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PHYSICS FORM THREE PP2 MARKING SCHEME

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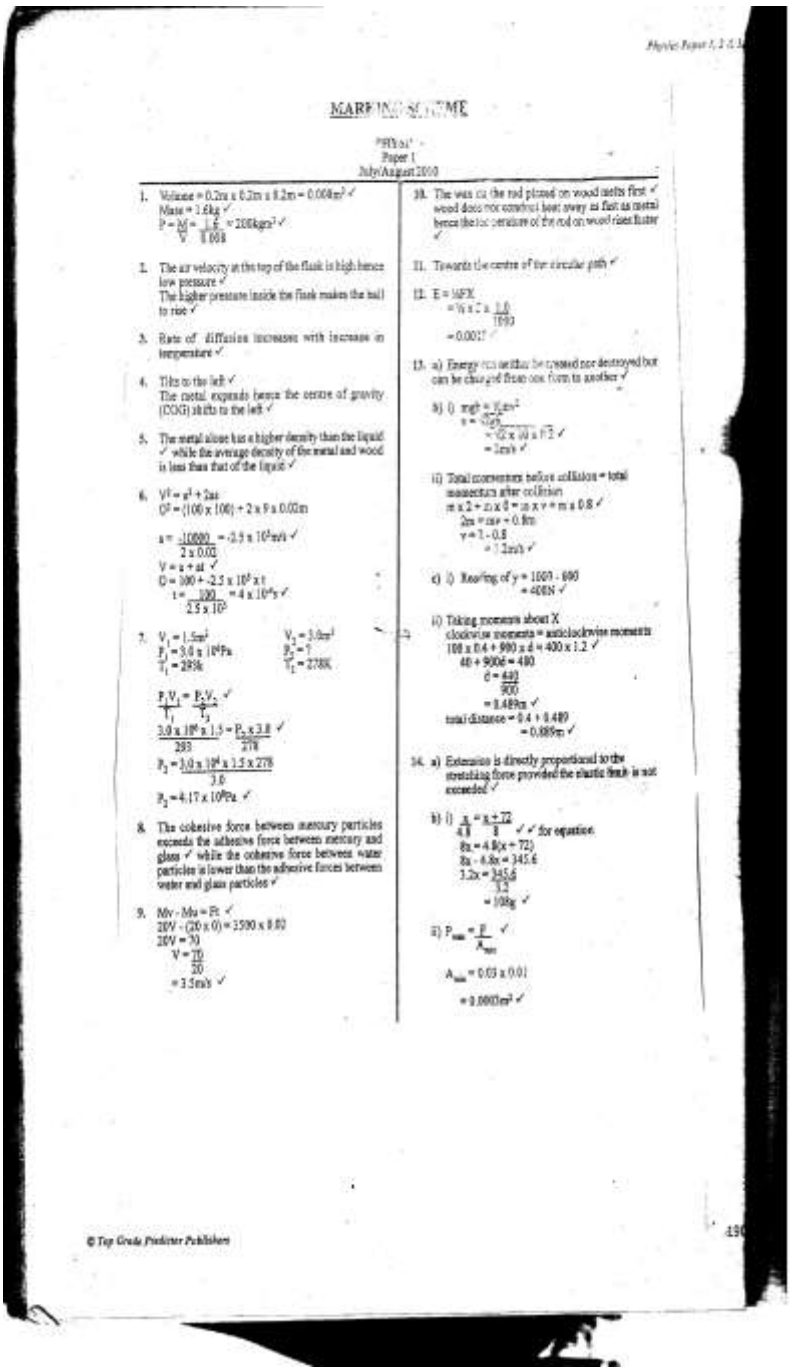

MARKING SCHEME

PHYSICS
Paper 1
July/August 2010

1. Volume = 0.2m x 0.2m x 0.2m = 0.008m³ ✓
Mass = 1.6kg ✓
$P = \frac{M}{V} = \frac{1.6}{0.008} = 200 kgm^{-3}$ ✓

2. The air velocity at the top of the flask is high hence low pressure ✓
The higher pressure inside the flask makes the ball to rise ✓

3. Rate of diffusion increases with increase in temperature ✓

4. Tilts to the left ✓
The metal expands hence the centre of gravity (COG) shifts to the left ✓

5. The metal alone has a higher density than the liquid ✓ while the average density of the metal and wood is less than that of the liquid ✓

