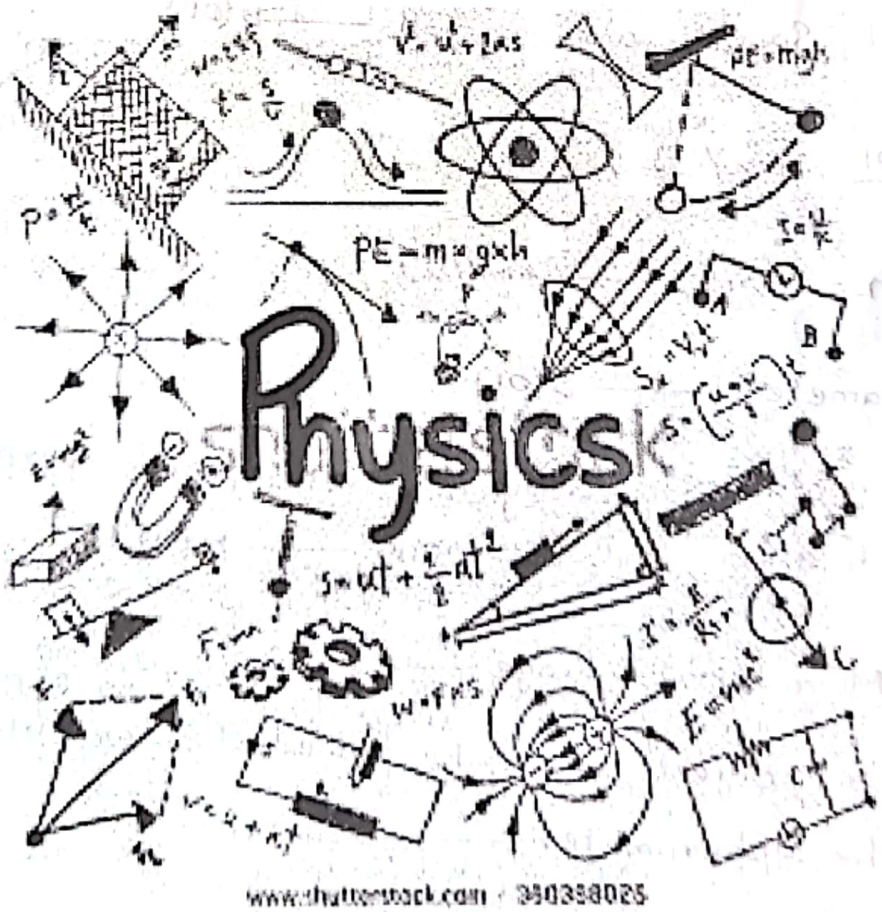
தொண்டைமானாறு வெளிக்கள நிலையம் நடாத்தும்
முதலாம் தவணைப் பரீட்சை - 2022
Conducted by Field Work Centre, Thondaimanaru.
1st Term Examination - 2022

FWC

Physics | **Gr -12 (2023)** | **Answer**

பகுதி - I

01) 2	06) 1	11) 5	16) 3	21) 5
02) 2	07) 5	12) 2	17) 2	22) 4
03) 2	08) 4	13) 4	18) 3	23) 4
04) 3	09) 3	14) 3	19) 5	24) 4
05) 5	10) 5	15) 2	20) 2	25) 5



Part II A Structure.

01. (I) A - Anvil
B - Locknut
C - Ratchet
D - Thimble.

If 4 correct ——▷ (03)
If 3 correct ——▷ (02)
If 2 correct ——▷ (01)

(II) 0.01 mm ——▷ (01)

(III) 0 → 25 mm ——▷ (01)

(IV) a - -0.04 mm ——▷ (02)
b - +0.02 mm ——▷ (02)

(V) Should be added ——▷ (01)
Should be subtracted. ——▷ (01)

(VI) Anvil, Spindle are faded. ——▷ (01)
Anvil, Spindle are rusted. ——▷ (01)

(VII) $\frac{0.01}{x} \times 100\% = 1\%$

$x = 1\text{mm}$ ——▷ (02)

(VIII) Diameter ——▷ (01)

By obtaining reading in several places perpendicular to each other and the mean. ——▷ (02)

(IX) a) Micro screw guage ——▷ (01)

b) This object cannot be placed between the legs of the spherometer. ——▷ (01)

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02. a) (i) Naming parts.

