eduvibrant
ENGINEERING & MEDICAL COACHING

Test Solution

Booster Medical

Test Code : PT01-1617-BM

Answer & Solution Biology

1.	B	23.	A
2.	B	24.	A
3.	D	25.	B
4.	C	26.	D
5.	B	27.	A
6.	A	28.	D
7.	A	29.	C
8.	C	30.	D
9.	A	31.	B
10.	A	32.	A
11.	C	33.	C
12.	C	34.	D
13.	B	35.	A
14.	B	36.	B
15.	B	37.	C
16.	A	38.	D
17.	C	39.	B
18.	D	40.	B
19.	B	41.	A
20.	C	42.	C
21.	D	43.	D
22.	C	44.	B

45.	C
46.	C
47.	D
48.	D
49.	A
50.	C
51.	A
52.	D
53.	C
54.	A
55.	C
56.	A
57.	A
58.	C
59.	B
60.	D
61.	C
62.	B
63.	B
64.	A
65.	C
66.	A
67.	B
68.	C
69.	C
70.	C
71.	A
72.	C
73.	B
74.	A
75.	C
76.	D
77.	A
78.	A
79.	A
80.	A
81.	B
82.	C
83.	D
84.	D
85.	D
86.	A
87.	D
88.	C
89.	B
90.	A

Answer & Solution Chemistry

91. 22.4 l of gas = 6.02×10^{23} molecules

$1\ l$ of gas = $\frac{6.02\times10^{23}}{22.4}$

$89.6\ l$ of gas = $\frac{6.02\times10^{23}}{22.4}\times89.6$

= $4 \times 6.02 \times 10^{23}$ molecules

92. % C = $\frac{12}{44}\times100$

= 27.27%

93. Mol. wt. of C_2H_6 = 30

Mol. Wt. of H_2 = 2

Substances are taken in equal wt.

So, 30 g of ethane = 1 mole

30 g of H_2 = 15 mole

Total pressure = 16

Fraction of pressure exerted by H

= 15/16

94. $1s^1\ 2s^2\ 2p^6\ 3s^2\ 3p^5$

1⇂	1⇂	1
−1	0	+1

→ unpaired

$n = 3$

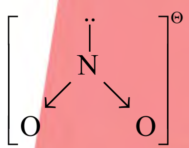
$l = 1$

$m = 1$

95. B

96. $\overleftarrow{C = O} < O = C = O <$ 

97. [N = N − N]⊖, [I − I − I]⊖,

$O \rightarrow \overset{\oplus}{N} = O$, 

98. $N_2 + 3H_2 \rightleftharpoons 2NH_3$

$\Delta ng = -1$

$\Delta H - \Delta U = -RT$

99. $C + O_2 \rightarrow CO_2 \quad \Delta H = -x_1 \quad \Delta H_f^\circ(CO_2)$

$H_2 + \frac{1}{2}O^2 \rightarrow H_2O \quad \Delta H = -x_2 \quad \Delta H_f^\circ(H_2O)$

$-x_3 = 2\Delta H_f^\circ(CO_2) + 3\Delta H_f^\circ(H_2O) - \Delta H_f^\circ(C_2H_6)$

$= -2x_1 - 3x_2 + x_3$

100. $\Delta G = \Delta H - T\Delta S$

For spont $\Delta G < 0$

Also no. of moles increases

So, $\Delta S > O$

Hence $\Delta H > O$

101. New $K_p = \sqrt{\frac{1}{80}} = 0.112$

102. At t = 0 $Q = \frac{[\text{product}]}{[\text{Reatant}]} = \frac{[C][D]}{[A][B]} = 0$

with time conc$^{\underline{n}}$ of product and hence Q also increases.

103. (C) As the no. of moles decreases.

104. (C) remains const. as pressure depends on temperature.

105. For weak monobasic acid

$[H^+] = \sqrt{Ka.c}$

$= \sqrt{1.84\times10^{-4}\times0.05}$

$= 3.0 \times 10^{-3}$ mol. dm^{-3}

pH = $-\log [H^+] = -\log[3.0 \times 10^{-3}] = 2.5$

106. $PbI_2 \rightleftharpoons Pb^{2+} + 2I^-$

1.3×10^{-3} M + $2 \times 1.3 \times 10^{-3}$

Ksp = $[Pb^{+2}]\ [I^-]^2$

$= (1.3 \times 10^{-3})\ (2 \times 1.3 \times 10^{-3})^2$

$= 8.8 \times 10^{-9}$

107. (B)Balance the eq$^{\underline{n}}$ in acidic medium

108. (A)

109. (C) $O > F \quad N > C$

$\downarrow$

Due to half filled orbital greater stability.

