

SAMIA SUB-COUNTY FORM FOUR JOINT EXAMINATION - 2021

PHYSICS PAPER 1
MARKING SCHEME

1. a) $-0.02\text{cm} \checkmark^1$

b) $2.13 + 0.02 = 2.15 \checkmark^1$

2. mass displaced $= (20 \times 0.6)$
 $= 12\text{g} \checkmark^1$

Density $= \frac{\text{mass}}{\text{volume}}$

$= \frac{12}{60} \checkmark^1$

$= 0.2\text{g/cm}^3 \checkmark^1$

3. - Surface tension $\checkmark^1$

- Weight of the drop $\checkmark^1$

4. Clockwise moments $=$ anti-clockwise moment $\checkmark^1$

$W \times 1.6 = T \times 0.4$

$40 \times 1.6 = 0.4T \checkmark^1$

$T = \frac{40 \times 1.6}{0.4}$

$= 160\text{N} \checkmark^1$

5. A loses heat through evaporation because of the large surface area. B because dull surface is a good emitter of heat. (2 marks)

6. $1 \text{ rev} = 2\pi^0$

$43 \text{ rev} = 43 \times 2\pi^0$

$= 86 \pi^0$

$\omega = 270.212 \text{ c/s} \checkmark^1$

$V = r\omega \checkmark^1$

$= \frac{10}{100} \times 270.212 \text{ m/s} = 27.0212 \text{ m/s} \checkmark^1$

7. a) A collision in which objects combine / fuse, losing kinetic energy in the process $\checkmark^1$

b) Final momentum $=$ initial momentum

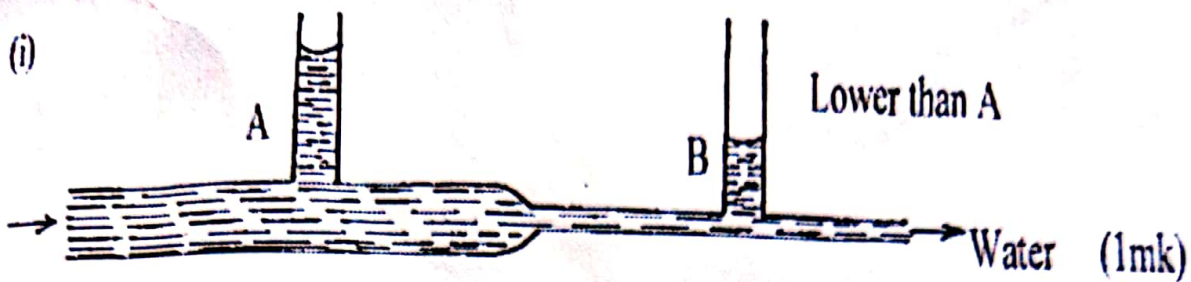
$(0.5 + 1.5)V = (0.5 \times 1.2) + (1.5 \times 0.2) \checkmark^1$

$2.0V = 0.6 + 0.3$

$2.0V = 0.9$

$V = 0.45\text{m/s} \checkmark^1$

8.



$$\text{ii) } V_B A_B = V_A A_A$$

$$V_B \times 2 \times 10^{-4} = 0.6 \times 8 \times 10^{-4}$$

$$V_B = \frac{0.6 \times 8 \times 10^{-4}}{2 \times 10^{-4}}$$

$$= 2.4 \text{ ms}^{-1}$$

9. Power = $\frac{\text{work done}}{\text{time taken}}$

$$= \frac{\text{force} \times \text{distance moved}}{\text{Time taken}} \checkmark^1$$

$$= \frac{mg \times d}{t}$$

$$= \frac{(60 \times 10 \times 25) \text{ W}}{30} \checkmark^1$$

$$= 500 \text{ W} \checkmark^1$$

SECTION B

~~at the upper end of the tower is the~~

10 (i) Effort distance = $V.R \times L_d$.
 $= 6 \times 1.5$ ✓
 $= 9m$ ✓

(ii) Work done _{by effort} = Effort $\times$ Effort distance
 $= 500N \times 9m$ ✓
 $= 4500J$ ✓

(iii) useful work done = Load $\times$ load distance
 $= 2800 \times 1.5$ ✓
 $= 4200J$ ✓

(iv) $M.A = \frac{L}{E} = \frac{2800}{500} = 5.6$ ✓

(v) $E_f = \frac{M.A}{V.R} \times 100$ ✓
 $= \frac{5.6}{6} \times 100$ ✓
 $= 93.33\%$ ✓

(vi) Friction between the moving parts of the machine.