If everything is correct ——▷ (02)

If any 2 or 3 correct ——▷ (01)

(ii) $0.5 - \frac{49}{50} \times 0.5$

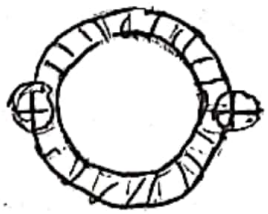
$= 0.01$ mm ——▷ (02)

b) Fitting horizontally in the same straight line with the traveling microscope. ——▷ (02)

c) Rotate the microscope vertically and measuring the ... between the objective and the paper when observing the clear image of the paper on the microscope platform.-

d) Fitting the end of the capillary tube approximately ... this distance. ——▷ (01)

e)



——▷ (02)

f) 75.36 ± 0.01 mm ——▷ (02)

g) $D = 75.36 - 69.36$

$= 6.00$ mm ——▷ (02)

h) $A = \pi \left(\frac{D}{2}\right)^2 - \pi \left(\frac{d}{2}\right)^2$

i) $l = 114.95 - 16.45$

$= 98.50$ mm. ——▷ (01)

j) $V = A \times l$

$= \frac{\pi}{4}(D^2 - d^2)\, l$

$= \frac{3}{4}\left[6^2 - 3^2\right] \times 10^{-6} \times 98.5 \times 10^{-3}$ ——▷ (01)

$= \frac{3}{4} \times 27 \times 98.5 \times 10^{-9}$

$= 1.99 \times 10^{-6}\ m^3$ ——▷ (01)

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03. a) Rule → (02)

b) $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$ ——▷ (02)

If $\theta = 0$, obtained maximum resultant. $R_{max} = P + Q$ ——▷ (01)

If $\theta = 180°$, obtained minimum resultant $R_{min} = P - Q$ ——▷ (01)

c) (i) Pull down weight W_1 or W_2 (P or Q) or stone, and slowly release it to see if it reaches the starting position and relaxes. ——▷ (02)

(ii) To check that if there is friction between pulleys and axis. ——▷ (02)

(iii) Pencil, Divider, Set square, Mirror, Pins. ——▷ (02)

d) (i) Keep the set square vertically and mark two points.

or

Place the mirror under the threads and mark two points when its image disappear. ——▷ (02)

(ii) Draw the lines that go through the marked points.

Measure the weight of the plates and add to the weight.

Select the suitable scale and mark the side length

Draw the equal and parallel sides to complete the parallelogram. ——▷ (02)

(iii) $R = \sqrt{P^2 + Q^2 + 2PQ\cos\theta}$

$= \sqrt{20^2 + 30^2 + 2\times20\times30\times\cos45^\circ}$

$= \sqrt{400 + 900 + 2\times600\times\frac{1}{\sqrt{2}}\times\frac{\sqrt{2}}{\sqrt{2}}}$

$= \sqrt{1300 + 600\times1.4}$

$= \sqrt{2140}$

$= 46.26\ g.$ ——▷ (02)

e) * If string is not weightless. ——▷ (01)

* If the pulleys have friction. ——▷ (01)

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04. a) (i) $P = 35\times0.16 = 5.6\ Ns$ ——▷ (01)

(ii) $I = \frac{1}{2}\times0.08\times280$ ——▷ (01)

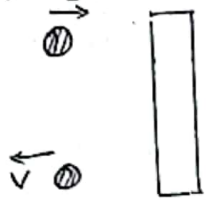
$= 11.2\ Ns.$ ——▷ (01)

From the area covered with the time axis on the graph. ——▷ (01)

(iii) $F_{av} = \frac{I}{t} = \frac{11.2}{0.08}$ or $F_{av} = \frac{280+0}{2}$

$= 140N$ $= 140N$ ——▷ (02)

