WEEKLY TEST TYM-02 TEST 18 RAJPUR ROAD
SOLUTION Date 22-12-2019

[PHYSICS]

1. (d)

2. (a) $\omega = \sqrt{\dfrac{\text{Acceleration}}{\text{Displacement}}} = \sqrt{\dfrac{2.0}{0.02}} = 10\,rad\,s^{-1}$

3. (b) From given equation $\omega = 3000$, $\Rightarrow n = \dfrac{\omega}{2\pi} = \dfrac{3000}{2\pi}$

4. (b)

5. (b) Given, $v = \pi\,cm/\sec$, $x = 1\,cm$ and $\omega = \pi s^{-1}$

using $v = \omega\sqrt{a^2 - x^2} \Rightarrow \pi = \pi\sqrt{a^2 - 1}$

$\Rightarrow 1 = a^2 - 1 \Rightarrow a = \sqrt{2}\,cm.$

6. (b) Length of the line = Distance between extreme positions of oscillation = 4 *cm*

So, Amplitude $a = 2\,cm.$

also $v_{\max} = 12\,cm/s.$

$\because v_{\max} = \omega a = \dfrac{2\pi}{T}a$

$\Rightarrow T = \dfrac{2\pi a}{v_{\max}} = \dfrac{2\times 3.14\times 2}{12} = 1.047\,\sec$

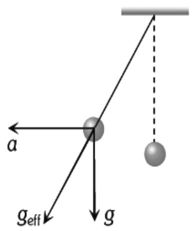
7. (c) $T = 2\pi\sqrt{\dfrac{l}{g}} \Rightarrow T \propto \sqrt{l}$

8. (b) When a little mercury is drained off, the position of *c.g.* of ball falls (*w.r.t.* fixed and) so that effective length of pendulum increases hence *T* increase.

9. (b) Initially time period was $T = 2\pi\sqrt{\dfrac{l}{g}}$.

When train accelerates, the effective value of *g* becomes $\sqrt{(g^2 + a^2)}$ which is greater than *g*

Hence, new time period, becomes less than the initial time period.



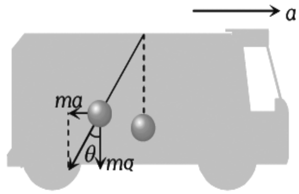
10. (b) As we know $g = \dfrac{GM}{R^2}$

$\Rightarrow \dfrac{g_{\text{earth}}}{g_{\text{planet}}} = \dfrac{M_e}{M_p}\times\dfrac{R_p^2}{R_e^2} \Rightarrow \dfrac{g_e}{g_p} = \dfrac{2}{1}$

Also $T \propto \dfrac{1}{\sqrt{g}} \Rightarrow \dfrac{T_e}{T_p} = \sqrt{\dfrac{g_p}{g_e}} \Rightarrow \dfrac{2}{T_p} = \sqrt{\dfrac{1}{2}}$

$\Rightarrow T_p = 2\sqrt{2}\,\sec$.

11. (b) In accelerated frame of reference, a fictitious force (pseudo force) *ma* acts on the bob of pendulum as shown in figure.



Hence,

$\tan\theta = \dfrac{ma}{mg} = \dfrac{a}{g}$

$\Rightarrow \theta = \tan^{-1}\left(\dfrac{a}{g}\right)$ in the backward direction.

12. (c) $T = 2\pi\sqrt{\dfrac{l}{g}}$ (Independent of mass)

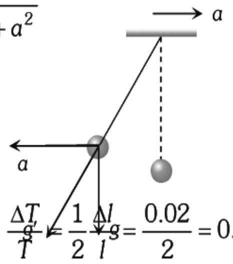
13. (c) In stationary lift $T = 2\pi\sqrt{\dfrac{l}{g}}$

In upward moving lift $T' = 2\pi\sqrt{\dfrac{l}{(g+a)}}$

(a = Acceleration of lift)

$\Rightarrow \dfrac{T'}{T} = \sqrt{\dfrac{g}{g+a}} = \sqrt{\dfrac{g}{\left(g+\dfrac{g}{4}\right)}} = \sqrt{\dfrac{4}{5}} \Rightarrow T' = \dfrac{2T}{\sqrt{5}}$

14. (d) $g' = \sqrt{g^2 + a^2}$



15. (d) $T \propto \sqrt{l} \Rightarrow \dfrac{\Delta T}{T} = \dfrac{1}{2}\dfrac{\Delta l}{l} = \dfrac{0.02}{2} = 0.01 \Rightarrow \Delta T = 0.01T$

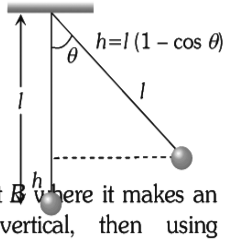
Loss of time per day $= 0.01\times 24\times 60\times 60$
$= 864\,\sec$

16. (b) At *B*, the velocity is maximum using conservation of mechanical energy

$\Delta PE = \Delta KE \Rightarrow mgH = \dfrac{1}{2}mv^2 \Rightarrow v = \sqrt{2gH}$

17. (c) If suppose bob rises up to a height *h* as shown then after releasing potential energy at extreme position becomes kinetic energy of mean position

