PHYSICS PAPER 1

ANSWERS

KCSE 2010

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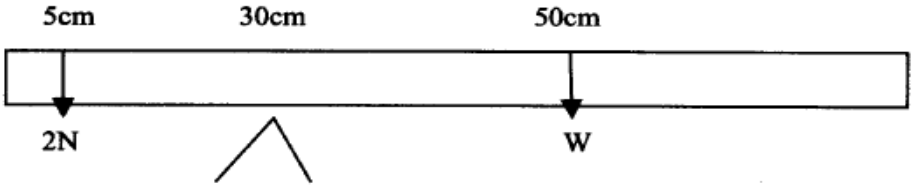
Physics Paper 1

1. 1.62cm
2. Time = (2.53 + 0.50)s = 3.03s
3. Air molecules expelled by heating;
   cooling creates partial vacuum – pressure
   inside is less than atmospheric pressure.
   Therefore collapses: **(2 marks)**

4. Flame heats air which becomes less dense and hence moves upwards. This will push the blades upwards and cause clockwise rotation.
   This creates a conventional current (2 marks)

5. Flask which is in contact with the heat expands first. Then the liquid expands more than glass. (2 marks)

6. 

   W x 0.2 = 2 x 0.25 (1 mark)

   $\therefore W = \frac{2 \times 0.25}{0.2} = 2.5N$ (1 mark)

7. The tube below Y is narrower than the tube below X. So water flows faster below Y. Pressure is therefore lower than Y (Benoulli effect). (2 marks)

8. (a) Resistance = 8N
   (b) 14 – 8 = 30 a

   $\therefore a = \frac{6}{30} ms^{-2}$

   $= 0.2\ ms^{-2}$ (2 marks)

9. Drop spreads out until the patch is one molecule thick/monolayer. (1 mark)

10. (a) Upthrust = (5.0 – 4.04)N
    = 0.96N (1 mark)

    (b) Weight of liquid displaced = 0.96N
    ∴ Mass of liquid = 0.096kg

    $\frac{m}{v} = \rho$

    $\frac{0.096}{V} = 800$

    $\therefore V = \frac{0.096}{800} m^3$

    $= 1.2 \times 10^{-4} m^3$

    $= 1.2 \times 10^{2} cm^3$

    $= 120 cm^3$ (2 marks)

11. Volume decreases, so more collisions per second – hence higher pressure. (1 mark)

12. $F = mr\omega^2 = mg$

$0.200 \times 1 \times \omega^2 = 0.5 \times 10 = 5$ (1 mark)

$\omega^2 = \frac{5}{0.200}$ (1 mark)

$\therefore \omega = \sqrt{\frac{5}{0.200}} = 5 \text{ rad s}^{-1}$ (1 mark)

13. Nm^{-1} (1 mark)

14. Increase the base area or lower the c.g. (1 mark)

15. (a) Potential Energy ⟶ Kinetic energy ⟶ Heat (1 mark)

(b) (i) Work done by the force = 200 x 22.5 J
= 4500 J (2 marks)

(ii) Work done on the mass = mgh
= 30 x 10 x 7.5 J
= 2250 J (2 marks)

(iii) Work done to overcome friction = (4500 – 2250J)
= 2250 J (2 marks)

(iv) Efficiency = $\frac{work\ output}{work\ input} x100\%$

= $\frac{2250}{4500} x100\% = 50\%$ (2 marks)

(c) Reduce friction by use of rollers/smoothing (polishing surfaces)/oiling. (1 mark)

16. (a) Mass of water completely filling the bottle
= (66.4 – 43.2)g
= 23.3g (2 marks)

(b) Volume of water completely filling the bottle = 23.3 cm^3 (1 mark)

(c) Volume of density bottle = 23.2 cm^3 (1 mark)

(d) Mass of sand = (67.5 – 43.2)g = 24g (1 mark)

(e) Mass of water filling space above sand = 82.3 – 67.5
= 14.8g (1 mark)

(f) Volume of sand = (23.2 – 14.8) cm^3
= 8.4 CM^3 (3 marks)