(iv) 35 →



← v

$I = mv - m(-35)$

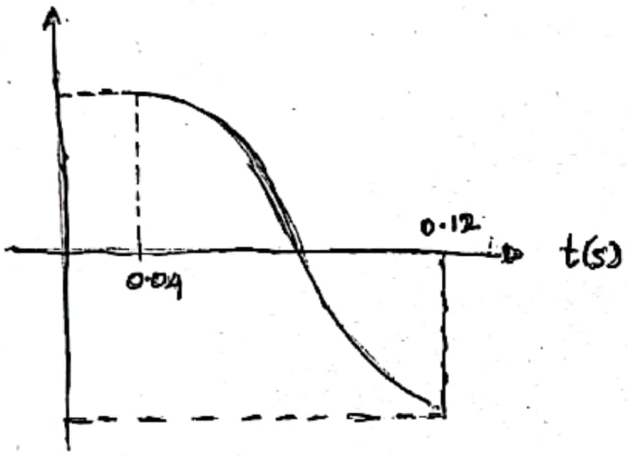
$I = m(v+35)$

$v + 35 = I/m$.

$v + 35 = \frac{11.2}{0.16}$

$v = 35\ ms^{-1}$ ——▷ (02)

(v)



For graph ——▷ (02)

To indicate the values in the axis. ——▷ (02)

b) (i) $\frac{1}{2}mv^2 = mgh$

$v^2 = 2 \times 10 \times 0.2$.

$v = 2\ ms^{-1}$ ——▷ (02)

(ii) $a = \frac{\Delta V}{t}$

$= \frac{2-0}{0.1}$

$= 20\ ms^{-2}$ ——▷ (01)

(iii) $F_{av} - mg = ma$. ——▷ (02)

$F_{av} = 50(10+20)$

$= 1500\ N$ ——▷ (01)

(iv) $K.E = \frac{1}{2}mv^2$

$= \frac{1}{2} \times 50 \times 2^2$

$= 100\ J$ ——▷ (01)

(v) $P = \frac{K.E}{t} = \frac{100}{0.1} = 1000\ W$ ——▷ (01)

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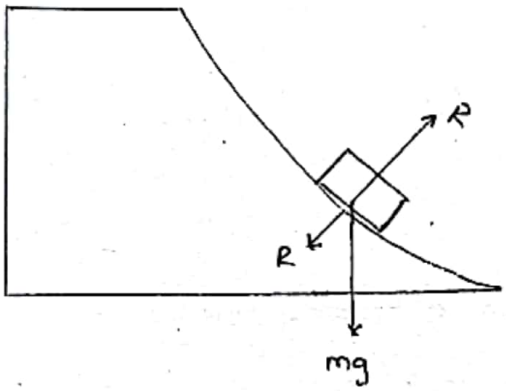
Part II B (Essay)

01. (a) (I)



→ (02)

(II) According to conservation of energy,

$mgh = \frac{1}{2} m v_0^2$

$v_0 = \sqrt{2gh}$ → (02)

(III) No.

The reaction force acts always perpendicular to the direction of motion of the block. → (02)

b) (I) →

According to conservation of momentum,

$0 = mv - M(-v')$ → (01)

$v' = \frac{mv}{M}$ → (02)

(II) $mgh = \frac{1}{2} mv^2 + \frac{1}{2} M(v')^2$ → (1)

$mgh = \frac{1}{2} mv^2 + \frac{1}{2} M\left(\frac{mv}{M}\right)^2$ For substitute. → (01)

$mgh = \frac{1}{2} mv^2 + \frac{1}{2} M \frac{m^2 v^2}{M^2}$

$2gh = v^2 + \frac{mv^2}{M}$

$v^2 = \frac{2gh}{1 + m/M} \Rightarrow v = \sqrt{\frac{2gh}{1 + m/M}}$ → (02)

(iii) Yes ——→ (01)

The component of the normal reaction acting on the direction of motion of the block A ——→ (02)

(c) (i) $\frac{1}{2}mu^2$ ——→ (02)

(ii) 1) 0 ——→ (02)

2) 0 ——→ (02)

iii According to conservation of momentum,

$mu = (m+M)u_0$ ——→ (02)