$\Rightarrow mgh = \frac{1}{2}mv_{max}^2 \Rightarrow v_{max} = \sqrt{2gh}$

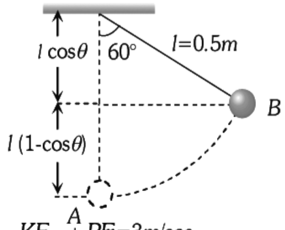


Also, from figure $\cos\theta = \frac{l-h}{l}$

$\Rightarrow h = l(1-\cos\theta)$

So, $v_{max} = \sqrt{2gl(1-\cos\theta)}$

18. (d) Let bob velocity be v at point B where it makes an angle of 60° with the vertical, then using conservation of mechanical energy



$KE_A + PE_A = KE_B + PE_B$

$\Rightarrow \frac{1}{2}m\times 3^2 = \frac{1}{2}mv^2 + mgl(1-\cos\theta)$

$\Rightarrow 9 = v^2 + 2\times 10\times 0.5\times\frac{1}{2} \Rightarrow v = 2\ m/s$

19. (a) If initial length $l_1 = 100$ then $l_2 = 121$

By using $T = 2\pi\sqrt{\frac{l}{g}} \Rightarrow \frac{T_1}{T_2} = \sqrt{\frac{l_1}{l_2}}$

Hence, $\frac{T_1}{T_2} = \sqrt{\frac{100}{121}} \Rightarrow T_2 = 1.1T_1$

% increase = $\frac{T_2 - T_1}{T_1}\times 100 = 10\%$

20. (c) $T = 2\pi\sqrt{l/g} = 2\pi\sqrt{\frac{1}{\pi^2}} = 2\ sec$

[CHEMISTRY]

21. (a) $\underset{2}{PCl_5} \rightleftharpoons \underset{0}{PCl_3} + \underset{0}{Cl_2}$

$\frac{2\times 60}{100}\quad \frac{2\times 40}{100}\quad \frac{2\times 40}{100}$

Volume of container = 2 *litre*.

$K_c = \frac{\frac{2\times 40}{100\times 2}\times\frac{2\times 40}{100\times 2}}{\frac{2\times 60}{100\times 2}} = 0.266$.

22. (d) Δn = 1 for this change

So the equilibrium constant depends on the unit of concentration.

23. (c) $K = \frac{[NO_2]^2}{[N_2O_4]} = \frac{\left[2\times\frac{10^{-3}}{2}\right]^2}{\left[\frac{.2}{2}\right]} = \frac{10^{-6}}{10^{-1}} = 10^{-5}$.

24. (b) For $A + B \rightleftharpoons C + D$

$K = \frac{[C]\ [D]}{[A]\ [B]} = \frac{0.4\times 1}{0.5\times 0.8} = 1$.

25. (a) $K = \frac{[NH_3]^2}{[N_2]\ [H_2]^3}$

27. (d) $A + B \rightleftharpoons C + D$

$x \quad x \quad 0 \quad 0$

$2x \quad 2x$

$K_c = \frac{[C][D]}{[A][B]} = \frac{2x.2x}{x.x} = 4$

28. (d) $\underset{(1-\alpha)}{\overset{}{\underset{1}{N_2O_4}}} \rightleftharpoons \underset{2\alpha}{\underset{0}{2NO_2}}$

total mole at equilibrium $= (1-\alpha) + 2\alpha = 1 + \alpha$

29. (b) $K = \frac{[C_2H_6]}{[C_2H_4]\ [H_2]} = \frac{[mole/litre]}{[mole/litre]\ [mole/litre]}$

= *litre*/*mole*. or litre mole^{-1}.

31. (b) $K_c = \frac{[HI]^2}{[H_2]\ [I_2]} = \frac{(28)^2}{8\times 3} = 32.66$

32. (a) $N_{2(g)} + O_{2(g)} \rightleftharpoons 2NO_{(g)}$; $\quad \Delta n = 2 - 2 = 0$

33. (b) The rate of forward reaction is two times that of reverse reaction at a given temperature and identical concentration $K_{equilibrium}$ is 2 because the reaction is reversible. So $K = \frac{K_1}{K_2} = \frac{2}{1} = 2$.

35. (b) $K_c = \frac{K_f}{K_b} \therefore K_b = \frac{K_f}{K_c} = \frac{10^5}{100} = 10^3$

37. (d) $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

For $1dm^3$ $R = k[SO_2]^2[O_2]$

$R = K\left[\frac{1}{T}\right]^2\left[\frac{1}{1}\right] = 1$

For $2dm^3$ $R = K\left[\frac{1}{2}\right]^2\left[\frac{1}{2}\right] = \frac{1}{8}$

So, the ratio is 8 : 1

38. (d) $K = \frac{[C][D]}{[A][B]} = \frac{\frac{1}{3} \times \frac{1}{3}}{\frac{2}{3} \times \frac{2}{3}} = \frac{1}{4} = 0.25$

So, $K = 0.25$

39. (d)

H_2	+	I_2	$\rightleftharpoons$	$2HI$
0.4		0.4		0.50
$0.4 - 0.25 = 0.15$		$0.4 - 0.25 = 0.15/2$		$0.50/2$

$$K_c = \frac{[HI]^2}{[H_2][I_2]} = \frac{\left[\frac{0.5}{2}\right]^2}{\left[\frac{0.15}{2}\right]\left[\frac{0.15}{2}\right]} = \frac{0.5 \times 0.5}{0.15 \times 0.15} = 11.11$$

40. (c) The equilibrium constant does not change when concentration of reactant is changed as the concentration of product also get changed accordingly.