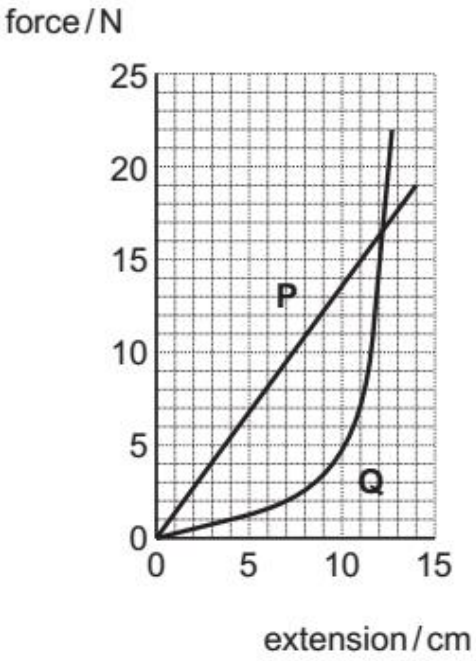
AS Level Physics B

H157/01 Foundations of physics

Question Set 1 (Module 3 MCQs)

1. This is a force–extension graph for two cords, **P** and **Q**, made of different materials.

The cords had the same initial length and diameter and were stretched up to breaking point.



Which one of these statements is true?

A The stiffness of **Q** decreases as it is stretched.

B The work done to stretch **Q** by 12 cm and the work done to stretch **P** by 12 cm is the same.

C The stiffness of **P** is approximately 1.3 N m^{-1}.

D **Q** is stronger than **P**.

Your answer ☐

[1]

2. A spacecraft sends images of Pluto to Earth.
Each image consists of 1024 × 1024 pixels. Each pixel is coded by 12 bits.

The data transfers at a rate of 200 bytes per second. Approximately how long does it take to transmit one image?

A 700 seconds

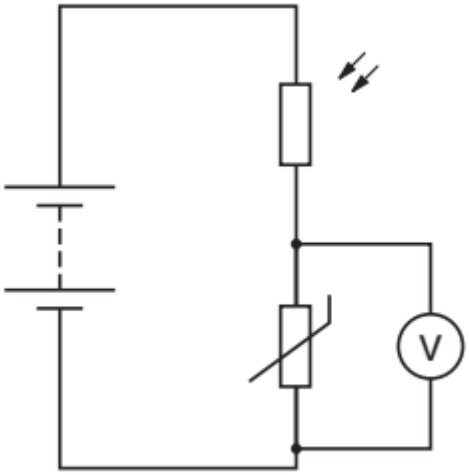
B 5200 seconds

C 7800 seconds

D 63 000 seconds

Your answer ☐ **[1]**

3. In the circuit below, the thermistor conducts better at higher temperatures.



Which set of conditions produces the highest reading on the voltmeter?

A high light intensity, high temperature

B high light intensity, low temperature

C low light intensity, high temperature

D low light intensity, low temperature

Your answer ☐

[1]

4. A plane-polarised light wave is passed through a single polarising filter. The filter is rotated and the intensity observed drops from a maximum to zero.

Through what angle was the filter rotated?

A 45°

B 90°

C 180°

D 360°

Your answer ☐

[1]

5. Which is an expression for energy?

A Fv where F is the force causing a body to move and v is its speed.

B I^2R where I is the current in a resistance of value R.

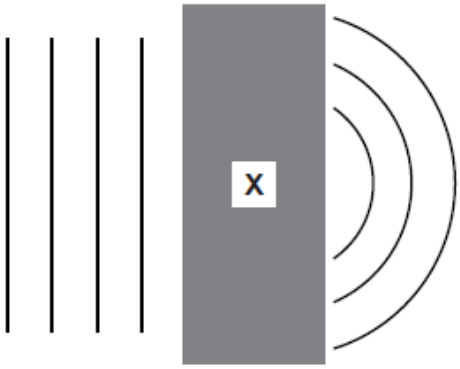
C mv where m is the mass of a body moving with velocity v.

D VIt where V is the potential difference across a conductor, I is the current through it and t isthe time for which the current flows.

Your answer ☐

[1]

6. The diagram shows plane wavefronts incident on a region **X**.The contents of region **X** are hidden from view.



Region **X** is most likely to contain …

A a converging lens.

B a narrow slit.

C a polarising filter.

D a rectangular plastic block.

Your answer ☐

[1]

7. An unextended spring is 0.2 m long and has a spring constant of 2500 N m^{-1}.
It is stretched to **three** times its original length and is still obeying Hooke's law.

What is the work done in stretching the spring?

A 50 J

B 200 J

C 450 J

D 800 J

Your answer ☐

[1]

8. The length of a square paving stone is 0.500 ± 0.002 m.

The percentage uncertainty in this measurement is 0.4%.

The area of the paving slab is 0.250 m^2.

What is the uncertainty in the value for the area?