11 (i) $H = \frac{1}{2} g t^2$ ✓

$20 = \frac{1}{2} \times 10 \times t^2$ ✓

$t = 2.0 \text{ sec.}$ ✓

$$\begin{aligned} \text{(ii)} \quad R &= ut \\ &= 20 \times 2 \checkmark \\ &= 40 \text{ m} \checkmark \end{aligned}$$

$$\begin{aligned} \text{(iii)} \quad v &= u + at \checkmark \\ &= 0 + 10(2) \\ &= 20 \text{ m/s} \checkmark \end{aligned}$$

$$\begin{aligned} \text{(iv)} \quad \frac{F_1}{A_1} &= \frac{F_2}{A_2} \checkmark \\ F_1 &= \frac{25000 \times 50}{2500} \checkmark \\ &= 500 \text{ N} \checkmark \end{aligned}$$

$$\begin{aligned} \text{(v)} \quad \text{Pressure due to water} &= h \rho g \\ &= h \times 1000 \times 10 \\ \text{Pressure exerted} &= \frac{F}{A} = \frac{25000}{0.25} = 100,000 \text{ N/m}^2 \\ h \rho g &= 100000 \\ 10000h &= 100000 \\ h &= \underline{10 \text{ m}} \checkmark \end{aligned}$$

12(a) Quantity of heat required to change a mass of a substance from solid state to liquid state without change in temperature.

$$\begin{aligned} \text{(b)(i)} \quad \text{Heat absorbed by ice} &= m l_f \checkmark \\ &= 0.02 \times 33400 \\ &= 668 \text{ J} \checkmark \end{aligned}$$

$$\begin{aligned}
 (ii) \quad Q &= mc\theta \\
 &= 0.02 \times 4200 T \\
 &= 84T \text{ Joules}
 \end{aligned}$$

$$\begin{aligned}
 (iii) \quad \text{Heat loss} &= M_{\text{WW}} c \theta + m_{\text{c}} c \theta \\
 &= 0.2 \times 4200 (60 - T) + 0.08 \times 900 (60 - T) \\
 &= 50400 - 840T + 4320 - 72T \\
 &= 54720 - 912T
 \end{aligned}$$

$$\begin{aligned}
 (iv) \quad \text{Heat loss} &= \text{Heat gained} \\
 54720 - 912T &= 84T \\
 996T &= 54720 \\
 T &= 54.94^\circ \\
 &\approx 55^\circ
 \end{aligned}$$

