

232/1

PHYSICS

PAPER 1

(THEORY)

FORM FOUR

END TERM 1 2023 EXAMS

MARKING SCHEME

1. 16.21mm ✓ 1 correct answer with correct units
Accept 1.621cm or 0.01621m

2. Momentum is conserved momentum before =
momentum after

$$72 \times 9 = 216 \times 4 \checkmark 1$$

$$\Rightarrow u = \frac{72 \times 9}{216} \checkmark 1$$

$$= 3.0 \text{ m/s} \checkmark 1$$

3. Roofing materials allows radiations to penetrate
into the greenhouse ✓ 1 but not out. Higher
concentration of carbon dioxide inside the
greenhouse helps to retain higher temperature by
trapping/ insulating ✓ 1 the heat.

4.



Effort ✓
Correct running
of the rope ✓
Correct label
of Load and
Effort ✓

5. V.R = 3 ✓ 1

6. Increase in temperature increases ✓ 1 the speed of
sound.

7. i) Convection takes place in air upwards direct
due to ✓ 1 to density defect.

ii) Convection requires a ✓ 1 material medium
but the space between the sun and the earth
i.e. space of the atmosphere has no material
medium

8. From the equation of continuity

$$A_1 U_1 = A_2 U_2 \checkmark 1 (\text{flow rate is constant})$$

$$120 \times 0.4 = 4 \times U_2$$

$$\therefore U_2 = \frac{120 \times 0.4}{4} \checkmark 1$$

$$= 12 \text{ ms}^{-1} \checkmark 1$$

9. Work done on the mass

$$= \text{force} \times \text{distance}$$

$$= 25 \times 10 \times 120$$

$$= 5000 \text{ J} \checkmark 1$$

$$\text{Work done} = \text{power} \times \text{time}$$

$$= 200 \times 30 \checkmark 1$$

$$= 6000 \text{ J} \checkmark 1$$

$$\text{But} = \frac{\text{work output}}{\text{work input}} \times 100$$

$$= \frac{5000}{6000} \times 100$$

$$= 83.3\% \checkmark 1$$

10. $\Delta H = MC\Delta\theta$

$$= \frac{150}{1000} \times 1000 \times 4200 \times (70 - 15) +$$

$$390 \times 20 \times (70 - 15)$$

$$= 34650.000 + 429000$$

$$= 463650 \checkmark 1$$

$$\text{Energy dissipation } E = pt$$

$$3000 \times t = 463650 \checkmark 1$$

$$\Rightarrow t = \frac{463650}{3000} = 154.55 \text{ sec} \checkmark 1$$

11. At balance

Sum of clockwise = sum of anti-clockwise
moments

$$\left(\frac{180}{1000} \times 100\right) \times 40 = 30 \times X + (10 \times 1.8) \checkmark 1$$

$$1.8 \times 40 = 30X + 18$$

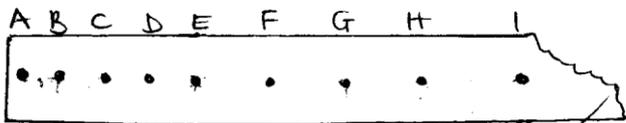
$$X = \frac{1.8 \times 40 - 18}{30} \checkmark 1$$

$$= 1.8 \text{ N} \checkmark 1$$

12. To increase surface area of contact thus reducing
pressure exerted on the road ✓ 1

SECTION B

13. a)



AE — 2.5cm ± 0.1
 EI — 4.5cm ± 0.1
 Increasing order ✓

b) i) Velocity = $\frac{\text{displacement}}{\text{time}}$
 $= \frac{2.5}{4 \times 0.02} \checkmark 1$
 $= 31.25 \text{ cms}^{-1} \checkmark 1$ OR 0.3125 ms^{-1}

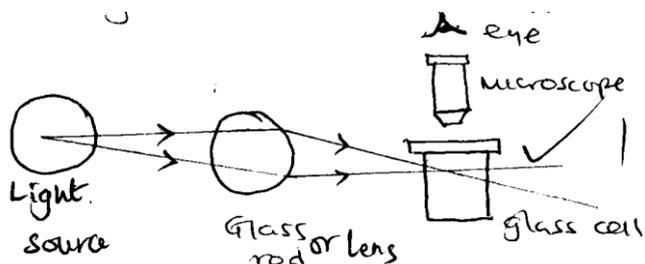
ii) E to I
 Velocity = $\frac{4.5}{4 \times 0.02} \checkmark 1$
 $= 56.25 \text{ cms}^{-1} \checkmark 1$

c) a) $a = \frac{u-v}{t}$
 $= \frac{0.5625 - 0.3125}{0.02 \times 8}$
 $= \frac{0.25}{0.16} = 1.5625 \text{ ms}^{-2}$

d) End A ✓ 1

- e) i) Trolley runs on a straight path on the runway ✓ 1
 ii) Tape lies flat on the horizontal surface. ✓ 1

