

- 1 (a) Distinguish between a *systematic* and a *random* error in the measurement of a physical quantity.

.....

 [2]

- (b) A travelling microscope fitted with a vernier scale is used to measure the internal diameter of a capillary tube. Fig. 1a and Fig. 1b show the vernier when the microscope is adjusted so that the cross-wires are aligned at opposite ends of a diameter.

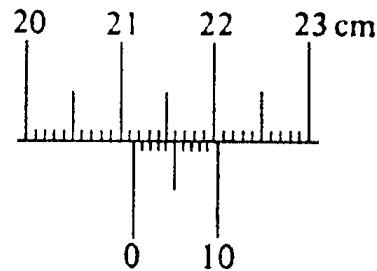


Fig. 1a

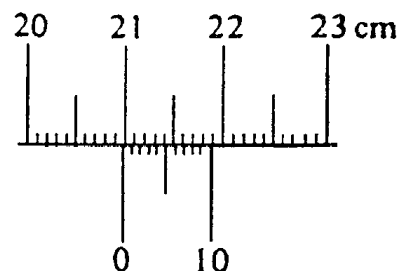


Fig. 1b

- (i) Write down the two vernier readings.

Fig. 1a = cm

Fig. 1b = cm [1]

- (ii) State the absolute uncertainty in a single reading of the vernier.

absolute uncertainty = cm [1]

- (iii) Hence determine the percentage uncertainty in the cross-sectional area of the capillary tube that could arise if it were calculated using these two readings.

percentage uncertainty = % [2]