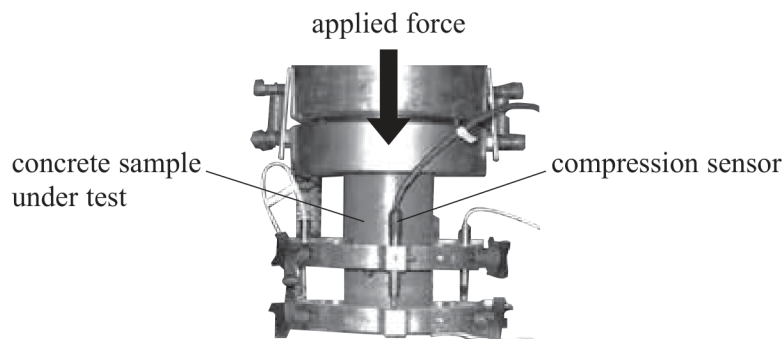
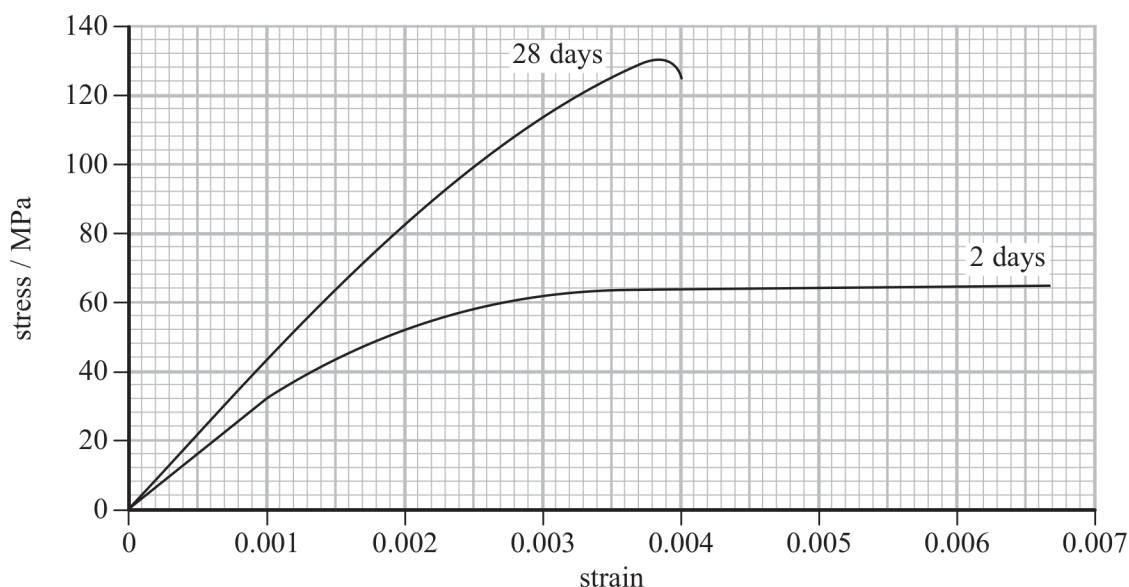


- 17 When concrete is first made it has a high moisture content. As the concrete dries its properties change.

A manufacturer of concrete carried out compression testing of cylindrical samples of concrete using the equipment shown.



The diagram shows stress-strain graphs, up to the fracture point, for concrete samples 2 days and 28 days after being made.



- (a) As the concrete dries its Young modulus increases.

Show that the value for the Young modulus of the concrete after it has dried is at least 1.3 times greater.

(4)

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- (b) The energy absorbed before fracture by the 28-day old sample is less than the energy absorbed before fracture by the 2-day old sample.

The area under a stress-strain graph gives the energy absorbed per unit volume of the sample.

The energy absorbed before fracture by the 2-day old sample is  $0.35 \text{ MJ m}^{-3}$ .

Determine the percentage reduction in the energy absorbed before fracture between the 2-day old and the 28-day old samples.

You may assume that the volumes of the cylindrical samples are the same.

(3)

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- (c) Manufacturers recommend leaving concrete blocks to dry for at least 28 days before use.

Discuss why.

(3)

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(Total for Question 17 = 10 marks)