PHYSICS PAPER 232/1 2009
MARKING SCHEME

1. Volume runout = $46.6cm^3$ ✓ (3 mark)

$$\text{Density} = \frac{m}{v} = \frac{54.5}{46.6} \checkmark = 1.16953$$

$= 1.17\,g/cm^3$ ✓ (1.2 not accepted)

2. $T^2 = 4\pi^2 \frac{L}{g}$ (2 marks)

$= 117^2 = \frac{4\pi^2 \times 0.705}{g}$ ✓

$g = 9.63 m/s^2 \quad = 9.6 m/s^2$ ✓

3. Needle floats due to surface tension forces ✓
Detergents reduce surface tension so the needle sinks ✓ (2 marks)

4. When equal forces applied, pressure on B is greater than on A due to smaller areas /Pressure difference is transmitted through to liquid A causing rise upward force on A is greater than B hence upward motion
Upward force on B is greater than that on A, hence upward mosition (2 marks)

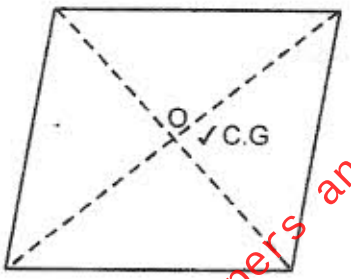
5. Molecules inside warm water move faster than in cold water /or kinetic energy in warm water is higher than in cold water /move with greater speed /molecules vibrate faster in warm water.
This increases rate to diffusion ✓ (2 marks)

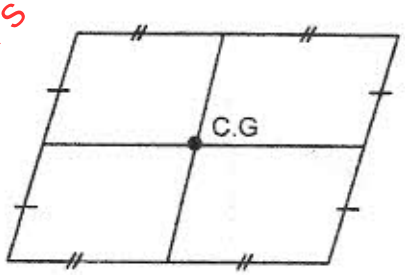
6. Stops (prevents, holds, traps, breaks, mercury thread) mercury to bulb when thermometer is removed from particular body to the surrounding (1 mark)

7. Dull surfaces radiate faster than bright surfaces
P looses more of the heat supplied by burner than Q
Or Q shiny surface is a poorer /radiator /emitter of heat thus retains more of heat absorbed
Or P dull surface is a better radiator / emitter i.e. retains less of the heat absorbed (There must be comparison between P and Q (2 marks)
Accept both good or poor radiator

8. Heat travels from container to test tube by radiation so the dull surface P, gives more heat to the test tube
P or Q radiates heat to the test tube
P radiates more heat to test tube ✓ (2 marks)

9.





CG - located at intersection of diagonals
CG - at intersection of lines joining centres of sides (1mark)

10. (2 marks)

Parallel

$f = 2Ke$

$40 = 2 \times Ke_1$

$e_1 = \frac{40}{2K} = \frac{20}{K}$

Single

$f = Ke_2$

$20 = Ke_2$

$e_2 = \frac{20}{K}$

$e_1 = e_1 + e_2$

$20 = \frac{20}{K} + \frac{20}{K}$

$= \frac{40}{K}$

$20K = 40$

$K = \frac{40}{20} = 2N/cm$

Or

$e = 10cm$

$Kp = 2K$

$Load = 40N$

$f = Ke$

$40 = 2K \times 10$

$K = \frac{40}{20}$

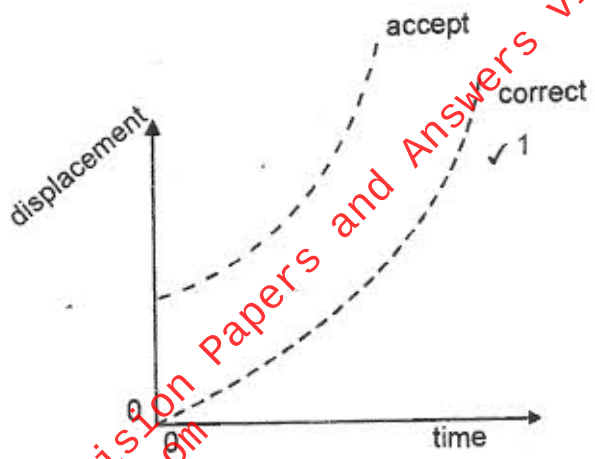
$= 2N/cm$

Extension of each spring 10cm

$$K = \frac{20\ N}{10\ cm} = 2\ N/cm$$

11. Air between balloons is faster than outside so that is pressure reduction between (1 mark)

12. (1 mark)



13. The lowest temperature possible /or temperature at which ideal gas has zero volume (zero pressure) or molecules have zero/minimum energy (1 mark)
or Temperature at which a gas has minimum internal energy /zero volum(assumed)

14. (3 marks)

$V = rw$

$V = r \times 2\pi f$

$= 0.08 \times 2\pi \times 33 m/s$

$(16.587609) \quad = 16.6 m/s$

Or

$T = \frac{1}{33} = 0.030303$

$T = \frac{2\pi}{w} \Rightarrow 0.030303 = \frac{2\pi}{w}$

$w \overset{\checkmark}{=} \frac{2\pi \checkmark}{0.030303} = 207.525$

$V = rw$

$= 0.08 \times 207.5292$

$= 16.5876 m/s$

SECTION B (55 marks)

15. (a) - Pressure (2 marks)
- Dissolved impurities

(b) (i) BPT = 78°C ✓ (1 mark)

(ii) (a) $\Delta t = 4.5$ min

$Q = Pt = 50 \times 4.5 \times 60J$ ✓ (2 marks)