$u_0 = \frac{mu}{m+M}$ ——→ (01)

(iv) $\frac{1}{2}mu^2 = \frac{1}{2}(m+M)u_0^2 + mgh_0$ ——→ (01)

$\frac{1}{2}mu^2 = \frac{1}{2}(m+M)\left(\frac{mu}{m+M}\right)^2 + mgh_0$ For substitute. ——→ (01)

$h_0 = \frac{mu^2}{2g(m+M)}$ ——→ (02)

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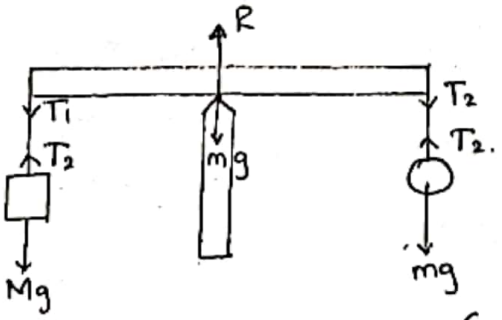
(02) (a) (i) The resultant force to be zero ——→ (02)

The moment of force to be zero ——→ (02)

(ii) To write the principle of the moment. ——→ (03)

(b) (i)



Normal reaction R ——→ (01)

Tension T_1, T_2 ——→ (02)

Weight mg, Mg ——→ (02)

(For both indicate and name)

(II) ↑ For equilibrium

$R = T_1 + T_2$

$R = (M+m)g$ ⟶ (02)

Vertically upward. ⟶ (01)

(III) Moment of force about the edge

$Mgx = mgx$ ⟶ (02)

$m = M.$

(IV) To take the moment of force about the pivot point to equlibrium

$Mgx\cos\theta = mgx\cos\theta$ ⟶ (01)

$m = M$ ⟶ (01)

(c) (I) To the vertical equlibrium of the pan

$3T\cos 30^\circ = m'g$ ⟶ (01)

$T = \frac{2m'g}{3\sqrt{3}}$ ⟶ (02)

(II) $G = 4\times10^{-2} \times \sin(5.74^\circ) \times 100\times10^{-3} \times 10$ ⟶ (02)

$= 4\times10^{-3}$ Nm ⟶ (01)

(III) Moment of force about the pivot point

$10\times25\times10^{-2}\cos(5.74^\circ) = 4\times10^{-3} + (m+0.2)\,10\times25\times10^{-2}\times\cos(5.74^\circ)$ ⟶ (02)

$m = 0.7984$ kg

$= 798.4$ g ⟶ (01)

(IV) Equlibrium occurs at the position of slope when the unequal mass is placed on the pan of the balance. Due to the moment of the beam mass, the slope further increases as the imbalance increases. ⟶ (02)

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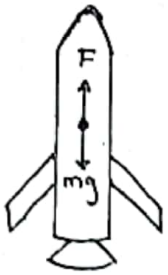
(03) (a) (I)



⟶ (03)

(II) ↑ For rocket

$\uparrow S = ut + \frac{1}{2}at^2$ ⟶ (01)

$1000 = 0 \times 40 + \frac{1}{2} \times a \times 40^2$

$a = 1.25\ ms^{-2}$ ⟶ (01)

(III) For rocket

$\uparrow F = ma$ ⟶ (01)

$F - mg = ma$ ⟶ (01)

$F = m(a+g)$

$= 5 \times 10^5 (1.25 + 10)$

$= 5.625 \times 10^6\ N$ ⟶ (01)

(IV) 1) The velocity of rocket with respect to earth.

$(V_{RE}) \uparrow$

$\uparrow v = u + at$ ⟶ (01)

$V_{RE} = 0 + 1.25 \times 40$

$= 50\ ms^{-1}$ ⟶ (01)

2) Velocity of object A with respect to earth.