110. (B)

111. (D) Reduces $\overset{+1}{Ag_2O}$ to $\overset{\circ}{Ag}$

112. 1 N H_2O_2 = 1.7%

1.5 N H_2O_2 = 1.7 × 1.5

= 2.55

113. (D)

114. $Na + NH_3 \rightarrow Na^+ + (NH_3)e^-$

115. $Na_2CO_3 + H_2O \rightarrow NaOH + H_2CO_3$

NaOH ↓ Strong Base; H_2CO_3 ↓ Weak acid

116. $CsBr_3 \longrightarrow Cs^{\oplus} + Br_3^{\ominus}$

117. (D) $B(OH)_3 + H_2O \longrightarrow B(OH)_4^{\ominus} + H^{\oplus}$

118. $4H_3BO_3 \xrightarrow[-4H_2O]{\Delta} 4HBO_2 \xrightarrow[-H_2O]{\Delta} H_2B_4O_7 \longrightarrow$ Tetra Boric

$\downarrow$ red Hot / $-H_2O$

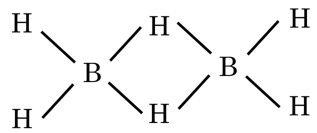
$2B_2O_3$

$\downarrow$

Boron oxide or Boric anhydride

119. Monobasic acid as it gives only H⊕(one).

120.



121. (C)

122. (B)

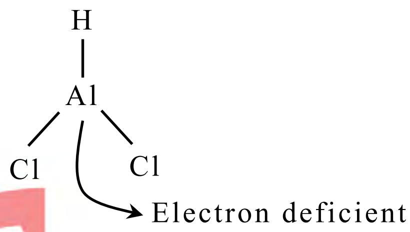
123. (B)

124. (A)

125. (C)

126. (B) 

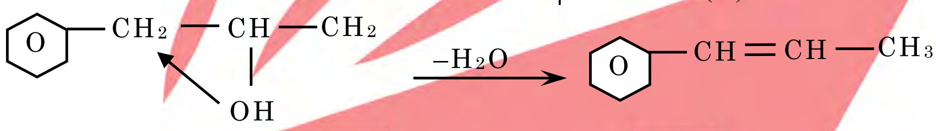
127. (D)



128. $CH_2 = CH - Br + HBr \rightarrow CH_3 - CH(Br)(Br)$

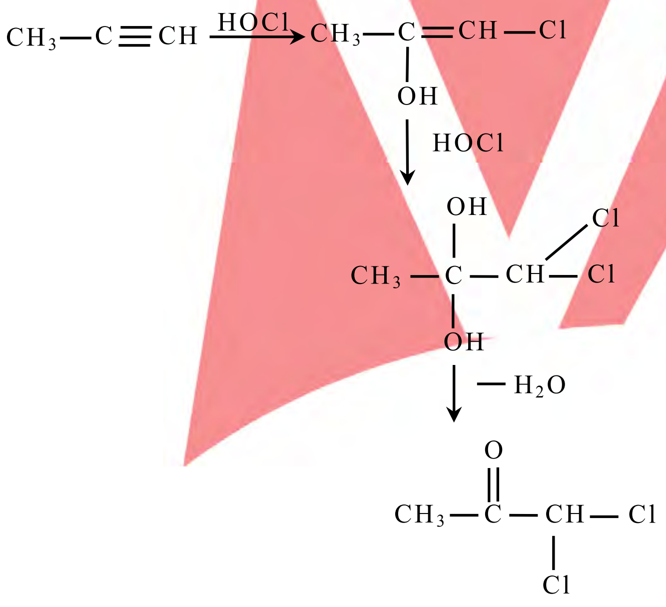
129. (B)

130.

