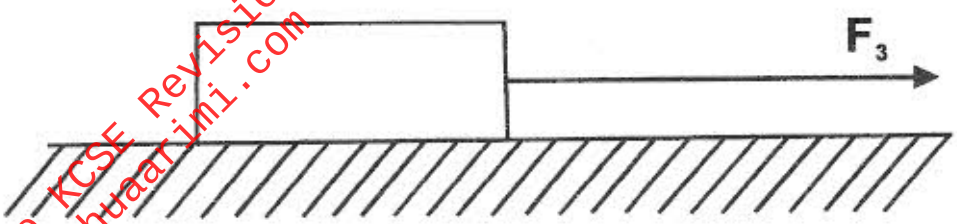
PHYSICS PAPER 232/1 2006
MARKING SCHEME

1. Volume = 68 cm^3
   Mass = 567g

   density $= \frac{m}{v} = \frac{567;}{68}$

   $= 8.3\dot{4}gcm^{-3}$ (3 marks)

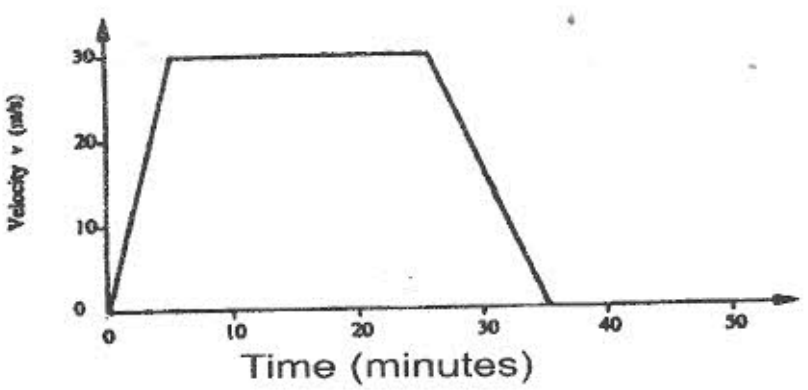
2. 

   (1 mark)

3. Pressure at a point in a fluid is transmitted equally to all points of the fluid and to the walls of the container (1 mark)

4. On heating, the bimetallic strip bends; This causes the position of the centre of gravity of the section to the left to shift to the right causing imbalance and so tips to the right (2 marks)

5. Lower spring extend by 15cm;
   Upper springs extended by 10cm ;
   Total = 15 + 10 = 25cm (3 marks)

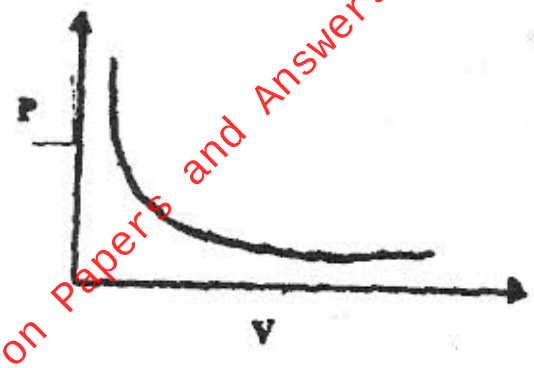
6. 

   (1 mark)

7. Effect of weight of second pulley reduces efficiency of A. Load in B is larger and so effect of friction is less in B increasing efficiency (1 mark)

8. In B some of the heat is used up in melting the ice; while in A all the heat goes to raise the temperature of the water to reach boiling point (2 marks)

9.



10. At F, radius of curve is smallest and so greatest centripetal force is required to keep luggage on carrier, $\left(F = \frac{mv^2}{r}\right)$ (2 marks)

11. $A_1V_1 = A_2V_2$;
$\pi \times 6^2 \times V_1 = \pi \times 9^2 \times 2$;
$= 4.5 ms^{-1}$ (3 marks)

12. As the temperature changes the volumes of the gases in the balloons change differently. The change in volume and hence the change in upthrust will differ (2 marks)

13. $Ft = \Delta mv$;
$720 \times 0.1 = 0.6 \times v$;
$v = 120\ ms^{-1}$ (3 marks)

14. (a) In solids the molecules are held in position by intermolecular forces that are very large. In liquids the molecules are able to roll over one another since the forces are smaller. (1 mark)

(b) (i) Volume $= \frac{4}{3}\pi r^3$;

$= \frac{4}{3}\pi \times 0.025^3$

$= 6.54\ 10^{-5}\ cm^3$ (2 marks)

