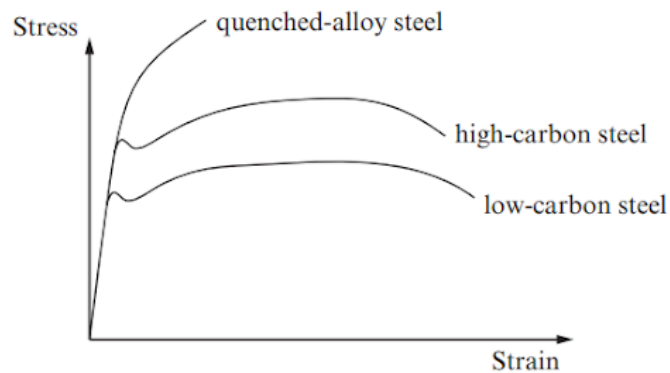


## Materials 1

Have a go at the following exam questions.

WJEC, 1325/01, JUNE 2011

C10. A. Stress - Strain curves for several kinds of steel are shown.



(a) State, giving reasons, which steel

(i) is the most ductile;

[1]

.....

(ii) has the highest breaking stress.

[1]

.....

(b) What can be said about their Young moduli?

[1]

.....

- 7 (a) Fig. 7.1 shows a length of tape under tension.

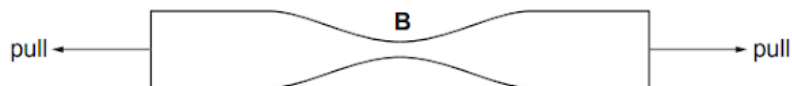


Fig. 7.1

- (i) Explain why the tape is most likely to break at point B.

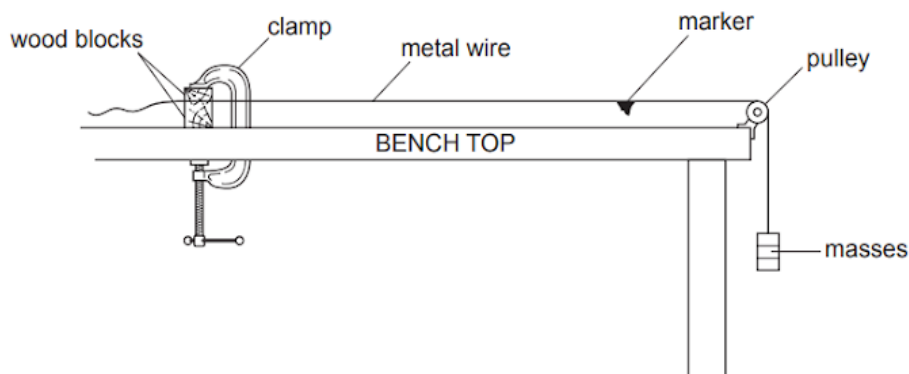
.....  
..... [1]

- (ii) Explain what is meant by the statement:

'the tape has gone beyond its elastic limit'.

.....  
.....  
..... [1]

- (b) Fig. 7.2 shows one possible method for determining the Young modulus of a metal in the form of a wire.



Describe how you can use this apparatus to determine the Young modulus of the metal. The sections below should be helpful when writing your answers.



The **measurements** to be taken:

*In your answer, you should use appropriate technical terms, spelled correctly.*

.....

.....

.....

.....

.....

.....



The **equipment** used to take the measurements:

*In your answer, you should use appropriate technical terms, spelled correctly.*

.....

.....

.....

.....

.....

.....

How you would **determine** Young modulus from your measurements:

.....

.....

.....

.....

.....

.....

[8]

[Total: 10]



- 5 (a) Tensile forces are applied to opposite ends of a copper rod so that the rod is stretched. The variation with stress of the strain of the rod is shown in Fig. 5.1.