6. $V^2 = u^2 + 2as$
$0^2 = (100 \times 100) + 2 \times 9 \times 0.02m$
$a = \frac{-10000}{2 \times 0.02} = -2.5 \times 10^5 ms^{-2}$ ✓
$V = u + at$ ✓
$0 = 100 + -2.5 \times 10^5 \times t$
$t = \frac{100}{2.5 \times 10^5} = 4 \times 10^{-4} s$ ✓

7. $V_1 = 1.5m^3$ $V_2 = 3.0m^3$
$P_1 = 3.0 \times 10^5 Pa$ $P_2 = ?$
$T_1 = 289K$ $T_2 = 278K$
$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ ✓
$\frac{3.0 \times 10^5 \times 1.5}{289} = \frac{P_2 \times 3.0}{278}$ ✓
$P_2 = \frac{3.0 \times 10^5 \times 1.5 \times 278}{3.0}$
$P_2 = 4.17 \times 10^5 Pa$ ✓

8. The cohesive force between mercury particles exceeds the adhesive force between mercury and glass ✓ while the cohesive force between water particles is lower than the adhesive forces between water and glass particles ✓

9. $Mv - Mu = Ft$ ✓
$20V - (20 \times 0) = 3500 \times 0.02$
$20V = 70$
$V = \frac{70}{20}$
$= 3.5 ms^{-1}$ ✓

10. The wax on the rod placed on wood melts first ✓ wood does not conduct heat away as fast as metal hence the temperature of the rod on wood rises faster ✓

11. Towards the centre of the circular path ✓

12. $E = MFX$
$= \frac{1}{2} \times 2 \times \frac{1.0}{1000}$
$= 0.001J$ ✓

13. a) Energy can neither be created nor destroyed but can be changed from one form to another ✓

b) i) $mgh = \frac{1}{2}mv^2$
$v = \sqrt{2gh}$
$= \sqrt{2 \times 10 \times 0.2}$ ✓
$= 2 ms^{-1}$ ✓

ii) Total momentum before collision = total momentum after collision
$m \times 2 + m \times 0 = m \times v + m \times 0.8$ ✓
$2m = mv + 0.8m$
$v = 2 - 0.8$
$= 1.2 ms^{-1}$ ✓

c) i) Reading of $y = 1000 - 600$
$= 400N$ ✓

ii) Taking moments about X
clockwise moments = anticlockwise moments
$100 \times 0.4 + 900 \times d = 400 \times 1.2$ ✓
$40 + 900d = 480$
$d = \frac{440}{900}$
$= 0.489m$ ✓
total distance = 0.4 + 0.489
$= 0.889m$ ✓

14. a) Extension is directly proportional to the stretching force provided the elastic limit is not exceeded ✓

b) i) $\frac{x}{4.8} = \frac{x+72}{8}$ ✓✓ for equation
$8x = 4.8(x + 72)$
$8x - 4.8x = 345.6$
$3.2x = \frac{345.6}{3.2}$
$= 108g$ ✓

ii) $P_{max} = \frac{F}{A_{min}}$ ✓
$A_{min} = 0.03 \times 0.01$
$= 0.0003m^2$ ✓

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13. a) Velocity is the rate of change of motion in a specificed direction

b) i) a = slope of graph

$= \frac{30m\ s^{-1}}{30 \times 60s}$ (1mk)

$= 0.016m\ s^{-2}$ (1mk)

between C and D

$a = -\frac{30m\ s^{-1}}{10 \times 60s}$ (1mk)

$= 0.05m\ s^{-2}$ (1mk)

ii) Distance = area under graph

$= 30ms^{-1} \times \frac{(100 + 60)}{2} \times 60s$

= 144 000m.

iii) $V_{av} = \frac{\text{total distance}}{\text{total time}}$

$= \frac{144\ 000m}{100 \times 60s}$ (1mk)

$= 24ms^{-1}$ (1mk)

c) $S = \frac{1}{2} gt^2$ (1mk)

$1.8m = \frac{1}{2} \times 10m\ s\text{-}1 \times t^2$

$t2 = 0.36s^2$

$t = 0.6s$ (1mk)

$s = vt$ (1mk)

$= 15m\ s^{-1} \times 0.6s = 9m$ (1mk)

14. a) Momentum before collision = momentum after collision (1mk)

