

- 1 a) Complete the following table relating to some fundamental quantities:

Fundamental quantity	SI unit	Symbol
Mass		
Length	metre	
Time		s
Temperature		

[6]

- b) Work and power are defined as follows:

$$\text{work} = \text{force} \times \text{distance}$$

$$\text{power} = \frac{\text{work}}{\text{time}}$$

- i) Determine the SI unit of work in terms of base units.

[2]

- ii) State an alternative name for the SI unit of work.

[1]

- iii) Determine the SI unit of power in terms of base units.

[2]

- iv) State an alternative name for the SI unit of power.

[1]

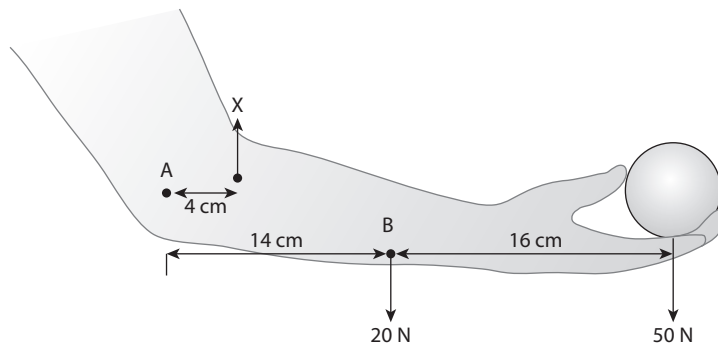
- 2 a) Explain what is meant by the 'moment' of a force, and state its SI unit.

[3]

- b) State the principle of moments.

[3]

- c) The diagram below shows a forearm holding a ball of weight 50 N horizontally. The elbow is at point A and acts like a fulcrum. The weight of the forearm is 20 N and is 14 cm away from the elbow. The bicep muscles exert an upward force X.



- i) Use the principle of moments to calculate the force X exerted by the bicep muscles.

[4]

ii) A downward force Y is exerted at point A. Calculate this force.

[3]

- 3 A Form Four student is investigating Hooke's law. She attaches various masses to a spring of length 80 cm and measures the extension produced. She obtains the following data:

Mass/g	10	30	50	80	100	150	180	200
Weight/N								
Extension/cm	0.4	1.2	2.0	3.2	4.0	6.0	7.2	8.0

a) Complete the table. ($g = 10 \text{ Nkg}^{-1}$)

[4]

b) Plot a graph of extension (y -axis) against weight (x -axis). Use the graph paper on the next page.

[10]

c) From your graph, calculate the slope S .

[3]

d) The spring constant is related to the slope of the graph as follows:

$$\text{spring constant} = \frac{1}{S}$$

Calculate the spring constant and state its units.

[3]

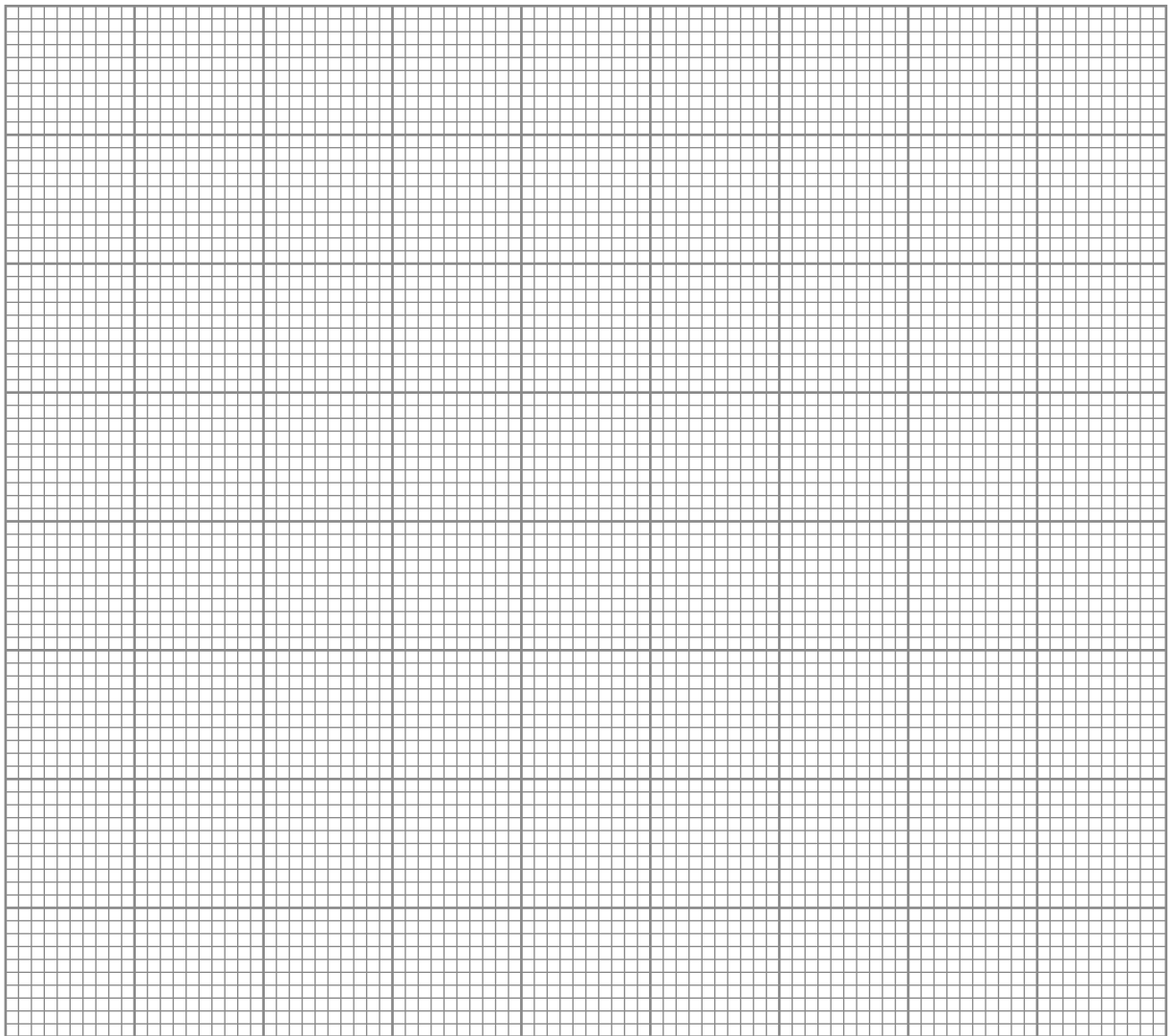
e) By drawing suitable lines on your graph, estimate:

- i) the mass that was attached to the spring to produce a TOTAL length of 85.2 cm.

[3]

- ii) the extension of the spring when a mass of 60 g is attached to it.

[3]



Total Marks / 51