

18 A student carried out an experiment to determine the Young modulus of copper.

She added a mass m to the free end of a sample of copper in the form of a long thin wire and the corresponding extension Δx was measured. This was repeated for increasing masses.

(a) State the meaning of the term Young modulus.

(1)

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(b) The student repeated the measurement of the diameter of the wire at different positions and orientations of the wire. She obtained the following results.

Diameter/mm	0.230	0.235	0.230	0.240
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(i) Determine the cross-sectional area of the sample of wire used.

(3)

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Cross-sectional area =



- (ii) The student plotted a graph of m against Δx . She measured the gradient and obtained a value of 195 kg m^{-1} .

Determine the Young modulus of the copper.

length of sample of copper used = 3.50 m

(3)

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Young modulus =

- (iii) The experiment was repeated by another student, using a 2.00 m length of the copper wire.

Suggest how the values obtained for the gradient and hence the Young modulus will differ between the students.

(2)

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(Total for Question 18 = 9 marks)