Determination of unknown masses by using the principle of moments

Practical question — PH3 2013 Task A2
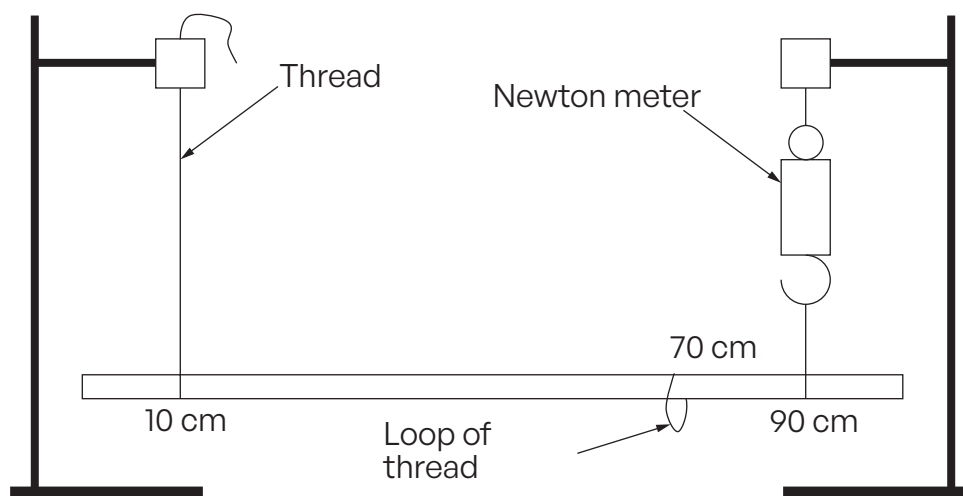
Total	/8

INSTRUCTIONS

Test 1

– 2 × Clamps and stands

– 2 × 'G' clamps to stabilise stands

– 2 × metre rulers

– Newton meter 0 – 10 N (± 0.1 N or 0.2 N)

– Split cork

– 400 g mass (including holder) — the masses to be taped together

– Thread

– The apparatus should be set up as shown below. The loop should be put on the ruler close to the 70 cm mark but with no 4.0 N weight attached.
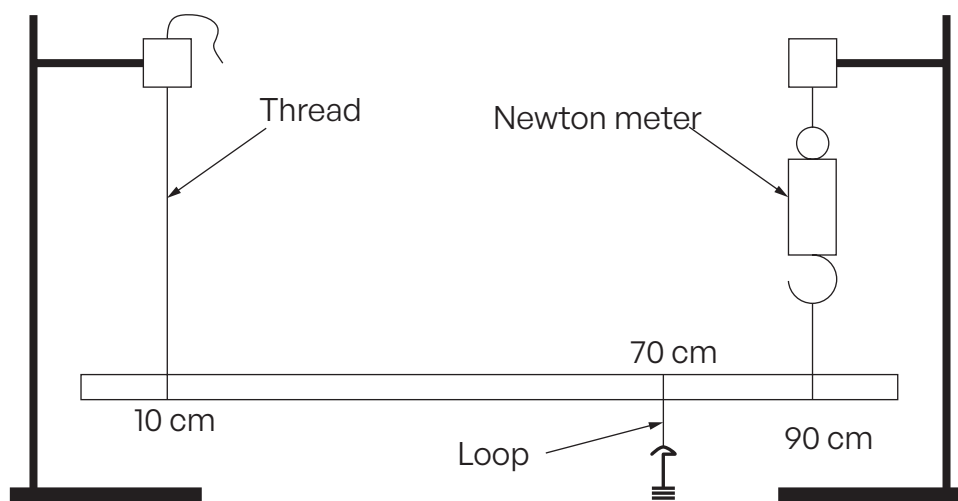

Test 2:

The apparatus is as for Test 1 except a 300 g mass (including holder) should be used and the loop should be put on the ruler close to the 80 cm mark.

TASK A2

You are going to use the apparatus set-up as shown below, and the principle of moments to determine the weight of the metre ruler.
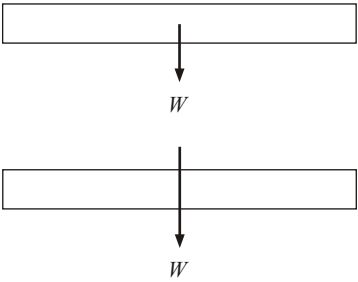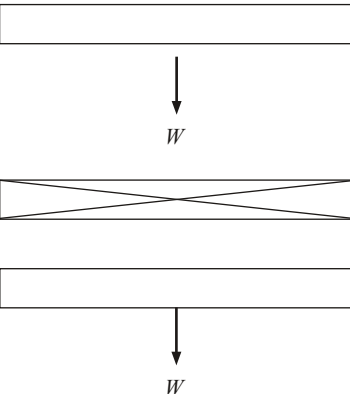

1. **Draw** an arrow, labelled W, on the diagram to represent the weight of the ruler acting through the centre of gravity. [1]

2. Attach the 4.0 N weight to the loop and move it to the 70 cm mark on the ruler. Adjust the length of the thread until the ruler is horizontal. Write down the reading of the Newton meter. **Repeat readings are not needed.** [1]

3. By taking moments about the 10 cm point, determine a value for the weight of the ruler. [3]

4. Move the 4.0 N weight to the 30 cm mark on the ruler and again adjust the length of the thread until the ruler is horizontal. Use the new reading on the Newton meter to calculate a second value for the weight of the ruler. [2]

5. Which of your two Newton meter readings has the smallest **percentage** uncertainty? Give a reason for your answer. [1]

MARK SCHEME

Question		Marks available
1.	*Acceptable answers:* *Not acceptable answers:*	1
2.	Reading to 2 sig. figs. i.e. to resolution of Newton meter (allow to ½ scale division) with unit (N)	1
3.	Attempt to equate moments even if incorrect [e.g. Newton meter × 90 = weight × 50] (1) Correct equation and rearrangement (1) Weight ± 10 % of centre value (1) (no e.c.f. allowed within the question)	3
4.	Weight calculated correctly (1) Unit (N) in both **2.** and **3.** (stand alone mark i.e. can be awarded even if weight values are incorrect) (1)	2
5.	**3.** lower [%], larger value on Newton meter N.B. no e.c.f. allowed	1