$V_{AE} \uparrow \quad V_{AE} = 50\ ms^{-1}$ ⟶ (01)

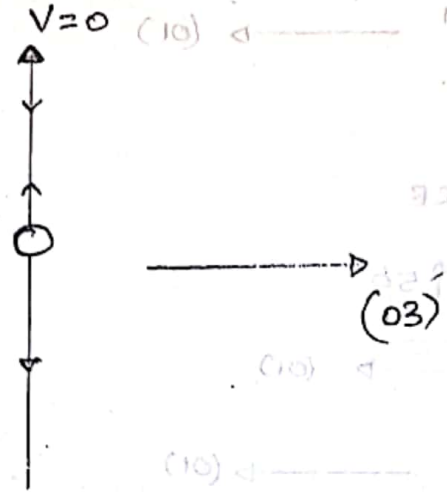
3) Velocity of object A with respect to rocket.

$V_{AR} = V_{AE} + V_{ER}$ ⟶ (01)

$= 50\uparrow + \downarrow 50$

$= 0$ ⟶ (01)

(V)



(VI) $\uparrow S = ut + \frac{1}{2}at^2$ ⟶ (01)

$-1000 = 50 \times t + \frac{1}{2} \times (-10) t^2$

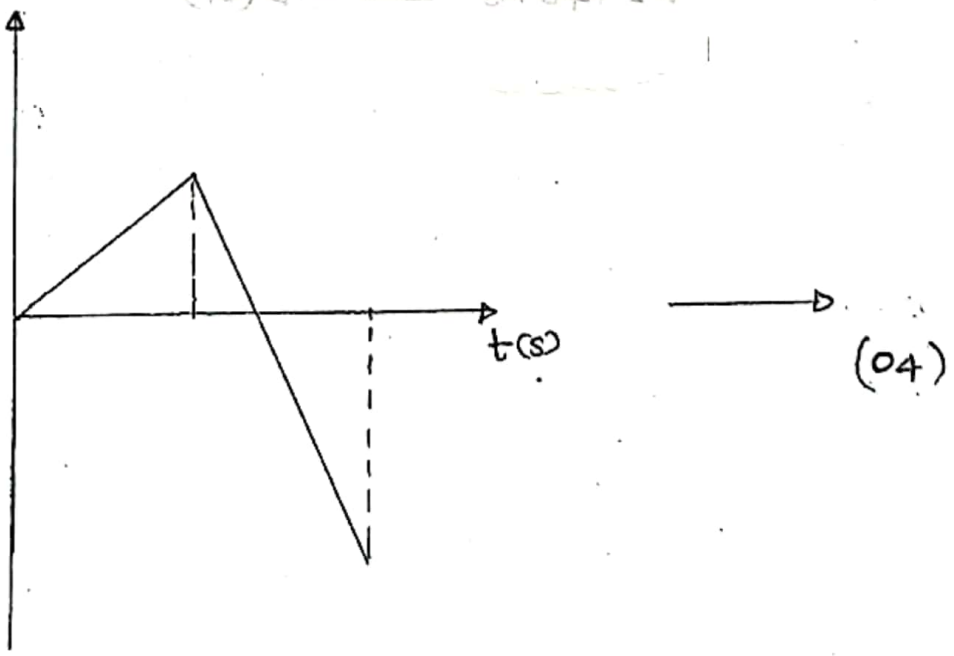
$t = 20s$ ⟶ (01)

(VII) $\uparrow V = u + at$ ⟶ (01)

$-V = 50 + (-10)\,20$

$V = 150\ ms^{-1}$ ⟶ (01)

(VIII) $V(ms^{-1})$



(04)

(b) (I) $V_{AR} = \downarrow 50 ms^{-1}$ ⟶ (01)

$V_{RE} = \uparrow 50 ms^{-1}$

$V_{AE} = V_{AR} + V_{RE}$

$= \downarrow 50 + \uparrow 50$

$= 0$ ⟶ (01)

(II) $\downarrow S = ut + \frac{1}{2}at^2$ ⟶ (01)

$1000 = \frac{1}{2} \times 10 \times t^2$

$t = \sqrt{200}$

$t = 10\sqrt{2}$

$= 10 \times 1.4$

$= 14 s$ ⟶ (01)

(III) $\downarrow = V = u + at$ ⟶ (01)

$V = 0 + 10 \times 14$

$V = 140 ms^{-1}$ ⟶ (01)

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