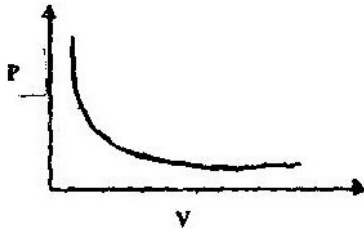


9.



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

11. $A_1V_1 = A_2V_2$;
 $\pi \times 6^2 \times V_1 = \pi \times 9^2 \times 2$;
 $= 4.5 \text{ ms}^{-1}$ (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. $Ft = \Delta mv$;
 $720 \times 0.1 = 0.6 \times v$;
 $= 120 \text{ms}^{-1}$ (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 = $\frac{4}{3} \pi r^3$
 $= \frac{4}{3} \pi \times 0.025^3$
 $= 6.54 \times 10^{-5} \text{ cm}^3$ (2 marks)

(ii) Area = πr^2
 $= \pi \times 10^2$
 $= 314 \text{ cm}^2$ (2 marks)

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

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

(ii) Sources of errors:

- Getting the right oil
- Measuring drop diameter
- Measuring diameter of patch
- Getting drop of a right size (any 2 x 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 x 1 = 2 marks)

(b) (i) 2.2 N ; 2.2 ± 0.1

(c) (ii) Spring constant = gradient

$$= 2.1$$

$$4.1 \times 10^{-2}$$

$$= 5/\text{Nm}^{-1}$$

For each spring $k = 102 \text{ Nm}^{-1}$

(1 mark)

(iii) Work = Area under graph

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

$$2$$

$$= 2.04 \times 10^{-2} \text{ J}$$

(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 to original temperature after each change (1 mark)

(ii) k is slope of graph

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

$$K = 0.083 \text{ NM}$$

(iii) Work done on the gas (4 marks)

(iv) Use dry gas (1 mark)

Make very small changes in pressure (any 1 x 1 = marks)

(c) Since pressure is constant

$$V_1 = V_2$$

$$T_1 T_2$$

$$T_1 = 273 + 37 = 310\text{k}$$

$$T_2 = 273 + 67 = 340\text{k}$$

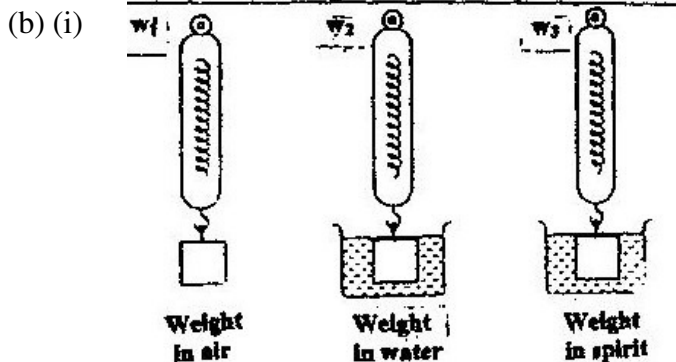
$$\frac{4000}{310} = \frac{V_2}{340}$$

$$310 \quad 340$$

$$V_2 = 4387 \text{ litres}$$

(4 marks)

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



(ii)

100g:	$U_w = 0.12\text{N}$	$U_s = 0.09\text{N}$
150g:	$U_w = 0.18\text{N}$	$U_s = 0.14\text{N}$
200g:	$U_w = 0.24\text{N}$	$U_s = 0.18\text{N}$

(2 marks)

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

