

Unit 6: Deformation of solids:

Subunit 6.2: Elastic and plastic behaviour:

Topical Question No: 1

- 18** A metal wire is stretched. The wire obeys Hooke's law.

Which quantity has a value that does **not** change?

- A** extension
- B** strain
- C** stress
- D** Young modulus

Topical Question No: 2

- 19** An object is stretched until it reaches the elastic limit.

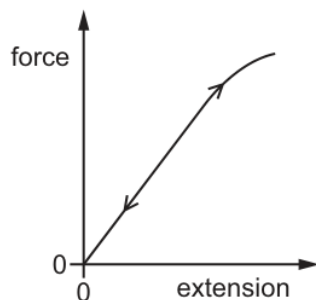
Which statement must describe the stress on the object when it is at the elastic limit?

- A** It is the maximum stress for which the object obeys Hooke's law.
- B** It is the maximum stress that can be applied to the object before it has elastic deformation.
- C** It is the maximum stress that can be applied to the object before it has plastic deformation.
- D** It is the maximum stress the object can withstand before it breaks.

Topical Question No: 3

- 19** A wire is fixed at one end and extended by a force that is applied to the other end. The force is slowly increased from zero and then slowly decreased back to zero.

The force–extension graph for the wire is shown.



The graph line for the wire being loaded is the same as the graph line for the wire being unloaded.

Which statement describes the deformation of the wire?

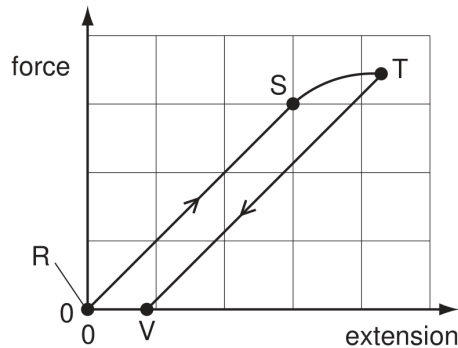
- A** It is both elastic and plastic.
- B** It is elastic only.
- C** It is neither elastic nor plastic.
- D** It is plastic only.

Topical Question No: 4

- 20** A long, thin metal wire is suspended from a fixed support and hangs vertically. Masses are suspended from its lower end.

The load on the lower end is increased from zero and then decreased again back to zero.

The diagram shows the force-extension graph produced.



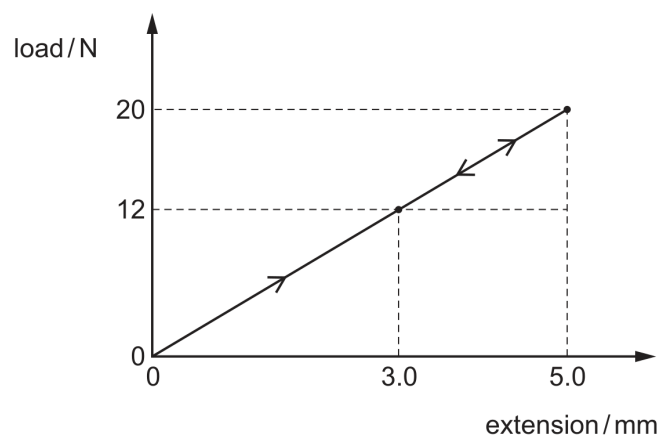
Where on the graph would the elastic limit be found?

- A** anywhere between point R and point S
- B** beyond point S but before point T
- C** exactly at point S
- D** exactly at point T

Space for working

Topical Question No: 5

- 21** A metal wire is attached at one end to a fixed point and a load is hung from the other end so that the wire hangs vertically. The load is increased from zero to 20 N. This causes the wire to extend elastically by 5.0 mm. The load is then reduced to 12 N and the extension decreases to 3.0 mm.



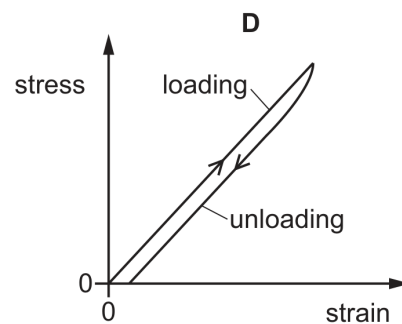
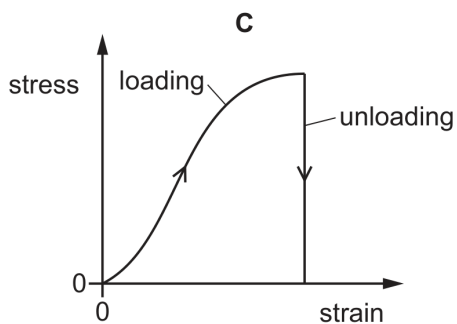
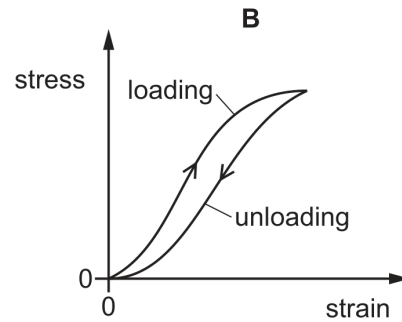
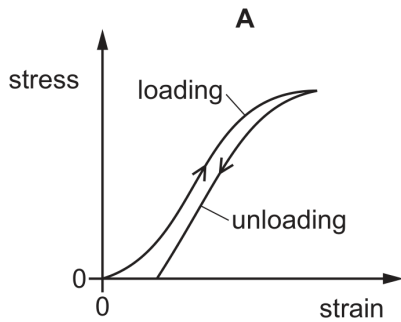
How much strain energy is released during the unloading process?

- A** $0.8 \times 10^{-2} \text{ J}$
- B** $1.8 \times 10^{-2} \text{ J}$
- C** $2.4 \times 10^{-2} \text{ J}$
- D** $3.2 \times 10^{-2} \text{ J}$

Topical Question No: 6

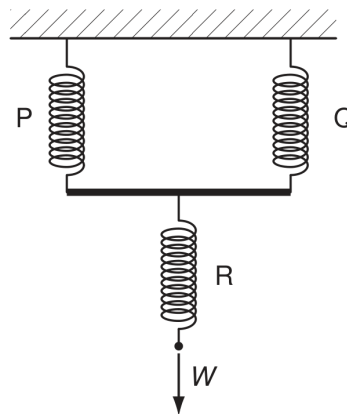
22 The stress-strain graphs for loading and unloading four different materials are shown.

Which material exhibits purely elastic behaviour?



Topical Question No: 7

23 Three springs are arranged vertically as shown.



Springs P and Q are identical and have spring constant k . Spring R has spring constant $3k$.

What is the increase in the overall length of the arrangement when a force W is applied as shown?

A $\frac{5W}{6k}$

B $\frac{4W}{3k}$

C $\frac{7}{2}kW$

D $4kW$

Space for working

Answer Key

1. D
2. C
3. B
4. N/A
5. N/A
6. N/A
7. N/A