

Topic Test – Solid Materials

Examination time – 30 minutes

Answer all the questions by ringing the letter that you think corresponds to the correct answer. If you change your mind, make it clear what your new choice is. Each question carries 1 mark.

1. The formula that describes density is:

A: $\rho = mV$; **B:** $\rho = m/V$; **C:** $\rho = V/m$; **D:** $\rho = mV^2$.

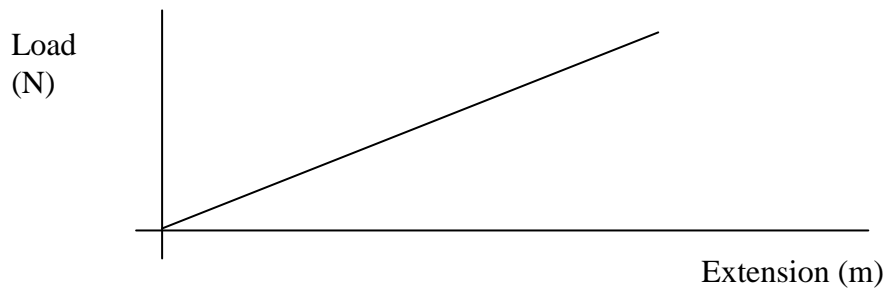
2. Units for stress are:

A: N/m; **B:** Nm; **C:** N/m²; **D:** N²m.

3. A material that springs back to its original length is called:

A: plastic; **B:** brittle; **C:** ductile; **D:** elastic.

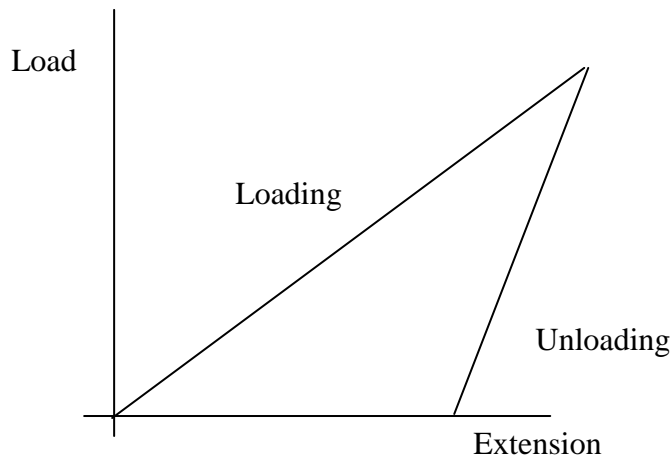
4. The graph shows the extension of a spring with load:



The gradient is:

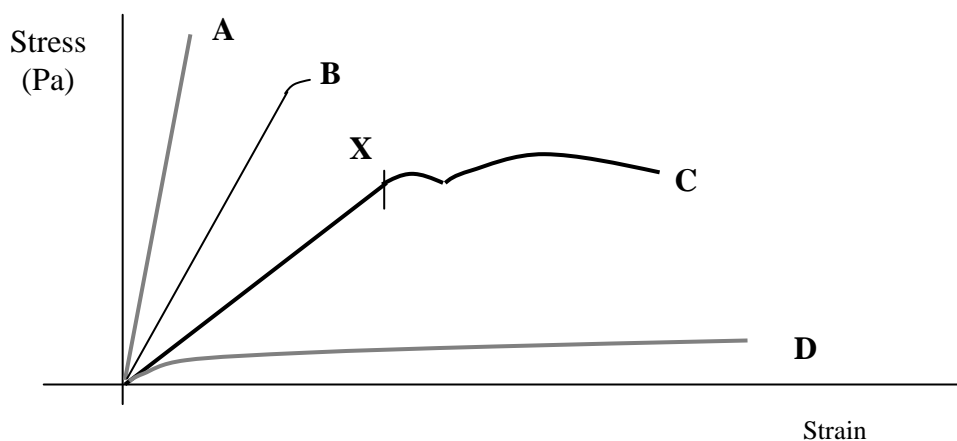
- A:** the spring constant;
B: the energy in the spring;
C: the Young Modulus;
D: the resistivity of the material.