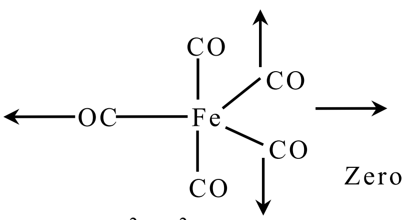


131. (D) Due to Sp Hydridised Carbon.

132.



133.



134. $4Be \rightarrow 1s^2\ 2s^2$

$2s^2$

[1⇂]

n = 2

l = 0

m = 0

s = 1/2

135. 6.022×10^{23} atom $= 12\ g$

$1\ \text{atom} = \dfrac{12}{6.022 \times 10^{23}}\ g$

$= 1.99 \times 10^{-23}$ g

Answer & Solution Physics

136.(D) Momentum, $p = mv = MLT^{-1} = ML^{-3}L^4T^{-4}T^3$

$= DV^4F^{-3}$

137.(D) $X = M^{-1}L^3T^{-2}$

$$\frac{\Delta X}{X} = \frac{\Delta M}{M} + 3\frac{\Delta L}{L} + 2\frac{\Delta T}{T}$$

$= 2 + 3 \times 3 + 2 \times 4 = 19$

138.(D) Distance covered by the object in first 2 s

$$h_1 = \frac{1}{2}gt^2 = \frac{1}{2} \times 10 \times 2^2 = 20\text{m}$$

Similarly, distance covered by the object in next 2 s will also be 20 m, hence the required height = H – 20 – 20

= H – 40 m

139.(C) Maximum acceleration will be from 30 to 40 s, because slope in this interval is maximum.

$$a = \frac{v_2 - v_1}{t_2 - t_1} = \frac{60-20}{40-30} = 4ms^{-2}$$

140.(A) $\vec{v}_c = 25\hat{i}, \vec{v}_{b/c} = 25\sqrt{3}\hat{j}$

$$\vec{V}_{b/c} = \vec{V}_b - \vec{V}_c \Rightarrow \vec{V}_b = \vec{V}_{b/c} + \vec{V}_c$$

$$\Rightarrow \quad \vec{v}_b = 25\hat{i} + 25\sqrt{3}\hat{j}$$

$$|v_b| = \sqrt{25^2 + (25\sqrt{3})^2} = 50\,\text{km h}^{-1}$$

$$\tan\theta = \frac{25}{25\sqrt{3}} = \frac{1}{\sqrt{3}} \Rightarrow \theta = 30^\circ$$

141.(B) H = 100 m, R = 2 × 200 = 400 m

$$\tan\theta = \frac{4H}{R} \Rightarrow \tan\theta = \frac{4\times100}{400} = 1$$

$$\Rightarrow \quad \theta = 45^\circ \quad \left[\because \frac{H}{R} = \frac{\tan\theta}{4}\right]$$

142.(A) Acceleration of the system :

$$a = \frac{P}{M+m} \quad \text{(i)}$$

The FBD of mass m is shown in the figure.

$R \sin\beta = ma$ (ii)

$R \cos\beta = mg$ (iii)

From Eqs. (ii) and (iii), we get

$a = g \tan\beta$

Putting the value of a in (i), we get

$P = (M + m)g \tan\beta$

143.(B) Here

$$a = \frac{m_1 - m_2}{m_1 + m_2}g,$$

if $m_1 > m_2$.

But a = $g/8$

$$\frac{g}{8} = \left(\frac{m_1 - m_2}{m_1 + m_2}\right)g$$

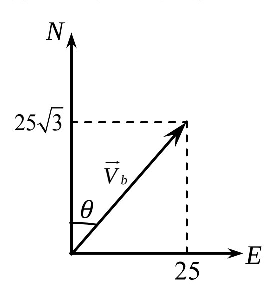
or $m_1 : m_2 = 9 : 7$

144.(C) Given horizontal force F = 25 N and coefficient of friction between block and wall (μ) = 0.4.

We know that at equilibrium horizontal force provides the normal reaction to the block against the wall. Therefore, normal reaction to the block (R) = F = 25 N.

We also know that weight of the block (W) = Frictional force

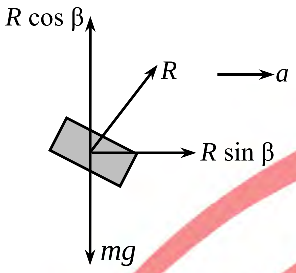
= μR = 0.4 × 25 = 10 N.