A ± 0.0004 m^2

B ± 0.0010 m^2

C ± 0.0020 m^2

D ± 0.0040 m^2

Your answer ☐

[1]

9. Two wires of the same material are of equal unstretched length. One of the wires has double the diameter of the other wire. Equal weights are suspended from both wires. The thinner wire has strain ε.

What is the strain in the thicker wire?

A $\frac{\varepsilon}{4}$

B $\frac{\varepsilon}{2}$

C 2ε

D 4ε

Your answer ☐

[1]

10. A student uses an ohmmeter and obtains five readings all of 1.89 kΩ.

The student changes the range from 0–20 kΩ to 0–2 kΩ.

The student takes five new readings as shown in the table.

Resistance / kΩ	1.888	1.892	1.887	1.889	1.891

Which line in the table correctly describes the effects of this change?

	Meter	**Results**
A	Better resolution	More precise
B	Better resolution	More accurate
C	Better precision	More accurate
D	Better precision	More precise

Your answer ☐

[1]

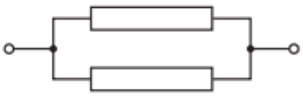
11. The resistors below are identical. Each combination is connected in a circuit to a 6 V battery of negligible internal resistance.

For which combination is the most power dissipated?

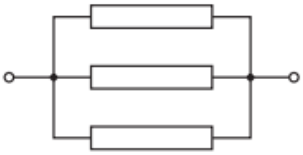
A

B

C



D



Your answer ☐

[1]

12. Which of the following correctly describes ceramic materials?

A ductile

B plastic

C stiff

D tough

Your answer ☐

[1]

13. The sum of the currents entering a junction is equal to the sum of the currents leaving the junction.

This is the principle of conservation of which quantity?

A charge

B energy

C mass

D momentum

Your answer ☐

[1]

14. Which of these statements about metals is **not** correct?

A They have a high number density of charge carriers.

B They have directional bonds between the metal ions.

C They have mobile dislocations.

D Pure metals are usually ductile.

Your answer ☐

[1]

15. There is a current of 5.0 mA in a 250 Ω resistor for 40 minutes.

How much energy is dissipated in the resistor?

A 2.5×10^{-6} J

B 1.5×10^{-4} J

C 0.25 J

D 15 J

Your answer ☐

[1]

16. A converging lens produces a focused image at a distance of 0.40 m from the lens.

The magnification of the image is 2.0.

What is the power of the lens?

A 0.13 D

B 0.20 D

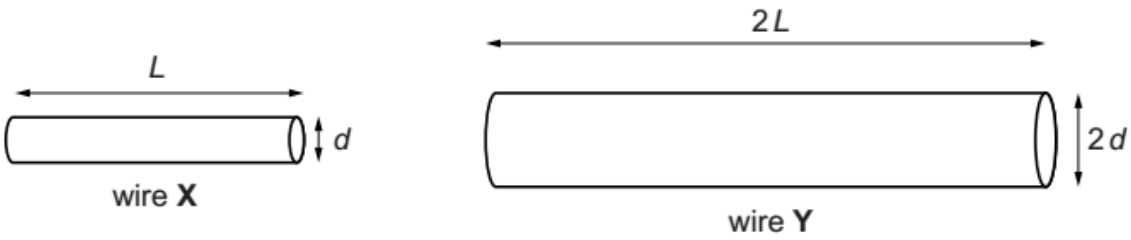
C 5.0 D

D 7.5 D

Your answer ☐

[1]

17. Two wires of the same material have the dimensions shown in the diagram.



What is the ratio $\frac{\text{conductance of wire } \mathbf{X}}{\text{conductance of wire } \mathbf{Y}}$?

A $\frac{1}{2}$

B 1

C $\sqrt{2}$

D 2

Your answer ☐

[1]

18. The unit of electrical charge, the coulomb, C, can be expressed in base units as

A ampere per second, A s^{-1}

B ampere-second, A s

C ampere second-squared, A s^2

D second per ampere, s A^{-1}

Your answer ☐

[1]

19. Three identical resistors each of conductance G are connected in parallel.

The conductance of the combination is

A $3G$

B $\frac{3}{G}$

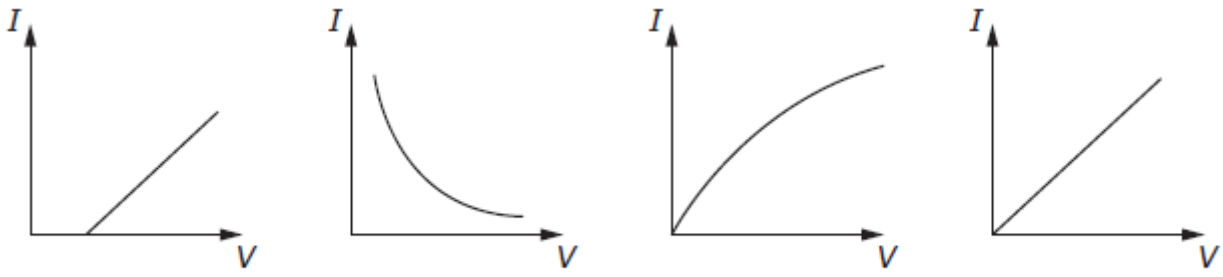
C G^3

D $\frac{G}{3}$

Your answer ☐

[1]

20. Which sketch graph shows how the current I in an ohmic resistor varies with the p.d. V across it?



A **B** **C** **D**

Your answer ☐

[1]

21. A student measures the potential difference across a wire = 1.05 V (±0.01 V) and the current in the wire = 0.34A (±0.01A).

