

A level Physics B

H557/01 Fundamentals of physics

Question Set 1: (Module 3 MCQs)

1

The unit of electrical resistance is the ohm Ω . 1Ω is the same as

- A 1 C V^{-1}
- B 1 S^{-1}
- C $1 \text{ C}^2 \text{ J}^{-1} \text{ s}^{-1}$
- D 1 A V^{-1}

[1]

2

A signal is being digitised by sampling at 12 kHz.
The total voltage is 5.0 V and the noise voltage is 4.9 mV.

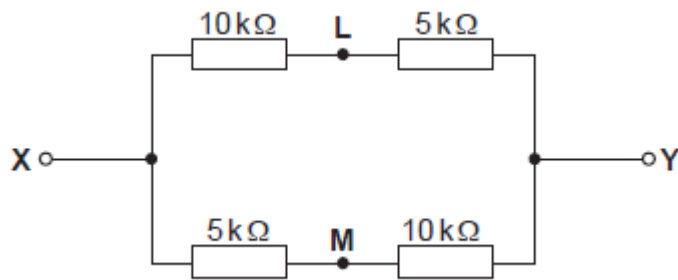
Which statement is correct?

- A $\frac{V_{\text{total}}}{V_{\text{noise}}} \approx 10^3$
- B The highest frequency in the signal should not exceed 24.0 kHz.
- C The recommended number of bits per sample is 8.
- D The voltage resolution of the sampling should be about 1 mV.

[1]

3

The diagram shows a combination of four resistors.



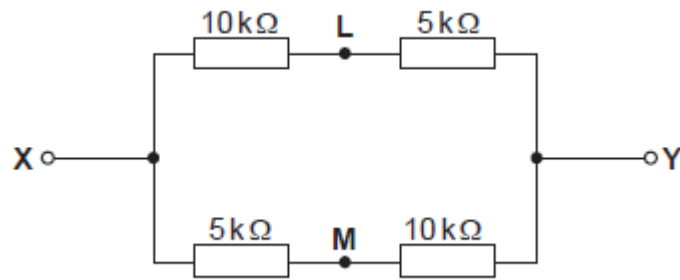
What is the resistance between X and Y?

- A $5 \text{ k}\Omega$
- B $7.5 \text{ k}\Omega$
- C $15 \text{ k}\Omega$
- D $30 \text{ k}\Omega$

[1]

4

The diagram shows a combination of four resistors.



A battery of e.m.f. 12 V and negligible internal resistance is connected across XY . What is the magnitude of the p.d. between L and M ?

- A 2 V
- B 4 V
- C 6 V
- D 8 V

[1]

5

Two heater coils X and Y dissipate the same power when coil X runs at 12 V and coil Y runs at 6 V . The coils are made from equal lengths of wire of the same material, but different diameter.

Which one of **A** to **D** below is equal to the ratio $\frac{\text{resistance of } X}{\text{resistance of } Y}$?

- A $\frac{1}{4}$
- B $\frac{1}{2}$
- C 2
- D 4

[1]

6

Two heater coils X and Y dissipate the same power when coil X runs at 12 V and coil Y runs at 6 V . The coils are made from equal lengths of wire of the same material, but different diameter.

Which one of **A** to **D** below is equal to the ratio $\frac{\text{diameter of wire } X}{\text{diameter of wire } Y}$?

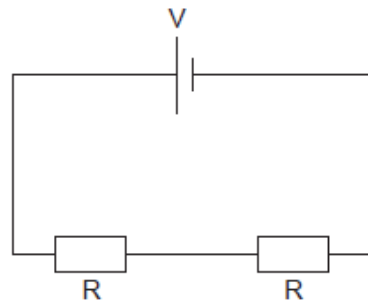
- A $\frac{1}{4}$
- B $\frac{1}{2}$
- C 2
- D 4

[1]

