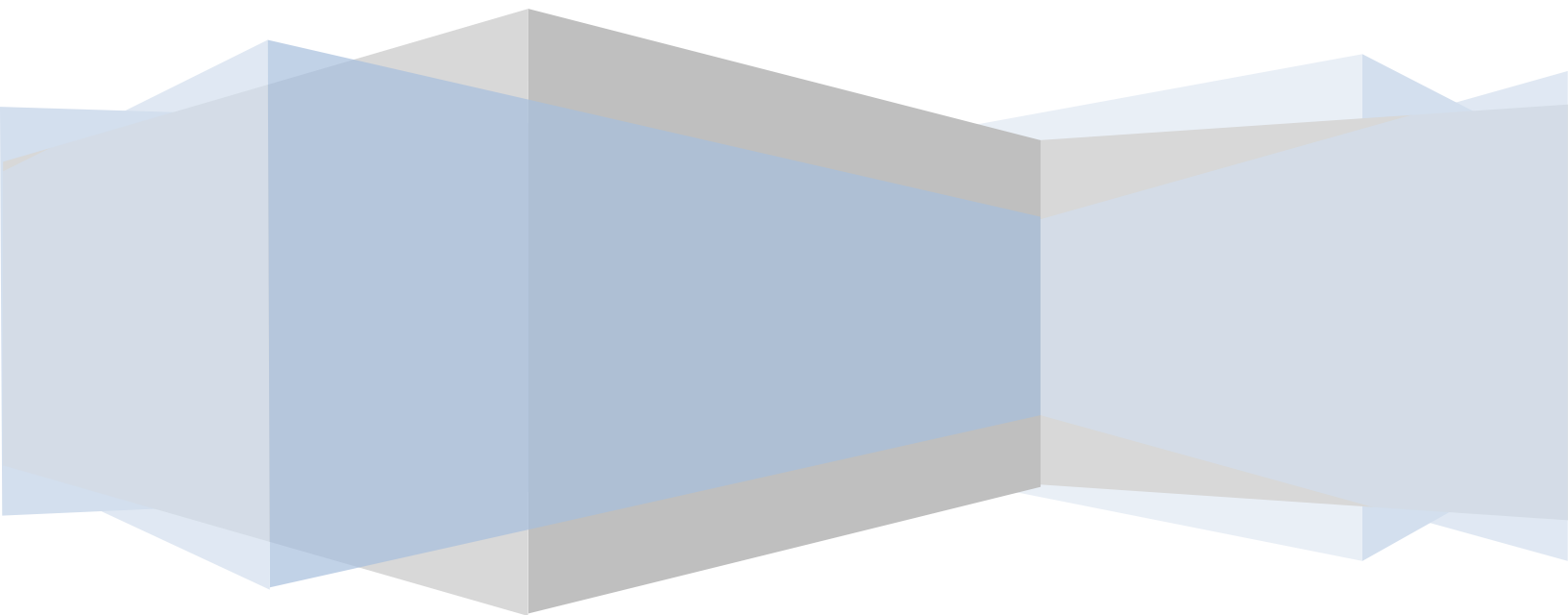


www.fixurscore.com

Physical Quantities

Problems by Topic



1 Make estimates of the following quantities.

June 2005

(a) the speed of sound in air

speed = [1]

(b) the density of air at room temperature and pressure

density = [1]

(c) the mass of a protractor

mass = [1]

(d) the volume, in cm^3 , of the head of an adult person

volume = cm^3 [1]

1 (a) Derive the SI base unit of force.

June 2006

SI base unit of force = [1]

- (b) A spherical ball of radius r experiences a resistive force F due to the air as it moves through the air at speed v . The resistive force F is given by the expression

$$F = crv,$$

where c is a constant.

Derive the SI base unit of the constant c .

SI base unit of c = [1]

(c) The ball is dropped from rest through a height of 4.5 m.

(i) Assuming air resistance to be negligible, calculate the final speed of the ball.

speed = m s^{-1} [2]

(ii) The ball has mass 15 g and radius 1.2 cm.

The numerical value of the constant c in the equation in (b) is equal to 3.2×10^{-4} when measured using the SI system of units.

Show quantitatively whether the assumption made in (i) is justified.

