

Advancing Physics AS

Chapter Test 4

Name:

Set:

1. Steel is stated as having a resistivity of $17.0 \times 10^{-8} \Omega\text{m}$ at room temperature.

(a) Calculate the conductivity of steel at room temperature.

$$\text{Conductivity} = \text{_____} \text{Sm}^{-1} \quad [1]$$

A wire is made from this steel with a length of 2.0m and a cross-sectional area of $5.0 \times 10^{-4} \text{m}^2$.

(b) Calculate the conductance of this wire at room temperature

$$\text{Conductance} = \text{_____} \quad [3]$$

(c) State what happens to the conductance of the wire if it is heated.

[1]

2. China is said to be both *brittle* and *hard*.

(a) Explain what is meant by the terms in italics.

[2]

(b) State which class of material china is from.

[1]

Rubber is said to be both *elastic* and *tough*.

(c) Explain what is meant by the terms in italics.

3.

[2]

(a) State which class of material rubber is from.

[1]

Polythene is said to be both *plastic* and *transparent*.

(b) Explain what is meant by the terms in *italics*.

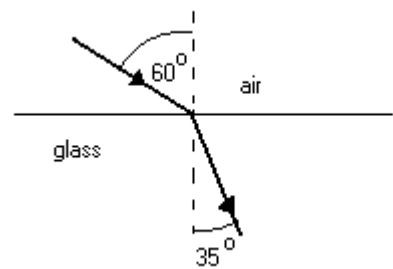
[2]

(c) State which class of material polythene is from.

[1]

4. The diagram shows a ray of light passing from air to glass.

(a) Calculate the refractive index of glass.



Refractive Index = _____ [2]

The speed of light in air can be taken to be $3.00 \times 10^8 \text{ ms}^{-1}$.

(b) Calculate the speed of the light ray when it is in the glass.

Speed = _____ ms^{-1} [2]

5. Diamond is stated as having a refractive index of 2.42

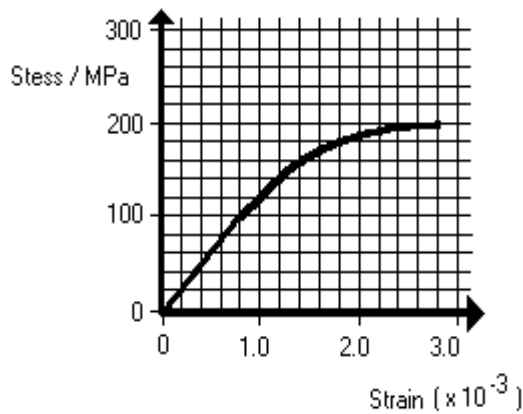
(a) Calculate the critical angle for diamond.

Critical angle = _____ [2]

(b) Use this to explain why light gets trapped in diamond for many reflections before finally being emitted into air.

[2]

6. An experiment is carried out to measure the Young Modulus of a copper wire.



is found between stress and strain for the

the Young Modulus for the copper wire

Young Modulus = _____ [3]

- (b) The wire has a cross-sectional area of 2.0 mm^2
Calculate the force on it when it is under a strain of 1.4×10^{-3} .

Force = _____ N [3]

- (c) The graph shows the behaviour of the wire up to breaking point.
Label the breaking point on the graph with the letter X. [1]

- (d) The original length of the wire is 200 mm
Calculate how long it is when it breaks

Length = _____ mm [2]

7. A constantan wire has the following bits of data known about it:

Resistivity = $4.90 \times 10^{-7} \Omega\text{m}$
Young Modulus = $1.62 \times 10^{11} \text{ Pa}$
Length = 5.00 m
Cross-sectional area = 1.00 mm^2

- (a) Calculate the resistance of the wire.

Resistance = _____ Ω [3]

- (b) A force of 500 N is hung on the wire, this is within the wire's elastic limit.
Calculate its new length

Length = _____ m [2]

- (c) Calculate the resistance of the wire now

Resistance = _____ Ω [1]

- (d) In practice, the resistance of the wire will have changed by more.
State a reason for this.

[1]