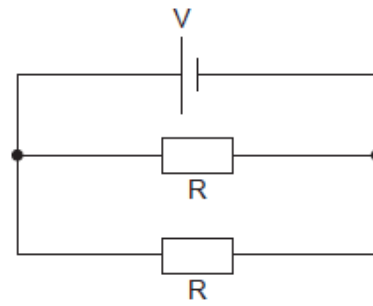
- 7 Which expression gives a quantity that can be expressed in joules?
- A Fv where F is the force causing a body to move and v is its speed
 - B I^2R where I is the current flowing through a resistance of value R
 - C mv where m is the mass of a body moving with velocity v
 - D VIt where V is the potential difference across a conductor and I is the current in it for time t .
- [1]**
- 8 How many bits are required to code for 1300 different levels?
- A 3
 - B 4
 - C 10
 - D 11
- [1]**
- 9 An image sent from Pluto to Earth is 1024×1024 pixels. Each pixel is coded by 12 bits. The data is transferred at a rate of 200 bytes per second.
- How long does it take to transmit the data?
- A 11 minutes
 - B 87 minutes
 - C 131 minutes
 - D 1049 minutes
- [1]**
- 10 A weight of 20 N is suspended from a steel wire.
- What is the extension of the wire?
- Data: original length of wire = 2.5 m
cross-sectional area of wire = $7.0 \times 10^{-8}\text{ m}^2$
Young Modulus of the wire material = $2.1 \times 10^{11}\text{ Pa}$
- A 0.0030 m
 - B 0.0034 m
 - C 0.030 m
 - D 0.034 m
- [1]**

11

These two circuits use identical components. The cells have zero internal resistance.



circuit 1



circuit 2

What is the ratio $\frac{\text{power dissipated in circuit 1}}{\text{power dissipated in circuit 2}}$?

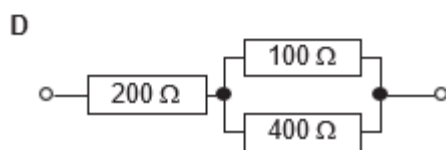
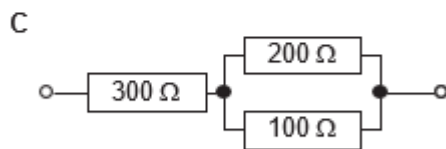
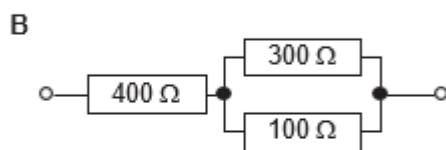
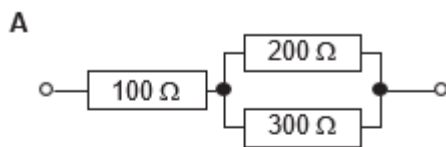
- A $\frac{1}{4}$
- B $\frac{1}{2}$
- C 2
- D 4

Your answer

[1]

12

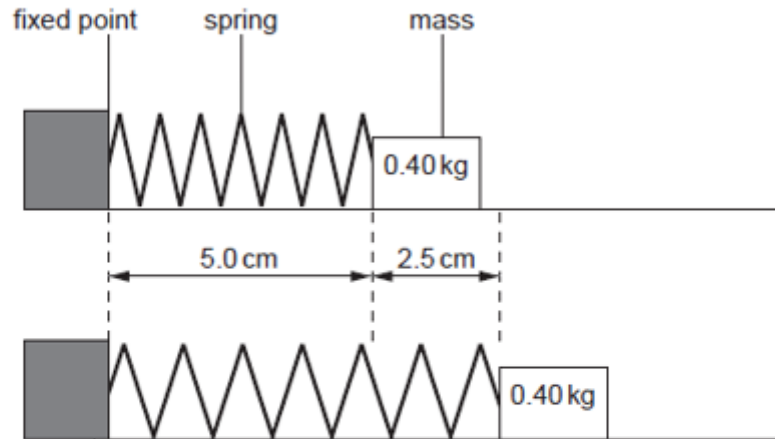
Which combination of resistors gives the lowest total resistance?