The percentage uncertainty in the resistance of the wire is

A 0.1%

B 2%

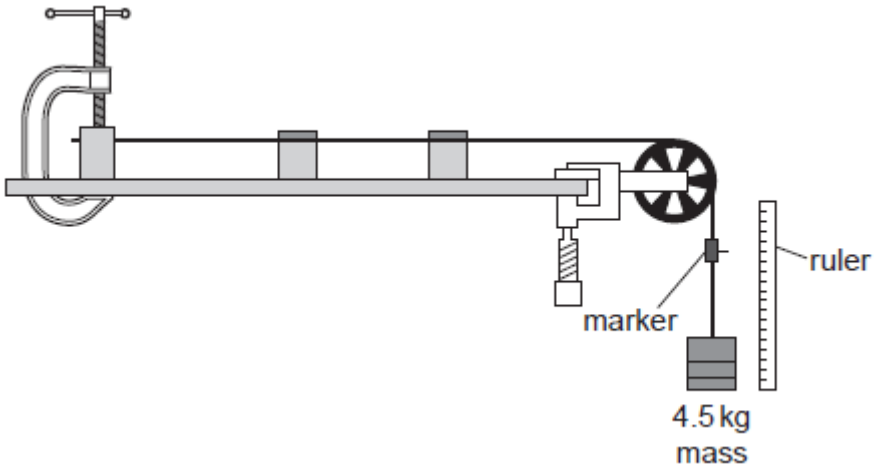
C 4%

D 8%

Your answer ☐

[1]

22. A wire of length 2.1 m is stretched using the apparatus shown.



A mass of 4.5 kg is attached to the end of the wire. The wire extends by 2.0 mm. The cross-sectional area of the wire is 7.5×10^{-7} m^2.

The Young modulus of the wire material is

A 56 kPa

B 5.6 GPa

C 6.2 GPa

D 62 GPa

Your answer ☐

[1]

23. A sensor is made up of 32 × 32 pixels.

In one experiment:

– a source emits 4096 photons, all of which are detected by the sensor;

– the probability of arrival of a photon is the same for each pixel.

The expected number of photons detected in each pixel is

A 1

B 4

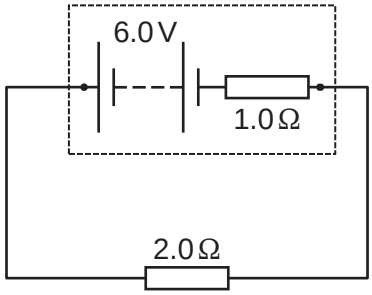
C 128

D 4096

Your answer ☐

[1]

24. In the circuit shown, the p.d. across the 2.0 Ω resistor is



A 2.0 V

B 3.0 V

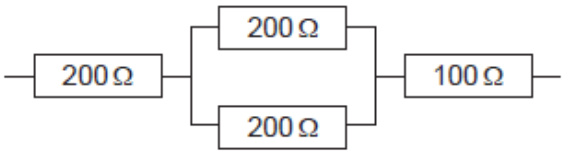
C 4.0 V

D 6.0 V

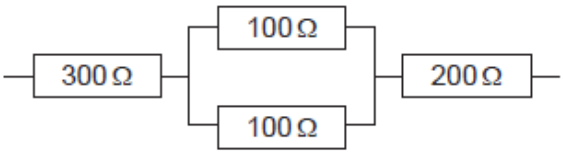
Your answer ☐

[1]

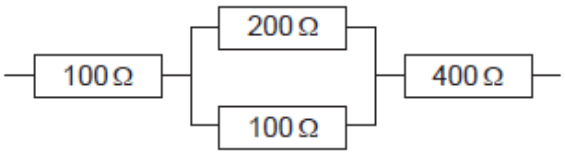
25. Which combination of resistors gives the **lowest** overall resistance?



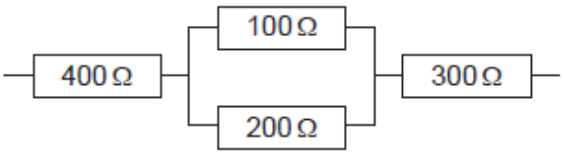
A



B



C



D

Your answer ☐

[1]

26. An unstretched spring is 20 cm long and has a spring constant of 25 N cm^{-1}.

It is stretched to 3 times its length and is still following Hooke's law.

The energy stored in the spring is

A 50 J

B 200 J

C 450 J

D 900 J

Your answer ☐

[1]

Total Marks for Question Set 1: 26