145.(D) Net force, $\vec{F} - mg\hat{i} = m(a_0\hat{j} - 2a_0\hat{i})$

$$\Rightarrow \quad \vec{F} = m\left(-2a_0\hat{i} + (a_0 + g)\hat{j}\right) = m(-g\hat{i} + \frac{3g}{2}\hat{j})$$

$$\Rightarrow \quad F = m\sqrt{g^2 + \left(\frac{3g}{2}\right)^2} = \frac{\sqrt{13}mg}{2}$$



146.(C) Let us assume that the displacement of the body is directly proportional to t^n, i.e.,

$$s = Kt^n, \; v = \frac{ds}{dt} = Knt^{n-1}$$

$$\text{and} \quad a = \frac{dv}{dt} = Kn(n-1)t^{n-2}$$

Force $F = ma = mKn(n-1)t^{n-2}$

Power, $P = Fv = [mKn(n-1)t^{n-2}]\,[Knt^{n-1}]$

$= mkn^2(n-1)t^{2n-3}$

As power is constant, i.e, independent of time, hence

$$2n - 3 = 0 \;\; \text{or} \;\; n = \frac{3}{2} \;\; \text{or} \;\; s \propto t^{\frac{3}{2}}$$

147.(D) $f(x) = -\frac{dU}{dx}(x)$ or $U(x) = -\int F(x)dx$

Here $F(x) = -kx$, where k is a positive constant.

148.(A) $m_1u_1 = m_2v_2$

$$\frac{1}{2}m_2v_2^2 = \frac{1}{2}\left[\frac{1}{2}m_1u_1^2\right]$$

$$\Rightarrow \quad (m_2v_2)v_2 = \frac{1}{2}(m_1u_1)u_1 \quad \Rightarrow \quad v_2 = \frac{u_1}{2}$$

$$e = \frac{v_2 - v_1}{u_1 - u_2} = \frac{v_2 - 0}{u_1 - 0} = \frac{v_2}{u_1} \quad \Rightarrow \quad e = \frac{1}{2}$$

149.(A) In this problem, the velocity of the earth before and after the collision may be assumed zero. Hence, coefficient of restitution will be

$$e^n = \frac{v_1}{v_0} \times \frac{v_2}{v_1} \times \frac{v_3}{v_2} \times \ldots \times \frac{v_n}{v_n - 1}$$

where v_n is the velocity after nth rebounding and v_0 is the velocity with which the ball strikes the earth for the first time.

Hence,

$$e^n = \frac{v_n}{v_0} = \frac{\sqrt{2gh_n}}{\sqrt{2gh_0}}$$

where h_n is the height to which the ball rises after nth rebounding. Hence,

$$e^n = \frac{v_n}{v_0} = \frac{\sqrt{h_n}}{\sqrt{h_0}}$$

150.(A) Mass of each of the four parts $= \frac{M}{3}$

Mass of the plate including the cut piece $= \frac{4M}{3}$

Moment of inertia of the whole plate (including the cut piece) about the said axis $= \left(\frac{4M}{3}\right)\frac{l^2}{6}$

Now moment of inertia of the remaining portion should be ¾ of the above = $Ml^2/6$

151.(A) $T_1 - mg = ma$

$$r(T_2 - T_2) = I\alpha$$

$$Mg - T_3 = Ma$$

$$r(T_3 - T_2) = I\alpha$$

and $a = R\alpha$

From Eqs. (ii) and (iv), we get

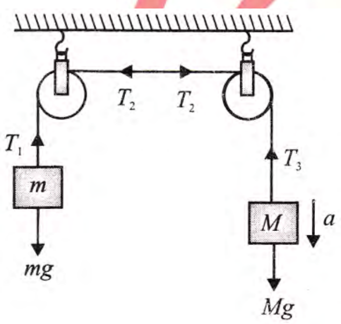
$$T_3 - T_1 = \frac{2Ia}{R^2}$$

From Eqs. (i) and (iii), we get

$$(M - m)g = (M + m)a + T_3 - T_1$$

$$(M - m)g = (M - m)a + \frac{2Ia}{r^2}$$

$$a = \frac{(M - m)g}{\left(M + m + \frac{2I}{r^2}\right)}$$



152.(A) Total mechanical energy is given by

$$E = K + u = -\frac{GMm}{2a} - \frac{GMm}{a} = \frac{-GMm}{2a}$$

$$\frac{GM}{a} = v^2 \Rightarrow E = -\frac{1}{2}mv^2$$

153.(C) $F_G = \dfrac{Gm^2}{4R^2} \Rightarrow \dfrac{mv^2}{R} = \dfrac{Gm^2}{4R^2}$