5. When a material is loaded and unloaded, the graph can show that energy is wasted. This lost energy can be determined by:



- A:** the gradient of the loading line
B: the gradient of the unloading line;
C: the area under the unloading line;
D: the area between the loading line and the unloading line.
6. A spring is loaded with a mass of 0.5 kg and stretches by 3 cm. The energy in the spring is:
A: 0.0075 J; **B:** 0.075 J; **C:** 0.75 J; **D:** 1.5 J.
7. Which one of the following statements concerning the stretching of rubber is correct?
A: Rubber is not an elastic material;
B: Rubber does not obey Hooke's Law;
C: Rubber shows zero strain when loaded;
D: Zero energy is wasted between loading and unloading.

8 – 12 Refer to the graphs below:



Which one of the materials is:

8. Plastic?

9. Brittle?

10. Strong?

11. Ductile?

12. Which one of the following does the letter X refer to?

A: The ultimate tensile stress;

B: the point at which the material breaks;

C: the elastic limit;

D: the point at which the material begins to obey Hooke's Law.

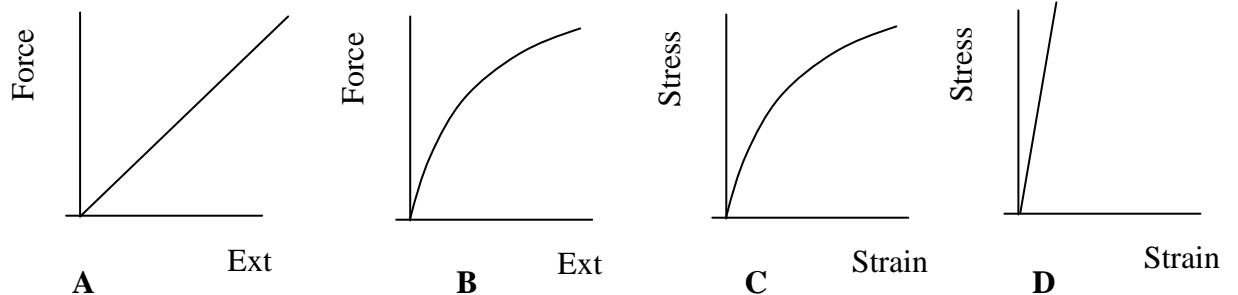
13. What are the units for strain?

A: N;

B: m ;

C: No units; **D:** m/N.

14. Which one of the following graphs can be used to determine the Young Modulus?



15. What are the units for the Young Modulus?

A: N/m^2 ;

B: N/m^3 ;

C: No units;

D: J.

16. The area under the stress-strain graph gives:

A: the inverse of the Young Modulus;

B: elastic potential energy;

C: the strain energy per unit volume;

D: the tension within the wire.

17. A load of 20 kg is applied to a steel wire 2 m long and diameter 0.5 mm. If the Young Modulus for steel is 2×10^{11} Pa, the extension is:
- A: 2 mm; B: 5 mm; C: 10 mm; D 20 mm
18. In an experiment to determine Young Modulus of copper using a 2 m length of wire of 0.5 mm diameter the **most likely** source of uncertainty is:
- A: measuring the length;
B: measuring the thickness with a micrometer;
C: determining the extension;
D: working out the load.
19. Experiments in a school lab to determine Young Modulus of steel wire can be hazardous for which one of the following reasons:
- A: The wire makes a loud noise when it breaks;
B: the strain energy in the wire can cause it to whiplash, to cause eye injuries.
C: the wire undergoes a lot of plastic deformation before it snaps.
D: the wire can be easily kinked.
20. Which one of the following statements about the Young Modulus is NOT true?
- A: It takes into account the thickness and length of a wire.
B: Its units are J m^{-3} .
C: The results of experiments to measure the Young modulus in school labs are usually less than the data book values.
D: It has the same units as pressure.

Total = 20 marks.