[3]

une

1 The uncalibrated scale and the pointer of a meter are shown in Fig. 1.1.

June 2007

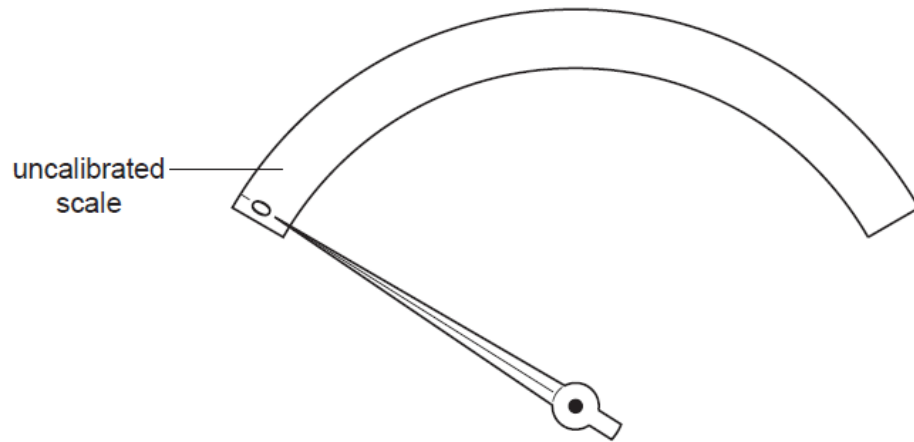


Fig. 1.1

The pointer is shown in the zero position.

The meter is to be used to indicate the volume of fuel in the tank of a car.

A known volume V of fuel is poured into the tank and the deflection θ of the pointer is noted.

Fig. 1.2 shows the variation with θ of V .

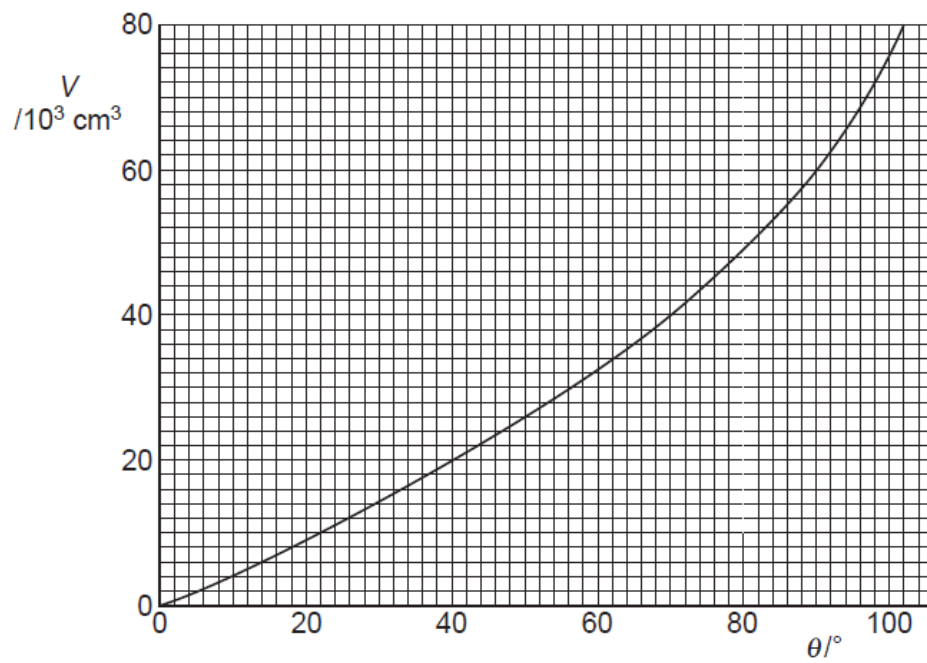


Fig. 1.2

- (a) On Fig. 1.1,
- (i) calibrate the scale at $20 \times 10^3 \text{ cm}^3$ intervals, [2]
 - (ii) mark a possible position for a volume of $1.0 \times 10^5 \text{ cm}^3$. [1]
- (b) Suggest one advantage of this scale, as compared with a uniform scale, for measuring fuel volumes in the tank of the car.
-
-[1]

1 Make reasonable estimates of the following quantities.

June 2008

- (a) the frequency of an audible sound wave
- frequency = Hz [1]
- (b) the wavelength, in nm, of ultraviolet radiation
- wavelength = nm [1]
- (c) the mass of a plastic 30 cm ruler
- mass = g [1]
- (d) the density of air at atmospheric pressure
- density = kg m^{-3} [1]

- 1 (a) State the most appropriate instrument, or instruments, for the measurement of the following.

June 2009

(i) the diameter of a wire of diameter about 1 mm
..... [1]

(ii) the resistance of a filament lamp
..... [1]

(iii) the peak value of an alternating voltage
..... [1]

- (b) The mass of a cube of aluminium is found to be 580g with an uncertainty in the measurement of ± 10 g. Each side of the cube has a length of (6.0 ± 0.1) cm.

Calculate the density of aluminium with its uncertainty. Express your answer to an appropriate number of significant figures.

density = \pm g cm^{-3} [5]

- 1 (a) Two of the SI base quantities and their units are mass (kg) and length (m).

June 2009/22

Name three other SI base quantities and their units.

- 1. quantity unit
- 2. quantity unit
- 3. quantity unit

[3]

- (b) The pressure p due to a liquid of density ρ is related to the depth h by the expression

$$p = \rho gh,$$

where g is the acceleration of free fall.

Use this expression to determine the derived units of pressure. Explain your working.

[5]

height = m [3]