$M_1U_1 + M_2(-U_2) = (M1 + M_2)\ V$

$(2000 \times 5)^2 + 5000 \times (-7) = 7000V$ (1mk)

$V = \frac{-25000}{7000}$

$= -3.571\ ms\text{-}1\ \sqrt{1}$ (1mk)

b) $Ft = M(V-U)$

$f = \frac{m(V - U)}{t}$ (1mk)

$F = 5000\ (\ -3.571 - (-7)$ (1mk)

0.1

$F = 171,450\ N$ (1mk)

c) initial K.E $= \frac{1}{2} M_1U_1^2 + \frac{1}{2} M_2 (-U_2)^2$

$= \frac{1}{2} \times 2000 \times 5^2 + \frac{1}{2} \times 5000 \times (-7)^2$

$= 25,000 + 122, 500$

$= 147,500J$ (1mk)

final K.E $+ \frac{1}{2} (M_1 + M_2)\ V^2$

$= \frac{1}{2} (2000 + 5000)\ (-3.571)^2$

$= 44,632\ J$ (1mk)

Change in K.E = K.E lost – final K.E – Initial K.E

$= (44,632 - 147,500)\ J$

$= -102,868J$ (1mk)

d) The change /lost K.E is converted into heat, sound, light and spent in deformation (1mk)

15. a) Particles of the transmitting medium vibrate in the direction of the wave for a longitudinal wave, but at right angles for a transverse wave.

b i) –wavelength = 4cm (1mk)

-Amplitude = 2cm (1mk)

ii) O to A = 9cm containing 2 ¼ waves

Time $= \frac{0.045}{2\ ¼}$ (1mk)

f =

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= 1
0.04s / 2 ¼

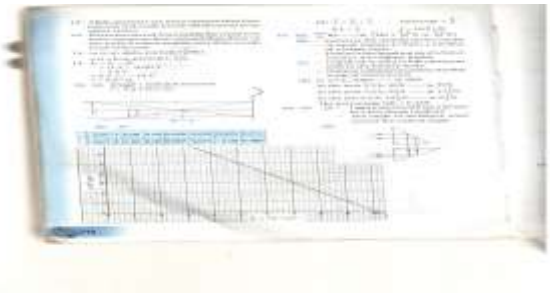
f = 56.25Hz. (1mk)

v = f^ (1mk)
= 56.25 x 0.04
=2.25ms^{-1} (1mk)

c) i) s = $\frac{2d}{t}$
= $\frac{2 \times 400}{2.5}$
= 320m s^{-1}

ii) 2(x - 400) = (2.5 +2)s (1mk)
x = 1120m (1mk)

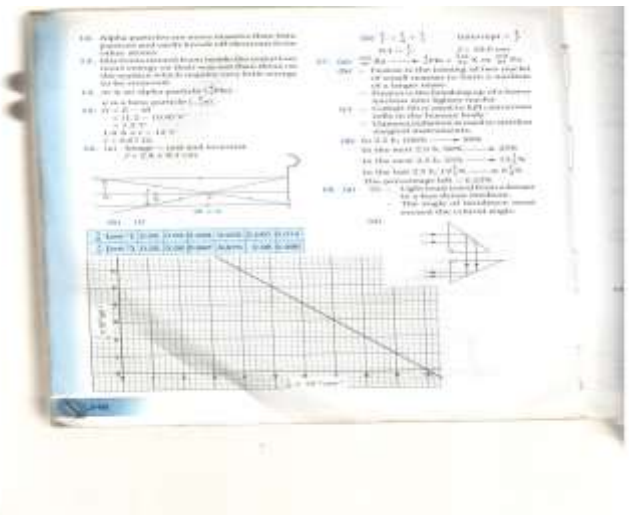
16. a) image – real and inverted
f = 2.4 ± 0.1cm.



- 2rays with arrows (2mks)
- inverted image (1mk)

bi)

(cm^{-1})	0.05	0.04	0.033	0.025	0.020	0.014
(cm^{-1})	0.05	0.06	0.067	0.075	0.08	0.086



A – 1mk

S – 1mk

P – 2mk

L- 1mk

ii) = + intercept = (1mk)

0.1 = (1mk)

f = 10cm (1mk)

17. i) 0.04M (1mk) correct reading
(1mk) correct units
ii) 2cm (1mk)
iii) F = (1mk)
(1mk)

= 100HZ (1mk)

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