prevents diuresis and is also called vasopressin. ANF decreases blood flow as it has vasodilatory effect. Hence, ANF mechanism acts as a check on renin-angiotensin mechanism.

(180) Answer : (2)
Solution:
Dialysing fluid has the same composition as that of plasma except the nitrogenous wastes.