(g) Density of sand $= \frac{m}{v} = \frac{24g}{8.4cm^3}$

$= 2.807\ gcm^{-3}$ (2 marks)

17. (a) At high altitudes pressure is low so boiling point is low. So pressure cooker increases pressure which raises the boiling point, hence faster cooking. (2 marks)

(b) (i) Heat absorbed by water $= 3 \times 4200 \times 80\ J$
$= 1008000\ J$ (2 marks)

(ii) Heat absorbed by kettle $= 450 \times 80\ J$
$= 3600\ J$ (2 marks)

(iii) Heat applied by heater $= pt = 3000t\ J$
$= 3000t = 1008000 + 36000\ J$
$= 1044000$

$$\therefore t = \frac{1044000}{3000}$$
$$= 348s$$

$$= \frac{348}{60} \text{ minutes}$$
$= 5.8$ minutes (3 marks)

(iv) Time taken to boil away
$m_{/v} = Pt$
$3 \times 2.3 \times 10^6 = 3000t$
$\therefore t = \frac{3x2.3x10^6}{3000} s = 2300\ s$

$= \frac{2300}{60}$ minutes $=$ 38.3 minutes (3 marks)

18. (a) $\frac{m}{v} = \rho$

$\frac{4}{v} = 3000$

$\therefore v = \frac{v4}{3000} m^3$

$v = 1.33 \times 20^{-3} m^3$ (2 marks)

(b) Mass of liquid displaced = m

$\frac{m}{v} = 800 \Rightarrow m = 800 \times 1.33 \times 10^{-3} kg$ (1 mark)

$=$ 1.064 kg (1 mark)

Weight of the displaced liquid = 10.64 N (1 mark)

Upthrust = 10.64 N (1 mark)

(c) Weight of stove in air = 40 N
Reading of spring balance = (40 – 10.64) N (1 mark)
= 29.36 N (1 mark)

(d) When the stone is removed reading of compression balance
= (85 – 10.64) N = 74.36 N (2 marks)

19. (a) (i) **OA** - Body moves from rest at constant acceleration.

(ii) **AB** - Body moves with decreasing acceleration.

(iii) **BC** - Body moves with constant velocity i.e. zero acceleration.
(3 marks)

(b) (i) $u = 10\ ms^{-1}$

$a = -25\ ms^{-2}$

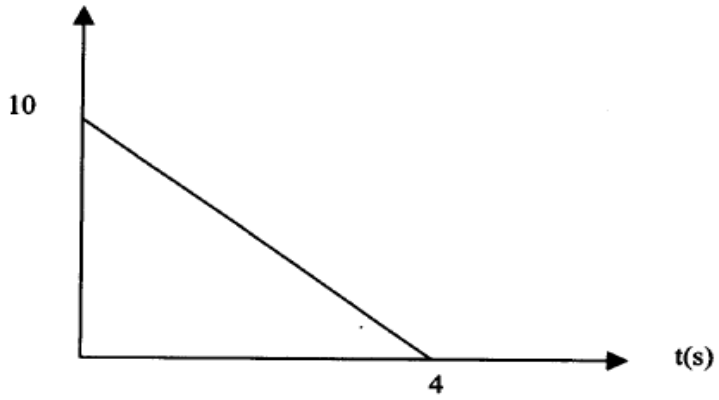
$t = 1.5s$

$V = u + at = 10\text{-}25 \times 1.5 = 6.25\ ms^{-1}$

(ii) $S = ut + \frac{1}{2}at^2$
$= 10(1.5) - \frac{1}{2}(2.5)\ 1.5)^2 = 12.1875m$ (1 mark)
$= 12.19m$ (1 mark)

(iii) $V = 0$
i.e. $o = 10 - 2.5t$
$\Rightarrow t = \frac{10}{2.5}s = 4s$ (1 mark)

(c) (i)
$V\ (ms^{-1})$



(1 mark)

(ii) Distance = Area of triangle (1 mark)
$= \frac{1}{2} \times 4 \times 10 = 20m$ (1 mark)