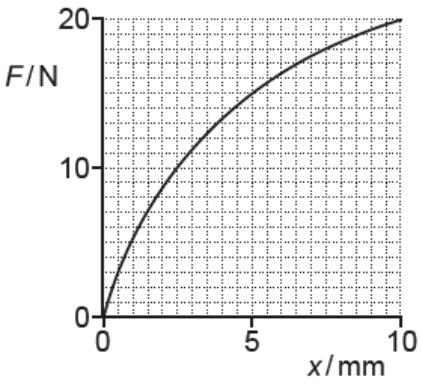
Materials – 2021/20 GCE Physics A Component 01

1. Nov/2021/Paper_H556_01/No.13

The force F against extension x graph for a material being stretched is shown.



What is best estimate for the energy stored in the material when the extension is 10 mm?

A 0.07 J

B 0.10 J

C 0.13 J

D 0.20 J

Your answer ☐ **[1]**

2. Nov/2020/Paper_H556_01/No.10

A spring is stretched by hanging on it a variable mass m. The mass m is always at rest.
The spring obeys Hooke's law.

What is the relationship between the elastic potential energy E in the spring and the mass m?

A $E \propto m^{-1}$

B $E \propto m^{-2}$

C $E \propto m$

D $E \propto m^{2}$

Your answer ☐ **[1]**

3. Nov/2020/Paper_H556_01/No.13

The Young modulus E of a metal can be determined using the expression $E = \frac{4F}{\varepsilon\pi d^2}$, where F is the tension in the wire, d is the diameter of the wire and ε is the strain of the wire.

Here is some data.

Quantity	Percentage uncertainty
F	5.3
ε	1.2
d	1.0

What is the percentage uncertainty in the calculated value of E?

A 2.1%

B 6.4%

C 7.5%

D 8.5%

Your answer ☐ **[1]**

4. Nov/2020/Paper_H556_01/No.16(e)

(e) The steel tow bar used to pull the car has length 0.50 m and diameter 1.2×10^{-2} m. The Young modulus of steel is 2.0×10^{11} Pa.

Calculate the extension x of the tow bar as the car travels up the slope.

$x =$ ..... m **[3]**

5. Nov/2021/Paper_H556_03/No.1b(ii)

(b) The overhead cable in **Fig. 1** must be tensioned.
It is constructed from several equal lengths of wire.

Some data for one length of this wire are shown below.

- length = 1500 m
- area of cross-section = $1.1 \times 10^{-4}\,m^2$
- resistivity = $1.8 \times 10^{-8}\,\Omega m$
- the Young modulus = $1.2 \times 10^{10}\,Pa$
- strain = 1.3%

(ii) Calculate the tension T in one length of wire.

T = ... N **[3]**