(ii) Area $= \pi r^2$;

$= \pi \times 10^2$

$= 314 cm^2$ (2 marks)

(iii) A × diameter of molecule = volume;
$314 \times d = 6.54 \times 10^{-5}$;
$d = 2.1 \times 10^{-7}$ cm (3 marks)

(c) (i) The oil is assumed to have spread to thickness of one molecule (1 mark)

(ii) Source of errors:
- Getting the right oil
- Measuring drop diameter
- Measuring diameter of patch
- Getting drops of right size (any 2 × 1 = 2 marks)

15. (a)
- Make diameter of springs different
- Make number of turns per unit length different
- Make lengths of springs different (any 2 × 1 = 2 marks)

(b) (i) 4.2N; 2.2 ± 0.1

(ii) Spring constant = gradient

$$= \frac{2.1}{4.1 \times 10^{-2}}$$

$$= 5/\text{Nm}^{-2}$$

For each spring k = 102 Nm^{-1} (1 mark)

(iii) Work = Area under graph

$$= \frac{0.75 + 1.65 \times 1.7 \times 10^{-2}}{2}$$

$= 2.04\ 10^{-2}$ J (3 marks)

16. (a) A gas that obeys the gas laws perfectly (1 mark)

(b) (i) By changing pressure very slowly or by allowing gas to go back to original temperature after each change (1 mark)

(ii) k is slope of graph

$$k = \frac{(2.9 - 0) \times 10^5}{(3.5 - 0) \times 10^6}$$

k = 0.083 Nm (4 marks)

(iii) Work done on the gas (1 mark)

(iv) Use dry gas
Make very small changes in pressure (any 1 × 1 = 1 mark)

(c) Since pressure is constant,

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$T_1 = 273 + 37 = 310k$

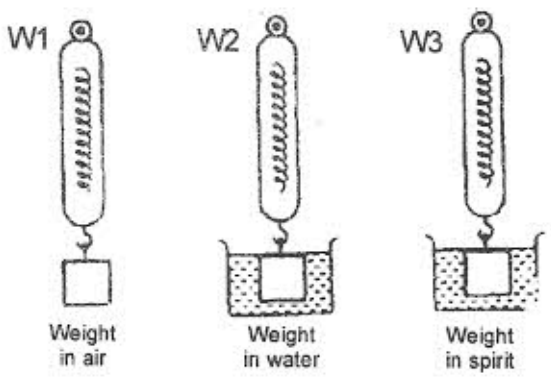
$T_2 = 273 + 67 = 340k$

$$\frac{4000}{310} = \frac{V_2}{340}$$

$V_2 = 4387$ litres (4 marks)

17. (a) A body fully or partially immersed in a fluid experiences an upthrust equal to the weight of the fluid displaces (1 mark)

(b) (i)



(ii) 100g: $U_w = 0.12N$ $U_s = 0.09N$
150g: $U_w = 0.18N$ $U_s = 0.14N$
200g: $U_w = 0.24N$ $U_s = 0.18N$ (2 marks)

(iii) Relative density $= \frac{\text{upthrust in spirit}}{\text{upthrust in water}}$

$$= \text{average}\left[\frac{0.09}{0.12}, \frac{0.14}{0.18}, \frac{0.18}{0.24}\right]$$

$= 0.76$ (3 marks)

(c) Weight of air displaced = PVg
= 1.25 × 1.2 × 10N
= 15N;
= upthrust

Weight of helium = PVg
= 0.18 × 1.2 × 10N
= 2.16N;

Weight of fabric = 3 N
Forces downwards = 2.16 + 3 = 5.16 N;
Tension = 15 – 5.16
= 9.84 N (4 marks)

18. (a) Specific latent heat of fusion of a substance is the quantity of heat required to melt completely one kilogram of the substance (at its normal melting point) to liquid witout change of temperature. (1 mark)

(b) (i) Q = ml
= 0.02 × 334000 J
= 6680 J (2 marks)

(ii) Q = mcθ
= 0.02 × 4200 (T – 0)
= 84 TJ (2 marks)

(iii) Heat lost by warm water
= mcθ
= 0.2 × 4200 (60 – T)
Heat lost by calorimeter = mcθ
= 0.08 × 900 (600 – T) (2 marks)

(iv) Heat gained = Heat lost;
6680 + 84T = 0.2 × 4200 (60 – T) + 0.08 × 900 (60 – T)
6680 + 84T = 50400 – 840T + 4320 – 72T
996T = 48040
T = 48.2°C (4 marks)