$$\therefore\ v = \frac{1}{2}\sqrt{\frac{Gm}{R}}$$

154.(C) Work done $= \dfrac{1}{2} F \times \text{Extension}$

$$= \frac{1}{2} \times \frac{YA}{L} \times 1 \qquad Y = \frac{F \times L}{A \times 1}$$

$$= \frac{YA}{2L} \qquad F = \frac{YA}{L}$$

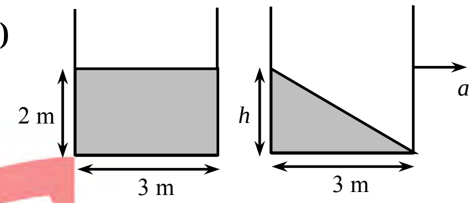
155.(C) $m = alp$, m and ρ are constants.

$$\therefore\ \frac{a_1}{a_2} = \frac{l_2}{l_1} = \frac{3}{2}$$

Now, $Y = \dfrac{Fl}{a\Delta l}$ or $\Delta l \propto \dfrac{l}{a}$

or $\dfrac{\Delta l_1}{\Delta l_2} = \dfrac{l_1}{l_2} \times \dfrac{a_2}{a_1} = \dfrac{2}{3} \times \dfrac{2}{3}$ or $\dfrac{\Delta l_1}{\Delta l_2} = \dfrac{4}{9}$

156.(B)



Volume equality gives

$$2 \times 3 = \frac{1}{2} \times h \times 3 \quad \Rightarrow h = 4 \text{ m}$$

$$\therefore\quad \tan\theta = \frac{4}{3} = \frac{a}{g} \quad \Rightarrow a = \frac{4}{3}g$$

157.(B) Using equation of continuity, we have

$$v_2 = \frac{A_1}{A_2} v_1$$

From Bernoulli's theorem,

$$p_1 + \rho g h_1 + \frac{1}{2}\rho v_1^2$$

$$p_2 + \rho g h_2 + \frac{1}{2}\rho v_2^2 \quad \Rightarrow g(h_1 - h_2) = \frac{1}{2}(v_2^2 - v_1^2)$$

$$\Rightarrow \quad 60 = \left(\frac{A_1^2}{A_2^2} - 1\right)v_1^2 \quad \Rightarrow \frac{A_1}{A_2} = \frac{4}{1}$$

158.(B) If the sheet is heated then both d_1 and d_2 will increase since the thermal expansion of isotropic solid is similar to true photographic enlargement.

159.(D) According to Newton's law of cooling

$$\frac{\theta_1 - \theta_2}{t} \propto \left[\frac{\theta_1 + \theta_2}{2} - \theta\right]$$

For the first condition

$$\frac{80 - 60}{60} \propto \left[\frac{80 + 60}{2} - 30\right] \qquad \text{(i)}$$

and for the second condition

$$\frac{60 - 50}{t} \propto \left[\frac{60 + 50}{2} - 30\right] \qquad \text{(ii)}$$

By solving Eqs. (i) and (ii), we get t = 48 s.

160.(A) From ideal gas equation,

$$PV = \mu RT$$

$$\therefore \quad P = \frac{\mu R}{V} T$$

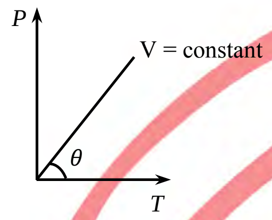
Comparing, this equation with $y = mx$

Slope of line, tan θ = m = μR/V

$$i.e., \quad V \propto \frac{1}{\tan\theta}$$

If means line of smaller slope represents greater volume of gas.

For the given problem figure



Points 1 and 2 are on the same line, so they will represents same volume, i.e., $V_1 = V_2$.

