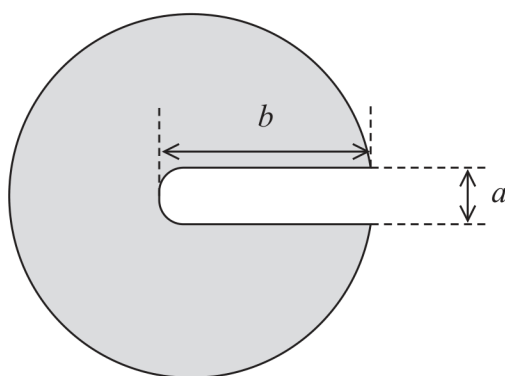


- 4 The diagram shows a 100 g slotted mass drawn approximately to size. A student determined the density of the metal from which the slotted mass was made.



- (a) (i) State the most appropriate measuring instrument for the student to use to measure the width a and the length b of the slot.

(1)

- (ii) Explain one technique she should use when measuring a and b .

(2)

- (iii) Calculate the area of the slot and its uncertainty in cm^2 . Assume the slot is rectangular.

$$a = 0.47 \pm 0.01 \text{ cm}$$

$$b = 2.19 \pm 0.005 \text{ cm}$$

(3)

Area of the slot = \pm cm^2



(b) The student made a single measurement of the diameter of the slotted mass as 3.81 cm.

(i) Calculate the shaded area of the slotted mass in cm^2 .

(2)

Shaded area = cm^2

(ii) Calculate the uncertainty in the value of the shaded area.

(3)

Uncertainty = cm^2

(c) The student used a micrometer screw gauge to measure the thickness t of the slotted mass. She obtained the following results.

t/mm				mean t/mm
11.39	11.36	11.35	11.38	11.37

(i) Calculate the density ρ of the metal in g cm^{-3} . Assume the value of mass is 100 g with negligible uncertainty.

(2)

ρ = g cm^{-3}



(ii) Calculate the percentage uncertainty in the value of ρ .

(3)

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Percentage uncertainty =

(d) The student thinks that the slotted mass is made from brass, which has a density of 8.5 g cm^{-3} .

Determine whether the slotted mass could be made of brass.

(2)

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(Total for Question 4 = 18 marks)

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