[1]

13

The spring in this diagram has a spring constant of 20 N m^{-1} .
 The mass is pulled away from the fixed point. The spring stretches by 2.5 cm .
 The mass is then released.



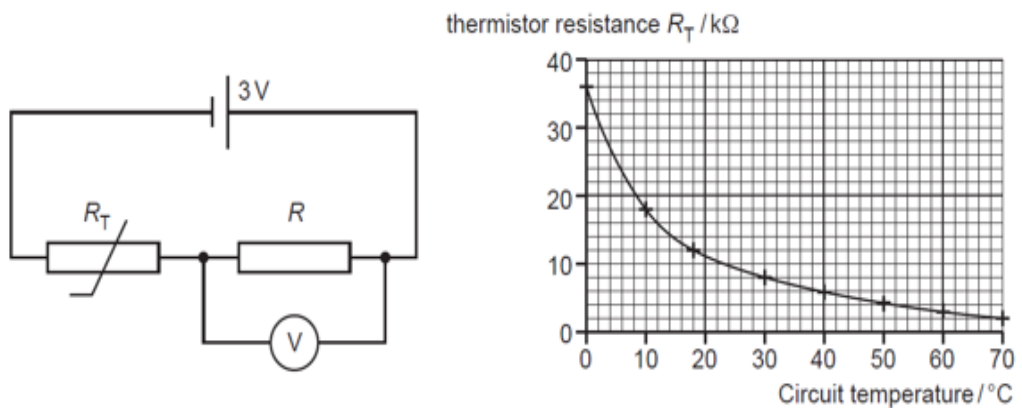
What is the maximum speed reached by the mass?

- A 0.18 m s^{-1}
- B 0.53 m s^{-1}
- C 1.25 m s^{-1}
- D 3.75 m s^{-1}

[1]

14

A thermistor is used in a potential divider circuit.



When the circuit temperature is 10°C the reading on the voltmeter is 1.0 V .
 What is the resistance of the resistor R ?

- A $6 \text{ k}\Omega$
- B $9 \text{ k}\Omega$
- C $18 \text{ k}\Omega$
- D $36 \text{ k}\Omega$

[1]

15

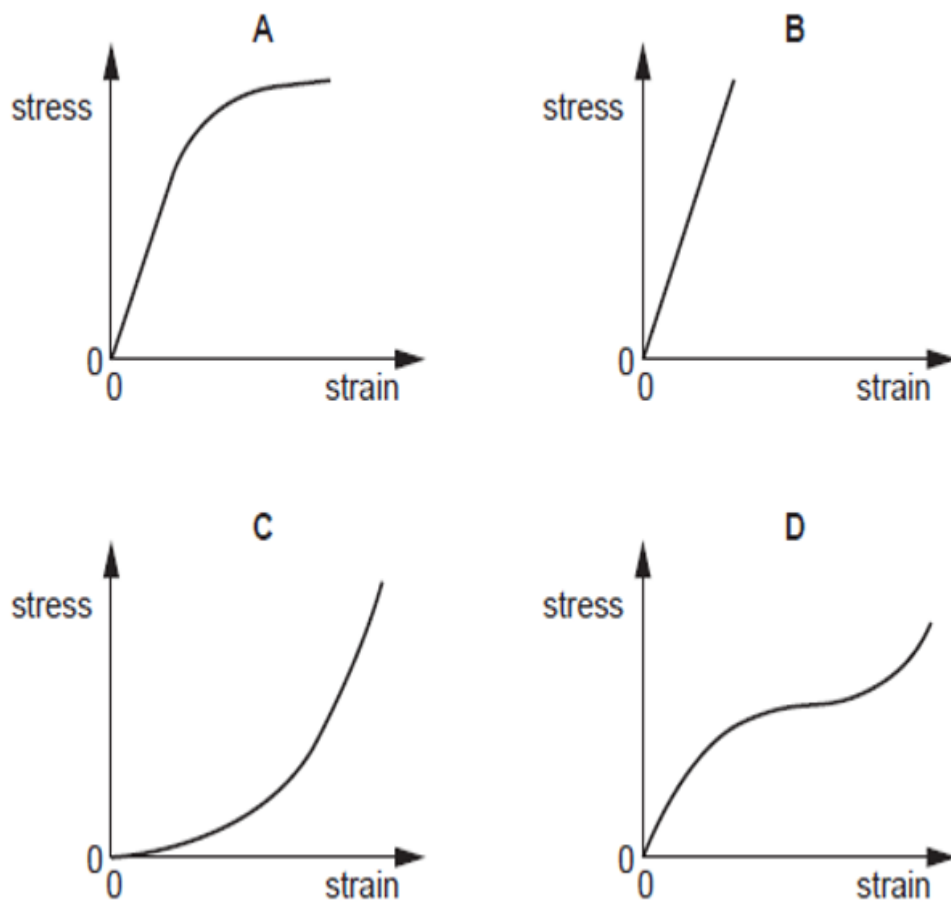
The unit of electrical conductance is the siemens S, 1 S is the same as