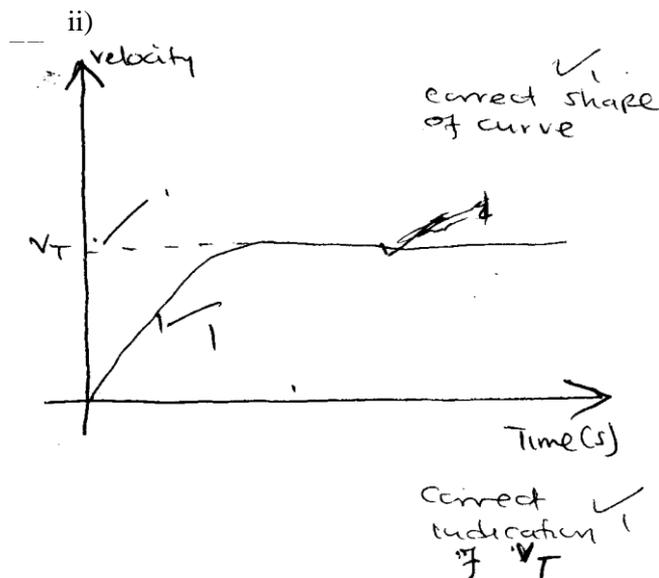
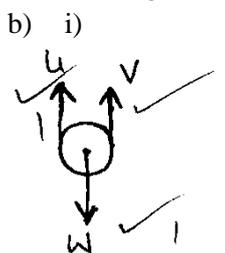
14. i) Brownian motion is the continuous erratic/random motion in either gas or liquid molecules ✓ 1
 ii) - A small glass with air and carbon (smoke) particles ✓ 1
 - the glass cell is strongly illuminated by a filament lamp directed by a perspex rod ✓ 1
 - the particles scatter light and they can be viewed through a microscope ✓ 1
 - they appear as bright specks (spots) moving with the same irregular random motion



b) i) $V = \pi r^2 h$
 $0.01 \times (10^{-3})^3 = 3.14 \times r^2 \times h \checkmark 1$
 $h = \frac{0.01 \times 10^{-9}}{3.14 \times r^2} \checkmark 1$
 $= \frac{0.01 \times 10^{-9}}{500 \times 10^{-4}} = 2 \times 10^{-10} \text{ m} \checkmark 1$

- ii) i) Oil spreads to form a monolayer ✓ 1
 ii) Oil patch formed is exactly circular. There is no evaporation of oil molecules movement/spreading ✓ 1 of the oil molecules are elastic.

15. a) i) In elastic collision – K.E and momentum of the objects are conserved ✓ 1
 Elastic collision – only momentum is conserved ✓ 1
 ii) Initial momentum = Final momentum
 $2M_B U_B + M_A U_A = 3M V \checkmark 1$
 $0 + M U_A = 3M u \checkmark 1$
 $3M u = M U$
 $u = \frac{M U}{3M}$
 $= \frac{u}{3} \text{ ms}^{-1} \checkmark 1$



16. a) i) $\omega = 2\pi f$
 $= 2\pi \times 10$
 $= 20\pi \text{ rad s}^{-1}$
 $= 62.83 \text{ rad}^{-1}$
 $T_A = M \omega^2 r - mg$
 $= (1 \times 62.83^2 \times 0.5) - (1 \times 10) \checkmark 1$

$$= 19 + 3.9 - 10$$

$$= 1963.9\text{N}\checkmark 1$$

ii) At the lowest point

$$F_c = T - Mg$$

$$\Rightarrow Fe + Mg$$

$$= mr \omega^2 + mg$$

$$= 1 \times 0.5 \times 62.83^2 + (1 \times 10)\checkmark 1$$

$$= 1973.9 + 10$$

$$= 1983.9\text{N}\checkmark 1$$

- b) i) - Electric heater is switched $\checkmark 1$ on.
 - Time is obtained for a certain temperature rise $\checkmark 1$
 - Mass of block is obtained $\checkmark 1$

$$pt = MC\theta$$

$$c = \frac{pt}{M\theta}\checkmark 1$$

ii) $pt = MC\Delta\theta$

$$\Rightarrow C = \frac{pt}{MC\Delta\theta}$$

$$= \frac{90 \times 15 \times 60}{2 \times (30 - 20)}\checkmark 1$$

$$= \frac{81000}{2 \times 10}\checkmark 1$$

$$= 4050\text{JKg}^{-1}\text{k}^{-1}$$

17. a) i) $\Sigma C.m = \Sigma A.C.M$

$$40(0.25 - u) = 30 \times 20\checkmark 1$$

$$10 - 40u = 600$$

$$40u = -590$$

$$U = \frac{-590}{40}\checkmark 1$$

$$= -14.75\text{N}\checkmark 1$$

$$\therefore u = 14.75 \text{ (acting upwards)}$$

ii) $U = \text{wgt of liquid displaced}$

$$14.75 = mg$$

$$= v \times \rho \times g$$

Vol of liquid displaced = vol of block

$$= \frac{M_b}{\rho_b}$$

$$= \frac{25}{1000} \times 200 = 0.00125\checkmark 1$$

$$\therefore 14.75 = 0.00125 \times \rho \times 10$$

$$\Rightarrow \rho = \frac{14.75}{0.00125 \times 10}\checkmark 1$$

$$= 1180\text{kgm}^{-3}\checkmark 1$$

b) i) A floating object displaces its own weight of the fluid on which it floats $\checkmark 1$

ii) Tension + Upthrust = weight

Upthrust = wgt of H_2O displaced

Vol. of H_2O displaced = vol of aluminium

$$= \frac{\text{Mass of aluminium}}{\text{Density of aluminium}} = \frac{1}{2.7 \times 10^{-3}}$$

$$= 3.7 \times 10^{-4} \text{ m}^3\checkmark 1$$

$$\text{Mass of H}_2\text{O} = \rho_w \times v_w$$

$$= 1000 \times 3.7 \times 10^{-4}$$

$$= 3.7 \times 10^{-1}\text{kg}$$

\therefore upthrust = wgt of H_2O displaced

$$= 3.7 \times 10^{-1} \times 10$$

$$= 3.7\text{N}\checkmark 1$$

Since $T + U = W$

$$T = W - U$$

$$= Mg - U$$

$$T = (10 \times 1) - 3.7$$

$$= 6.3\text{N}\checkmark 1$$