Similarly points 3 and 4 are on the same line, so they will

represents same volume, i.e., $V_3 = V_4$.

But $V_1 > V_3$ ($= V_4$) or $V_2 > V_3$ ($= V_4$) as slope of line 1–2 is less than that of 3–4.

161.(C) In second part there is a vacuum, i.e., P = 0. So work done in expansion = $P\Delta V$ = 0.

Also, ΔQ = 0. From the first law of thermodynamics, $\Delta U = 0$

i.e., temperature of an ideal gas remains same due to free expansion.

162. (B)

163.(C) $v_1 = \omega\sqrt{a^2 - x_1^2}, \quad v_2 = \omega\sqrt{a^2 - x_2^2}$

We get, $a = \sqrt{\dfrac{v_1^2 x_2^2 - v_2^2 x_1^2}{v_1^2 - v_2^2}}$

164.(D) $y = 4\sin\left(4\pi t - \dfrac{\pi}{16}x\right)$

$\omega = 4\pi, k = \pi/16$

$v = \dfrac{\omega}{k} = \dfrac{4\pi}{\pi/16} = 64 \text{ cm/s}$

In positive x-direction

165.(C) Node means a point at which medium particles do not displace from its mean position and antinode mean a point at which particles oscillate with maximum possible amplitude. Nodes and antinodes are obtained for both types of stationary waves, transverse and longitudinal. Hence , options (A) and (B) both are wrong . To obtain a stationary wave, two waves travelling in opposite directions, having same amplitude, same frequency are required. They must have same nature, means either both of the wave should be longitudinal or both of them should be transverse. Hence, option (C) is correct.

166. (A) Upthrust = V$\rho_{liquid}(g - a)$

where a = download acceleration and

V = volume of liquid displaced

But for free fall, a = g ⇒ Upthrust = 0

167.(C) Time taken by water to reach the bottom

$$= t = \sqrt{\frac{2(H-D)}{g}}$$

and velocity of water coming out of hole, $v = \sqrt{2gD}$

∴ Horizontal distance covered $x = v \times t$

$$= \sqrt{2gD} \times \sqrt{\frac{2(H-D)}{g}} \quad = 2\sqrt{D(H-D)}$$

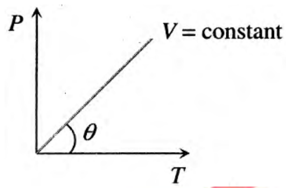
168.(A) W = weight of liquid.

f_B = buoyant force on the ball

mg = weight of the ball

N = normal reaction between the ball and the surface

The free-body diagrams of the balls in each vessel are as follows.



At base, reaction force of buoyant force will act in downward direction.

The forces acting at the base of each t ank are

$F_A = W + f_B = W + mg$

$F_B = W + f_B = W + mg$

$F_C = W + f_B + N = W + mg$

Thus, $F_A = F_B = F_C$

169.(C) On heating the system; x, r and d all increase, since the expansion of isotropic solids is similar to true photographic enlargement.

170.(A) $K_1 = 9K_2$, $l_1 = 18$ cm, $l_2 = 6$ cm, $\theta_1 = 100°C$, $\theta_2 = 0°C$

Temperature of the junction

$$\theta = \frac{\frac{K_1}{l_1}\theta_1 + \frac{K_2}{K_2}\theta_2}{\frac{K_1}{l_1} + \frac{K_2}{l_2}}$$

$$\Rightarrow \theta = \frac{\frac{9K_2}{18}100 + \frac{K_2}{6}\times 0}{\frac{9K_2}{18} + \frac{K_2}{6}} = \frac{50+0}{8/12} = 75^\circ C$$

171.(A) According to Newton's law of cooling, the rate of cooling of a body is directly proportional to the temperature difference between the body and the surroundings

172.(A) From ideal gas equation,

$$PV = \mu RT$$

$$\therefore \quad P = \frac{\mu R}{V} T$$

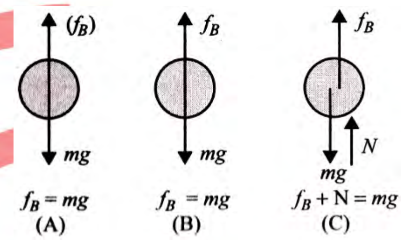
Comparing, this equation with y = mx

Slope of line, $\tan\theta = m = \mu R/V$

$$\text{i.e., } V \propto \frac{1}{\tan\theta}$$

If means line of smaller slope represents greater volume of gas

For the given problem figure



Points 1 and 2 are on the same line, so they will represents same volume, i.e., $V_1 = V_2$

Similarly points 3 and 4 are on the same line, so they will represent same volume, i.e., $V_3 = V_4$.

