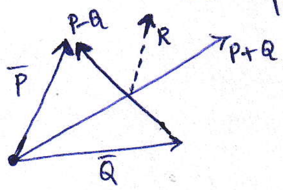
51) $K.E = \frac{1}{2}mv^2 \longrightarrow$ dimensions $[M^1L^2T^{-2}]$ [2]

54) $V = 22.4$ litre , ~~litre~~ $1m^3 = 1000$ litre [1]

$1 \text{ litre} = \frac{1m^3}{1000}$

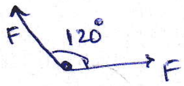
$V = \frac{22.4}{1000} m^3 = 2.24 \times 10^{-2} m^3$

56) 

the resultant $\bar{R}$ and $\bar{P}$ are parallel $\rightarrow \theta = 0°$ [4]

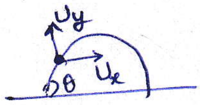
57) $|\bar{A} \cdot \bar{B}| = 6 \rightarrow AB\cos\theta = 6$ [3]

$|\bar{A} \times \bar{B}| = 6\sqrt{3} \rightarrow AB\sin\theta = 6\sqrt{3}$ } $\tan\theta = \sqrt{3}$, $\theta = 60°$

58) 

$R = \sqrt{F^2 + F^2 + 2FF\cos 120°}$ [3]

$= \sqrt{F^2 + F^2 - F^2} = F$

59) 

$U_x = U\cos\theta \rightarrow$ No acceleration along Horizontal (constant velocity) [4]

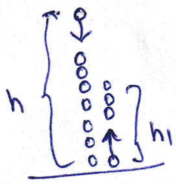
$U_y = U\sin\theta \rightarrow$ gravity is there, velocity changes

60) $H = \frac{U^2\sin^2\theta}{2g}$ $\quad \theta = 45° \rightarrow$ $H = \frac{U^2}{4g}$, $R = U^2/g$ } $\rightarrow H = \frac{R}{4} \rightarrow R = 4H$ [4]

$R = \frac{U^2 \sin 2\theta}{g}$

61) $U_x = U\cos\theta = 10\cos 60° = 10 \times \frac{1}{2} = 5$ m/sec [4]

62) Static > Kinetic > Rolling $\quad \mu_s > \mu_K > \mu_R$ [1]

63) 

$P.E = mgh$

$= 10\, mg$

20% P.E losses $\rightarrow$ so 80% energy remains [2]

$80\%(10mg) = mgh_1$

$8mg = mgh_1 \longrightarrow h_1 = 8$ metre.

64) $K.E = \frac{1}{2}mv^2 = \frac{1}{2} \times 10 \times 5^2 = \frac{250}{2} = 125$ Joule. [2]

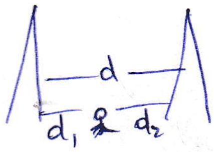
65) 
h increases $\longrightarrow P.E = mgh$ is max at Max height. [2]

66) $T = 2\pi\sqrt{\frac{l}{g}}$ earth , $g_{moon} = \frac{g}{6}$ $\quad$ Now $l_2 = \frac{g_m T^2}{4\pi^2} = \frac{gT^2}{6(4\pi^2)}$ [2]

$l_2 = \frac{l_1}{6}$ decreases.

67) $A\omega = 10$, $\omega^2 A = 31.4$ } $\omega = \frac{31.4}{10} = 3.14$ [3]

$\frac{2\pi}{T} = 3.14 \longrightarrow T = 2$ sec.

68) 

$d = d_1 + d_2$

$= \frac{ct_1}{2} + \frac{ct_2}{2}$

$= \frac{340}{2}(t_1 + t_2) = 170(1+2) = 170 \times 3 = 510$ m.

[3]

69) $T = \frac{1}{\Delta n} = \frac{1}{|n_1 \sim n_2|} = \frac{1}{2} = 0.5$ sec.

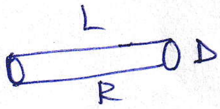
[2]

72) $F = \frac{\mu_0}{4\pi} \frac{m_1 m_2}{d^2}$ Now pole strengths $\longrightarrow 2m_1, 2m_2$

distance $\longrightarrow 2d$

[2]

$\therefore F_2 = \frac{\mu_0}{4\pi} \times \frac{2m_1 \times 2m_2}{(2d)^2} = \frac{\mu_0}{4\pi} \times \frac{\cancel{4} m_1 m_2}{\cancel{4} d^2} = F$ (Unchanged)

74) 

$R = \frac{\rho L}{A}$, $A = \pi r^2 = \frac{\pi D^2}{4}$

[3]

Now $D \longrightarrow \frac{D}{2} \longrightarrow R_1 = \frac{\rho L}{A_1}$, $A_1 = \frac{\pi (D/2)^2}{4} = \frac{\pi D^2}{16} = \frac{A}{4}$

$R_1 = \frac{\rho L}{A/4} = 4 \frac{\rho L}{A} \Rightarrow R_1 = 4R$

75) $\frac{P}{Q} = \frac{R}{S} \longrightarrow \frac{5}{15} = \frac{R+12}{60}$

[1]

$\longrightarrow \frac{1}{3} = \frac{R+12}{60} \longrightarrow 20 = R + 12$

$\longrightarrow R = 8\,\Omega$