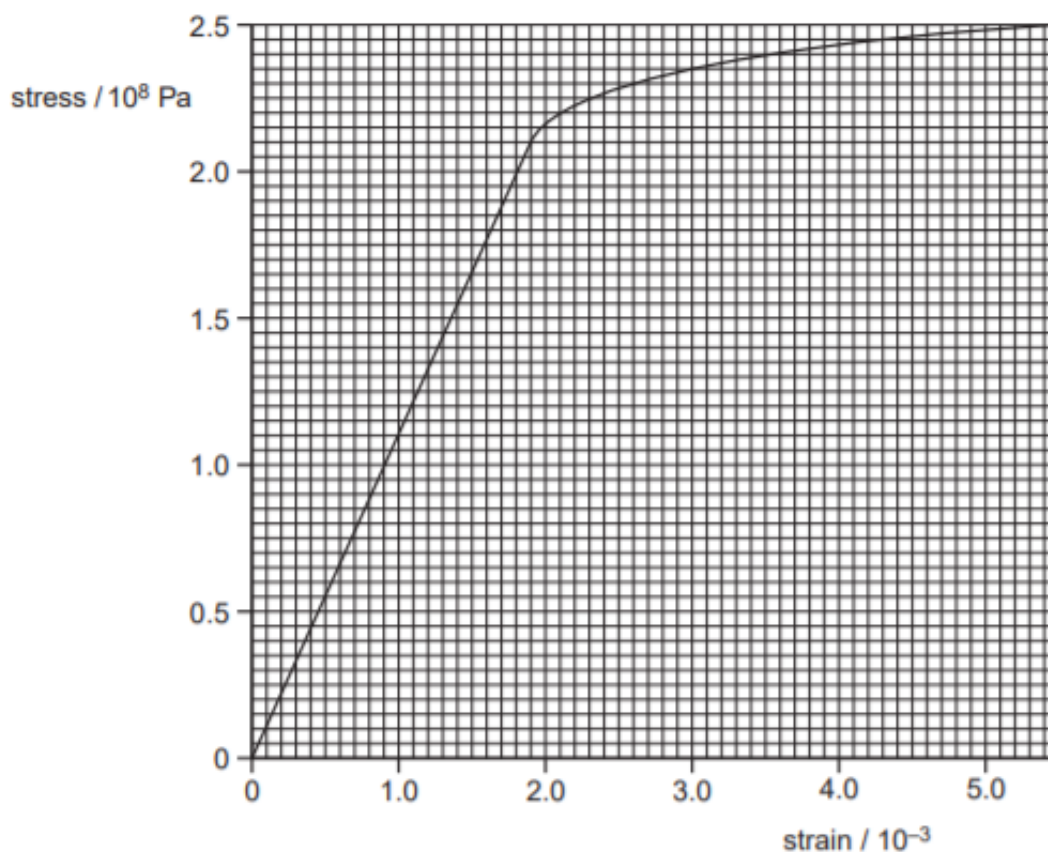


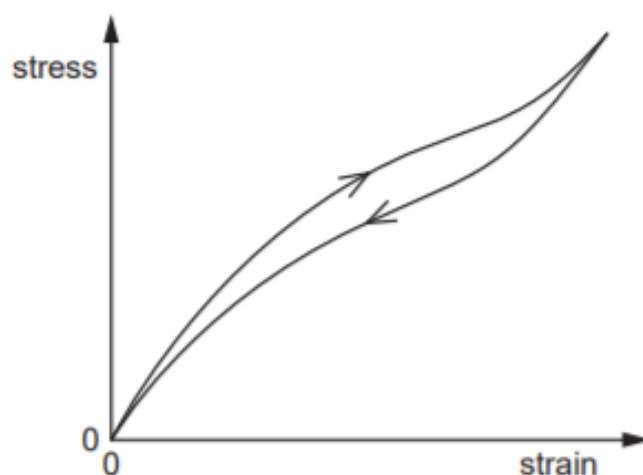
Fig. 5.1

- (i) Use Fig. 5.1 to determine the Young modulus of copper.

Young modulus = ..... Pa [3]

- (ii) On Fig. 5.1, sketch a line to show the variation with stress of the strain of the rod as the stress is reduced from  $2.5 \times 10^8$  Pa to zero. No further calculations are expected. [1]

- (b) The walls of the tyres on a car are made of a rubber compound. The variation with stress of the strain of a specimen of this rubber compound is shown in Fig. 5.2.



**Fig. 5.2**

As the car moves, the walls of the tyres bend and straighten continuously.

Use Fig. 5.2 to explain why the walls of the tyres become warm.

.....

.....

.....

.....[3]

4 (a) Define, for a wire,

(i) *stress*,

.....  
 ..... [1]

(ii) *strain*.

.....  
 ..... [1]

(b) A wire of length 1.70 m hangs vertically from a fixed point, as shown in Fig. 4.1.

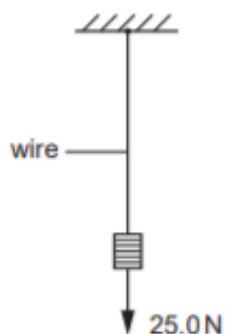


Fig. 4.1

The wire has cross-sectional area  $5.74 \times 10^{-8} \text{ m}^2$  and is made of a material that has a Young modulus of  $1.60 \times 10^{11} \text{ Pa}$ . A load of 25.0 N is hung from the wire.

(i) Calculate the extension of the wire.

extension = ..... m [3]

(ii) The same load is hung from a second wire of the same material. This wire is twice the length but the **same volume** as the first wire. State and explain how the extension of the second wire compares with that of the first wire.

.....  
 .....  
 ..... [3]