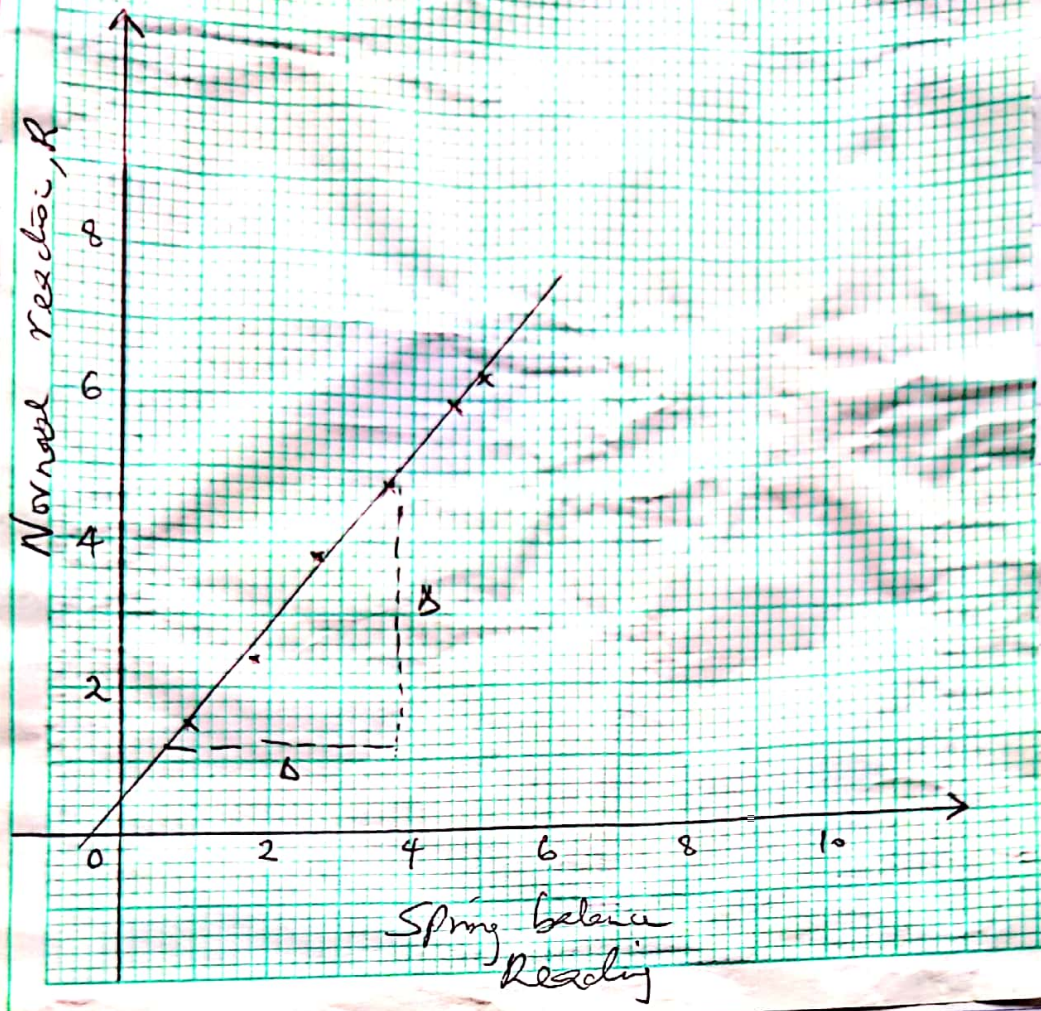
13 (a)	Mass of block (g)	Normal Reaction, R	Spring balance reading
		1.569	
	160	1.569	0.9
	250	2.452	1.8
	390	3.825	2.7
	490	4.805	3.7
	600	5.884	4.6
	640	6.276	5.0

3 mms for au
 2 mk for 4-5
 1 mk for 3

(b) Graph.

$$\begin{aligned}
 (c) \quad \text{Gradient} &= \frac{\Delta R}{\Delta F} = \frac{5.2 - 1.8}{4.0 - 1.0} \\
 &= \frac{3.4}{3} \\
 &= 1.13
 \end{aligned}$$

(b)



(c) Gradient = $\frac{\Delta \text{Normal}}{\Delta \text{balance read.}}$ ✓ = $\frac{5.0 - 1.2}{3.8 - 0.6}$
= 1.188 ✓

(d) Coefficient of friction

(e) Static friction

14(a) A floating body displaces its own weight of the fluid ^{in which} it floats.

(b) Upthrust in water = $40 - 30 = 10\text{N}$
Upthrust in paraffin = $40 - 35 = 5\text{N}$

$$R.D = \frac{\text{upthrust in liq. X}}{\text{upthrust in water}} = \frac{5}{10} = \underline{\underline{0.5}}$$

(c) Volume of Water displaced = $20 \times 10 = 200 \text{ cm}^3$
 Mass of Water displaced = $20 \times 1 \text{ g/cm}^3 = 20 \text{ g} \checkmark$
 Mass of lead shots = $20 \text{ g} - 10 \text{ g} = 10 \text{ g} \checkmark$ or 0.01 kg

(ii) Mass of test tube and contents = $20 \times 1.25 = 25 \text{ g} \checkmark$
 Mass to be added = $25 \text{ g} - 20 \text{ g} = 5 \text{ g} \checkmark$