$= 13500J$ ✓

(b) $Q = 70 - 16 = 54^{\circ}C$ ✓ (accept 54°C alone or from correct working) (1 mark)

(c) $Q = MC\Delta\theta$ ✓ (2 marks)

$C = \frac{13500J}{0.1kg \times 54k} = 2500J/kg$ ✓

(iii) $\Delta t = (7.3 - 6.8)\text{ min } 30s\ (0.5 \times 60) = 30s$ ✓ (4 marks)

$Q = Pt$ } $= 30 \times 50J$ ✓ Or $\Delta t = 30s$ ✓

$Q = ml$ } $Pt = ml$ ✓

$50 \times 30 = 0.0018l$ ✓

$L = \frac{30 \times 50}{0.0018kg}$ ✓

$= 8.33 \times 10^5\ J/kg$ ✓

$L = \frac{50 \times 30}{0.0018}$

$= 8.33 \times 10^5\ J/kg$ ✓

16. (a) $\text{Efficiency} = \frac{\text{Work output}}{\text{Work input}} \times 100\%$

Or Ratio of work output to work input expressed as percentage (1 mark)

(b) (i) Work by Effort $= F \times S$ ✓ (3 marks)

$= 420N \times 5.2m$ ✓

$= 2184J$ ✓

(ii) Distance raised $= 5.2 \sin 25 = 2.2m$ ✓ (2.1976) (3 marks)

Work done $= 900m \times 2.2m$ ✓

$1980J$ ✓ or $1977.85J$

(iii) $\text{Efficiency} = \frac{\text{Work output}}{\text{Work input}} \times 100\%$ Or $= \frac{1980}{2184} \times 100\%$ ✓

$= 90.7\%$ ✓

Or (90.65) (2 marks)

17. (a) A floating body displaces its own weight of the fluid on which it floats (1mark)

(b) (i) $W = T + U$ (1 mark)

(ii) Volume $= 0.3 \times 02 \times 0.2M^3$

Mass $= V \times W$ ✓

Weight $= mg = 0.3 \times 0.2 \times 0.2 \times 10500\ Kg/m^3 \times 10N/kg$ ✓

$= 1260N$ ✓

OR $W = \ell gV$ ✓ (3 marks)

$= 0.3 \times 0.2 \times 0.2 \times 10500 \times \text{Mass}$ ✓

$= 1260N$ ✓

(iii) Volume of liquid = Volume of block ✓
Weight of liquid displaced = $V\ell g$
$= 0.3 \times 0.2 \times 0.2 \times 1200 \times 10N$ ✓
$= 144N$ ✓ (2 marks)

(iv) $T = W - U$
$1260 - 144N$
$= 1116N$ (1 mark)

(c) Weight of solid = Weight of kerosene displaced ✓ (4 marks)
$= 800 \times 10 \times 10^{-6} \times 10 = 0.08N$
Mass = 0.008kg ✓
Volume = $50cm^3$

$$\text{Density} = \frac{M}{V} \checkmark = \frac{0.008}{50 \times 10^{-6} m^3}$$
$$= 160kg/m^3 \checkmark$$

18. (a) The pressure of a fixed mass of an ideal gas is directly proportional to the absulate temperature if the volume is kept constant (1 mark)

(b) (i) Volume increases as bubble rises because the pressure due to liquid column is lowered therefore the pressure inside bubble exceeds that of outside thus expansion (1 mark)

(ii) (a) Corresponding pressure (2 marks)

$$\frac{1}{v} = \frac{1}{0.5cm^3} = 2cm^{-3} \checkmark$$
$1.88 \times 10^5 Pa$ ✓

(b)
$$\text{At top} = \frac{1}{v} = \frac{1}{1.15} = 0.87cm^{-3}$$
Corresponding Pressure $= 0.8 \times 10^5 Pa$ ✓ (1 mark)

(iii) $\Delta\ell = (1.88 - 0.8) \times 10^5 Pa = 1.08 \times 10^5 Pa$ ✓ (3 marks)

$\Delta\ell = \ell gh$ = or $\ell \times 0.80 \times 10$ ✓

$$\ell = \frac{1.08 \times 10^5}{0.80 \times 10} kg/m^3$$
$= 13500kg/m^3$ ✓

(iv) Prssure at top = atmospheric (1 mark)
0.8×105 pa ✓

(c) $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$ ✓ (4 marks)

$25^0C = 298K$ ✓

$15^0C = 288K$

$\frac{2.7\times10^5\times3800}{298} = \frac{2.5\times10^5\times V_2}{288}$ ✓

$V_2 = 3966cm^3$ ✓

accept = (3966.28)

19. (a) Rate of change of angular displacement with time (1 mark)
Accept without (rate)

(b) (i) Mass (2 marks)
Friction
Radius (any two)

(ii) - Oil will reduce friction (2 marks)
- Since friction provides centripetal force, the frequency for sliding off is lowered

(c) f.s = work done = Δke (4 marks)

$Mah = \frac{1}{2}MV^2 - \frac{1}{2}MU^2$

$= \frac{1}{2}MV^2$

$ah = \frac{1}{2}V^2$

$\Rightarrow 2\times0.28\times1.26 = V^2$

$= 0.7056 = V^2$

$V = \sqrt{0.7056}$

$= 0.84m/s$

$w = \frac{V}{r}$

$= \frac{0.84}{0.14}$

$= 6rad/s$

$V^2 = U^2 + 2aS$

$V^2 = 0 + 2(0.28)h$

$V = \sqrt{0.56\times1.26}$ ✓

$V = rw$ ✓

$0.84 = 0.14 \times w$ ✓

$w = \frac{0.84}{0.14}$

$= 6rad/s$ ✓