But $V_1 > V_3$ (= V_4) or $V_2 > V_3$ (= V_4) as slope of line 1–2 is less than that of 3–4.

173.(C) From the given V–T diagram, we can see that in process AB, V ∝ T. Therefore pressure is constant (as quantity of the gas remains same).

In process BC, V = constant and in process CA, T = constant.

Therefore these processes are correctly represented on P–V diagram by graph (c).

174.(B) Thermal energy corresponds to internal energy.

Mass = 1 kg

Density = 8 kg/m^3

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}} = \frac{1}{8}\text{m}^3$$

Pressure = 8×10^4 N/m^2

$$\text{Internal energy } \frac{5}{2}P \times V = 5\times 10^4 \text{ J}$$

175.(C) Let T be the time period; then $\frac{T}{2}=\frac{5\pi}{64}-\frac{\pi}{64}=\frac{4\pi}{64}$

$$T=\frac{\pi}{8}\text{s}$$

$$\therefore \quad \omega=\frac{2\pi}{T}=\frac{2\pi}{(\pi/8)}=16\text{ rad/s}$$

Also, A = 10 cm (from the graph)

The equation of the sinusoidal wave can be written as y = 10 sin (16t + ϕ) cm, where ϕ is the initial phase.

From the graph, corresponding to the crest = 10 xm; when t = 3π/64.

$$10\text{ cm}=10\sin\left[16\left(\frac{3\pi}{64}\right)+\phi\right]\text{cm}$$

$$\sin\left[\frac{3\pi}{4}+\phi\right]=1 \quad \text{or} \quad \frac{3\pi}{4}+\phi=\frac{\pi}{2}\Rightarrow\phi=-\frac{\pi}{4}$$

$$\therefore \quad y=10\sin\left(16t-\frac{\pi}{4}\right)$$

176.(C) Let the acceleration be f; $f=-\omega^2x$

Therefore, distance of the particle from the centre at any time t is given by

x = r cos (ωt), where r is the amplitude

when t = 1 s, $x=r-a$

$\therefore \quad (r-a)=r\cos\omega$

$$\cos\omega=\frac{r-a}{r} \quad \text{(i)}$$

When t = 2 s, $x=r-a-b$,

therefore $r-a-b=\cos 2\omega$

$\therefore \quad r-a-b=r(\text{s}\cos^2\omega-1) \quad \text{(ii)}$

Substituting the value of cos ω from Eq. (i) in Eq. (ii).

we get $r-a-b=r\left[2\frac{(r-a)^2}{r^2}-1\right]$

$$=\frac{2(r-a)^2}{r}-r$$

$$\therefore \quad r(3a-b)=2a^2 \quad \Rightarrow r=\frac{2a^2}{3a-b}$$

177.(B) A(1 – cos ωt) = a

A(1 – cos 2ωt) = 3a

$$\cos\omega\tau=\left(1-\frac{a}{A}\right)$$

$$\cos 2\omega\tau=\left(1-\frac{3a}{A}\right)$$

$$2\left(1-\frac{a}{A}\right)^2-1=1-\frac{3a}{A}$$

Solving the equation

$$\frac{a}{A}=\frac{1}{2}$$

$\Rightarrow$ A = 2a

$$\cos\omega t=\frac{1}{2}$$

T = 6 τ

178.(B) After 2 sec the pulses will overlap completely. The string becomes straight and therefore does not have any potential energy and its entire energy must be kinetic.

179.(A) $x=a\sin\left(\omega t+\frac{\pi}{6}\right)$

$$x'=a\cos\omega\text{t}=a\sin\left(\omega t+\frac{\pi}{2}\right)$$

Therefore, phase difference

= (π/2) – π/6

(π/3)

180. **(C)**