- A 1 J C^{-1}
- B 1 A V^{-1}
- C 1 C V^{-1}
- D $1 \Omega^{-1} \text{ m}^{-1}$

[1]

16

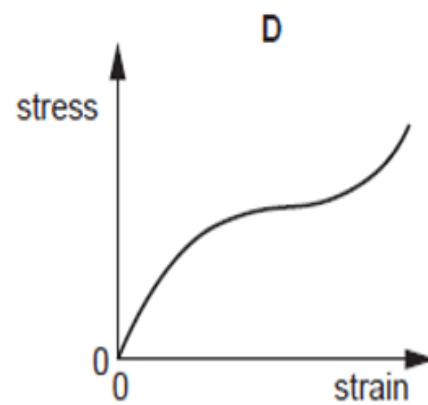
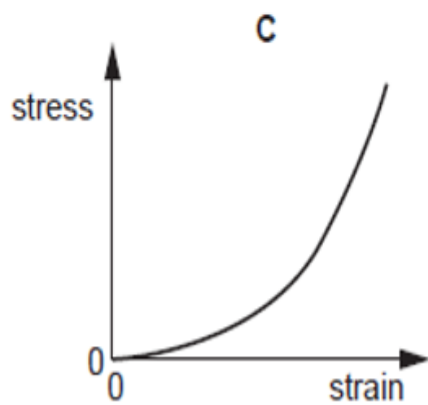
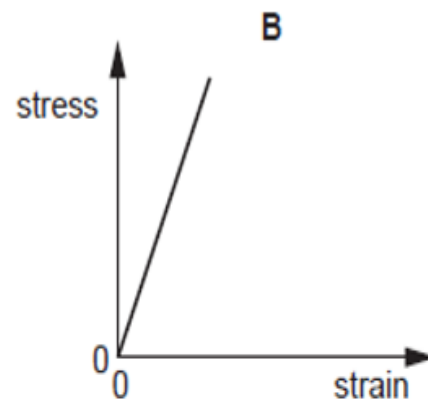
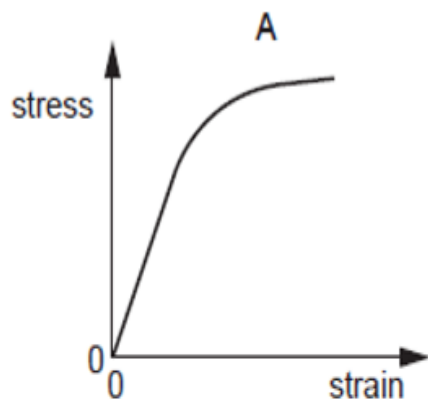
The stress–strain graphs for four different materials are shown.



Which diagram shows the stress–strain graph for a ductile metal?

[1]

The stress–strain graphs for four different materials are shown.

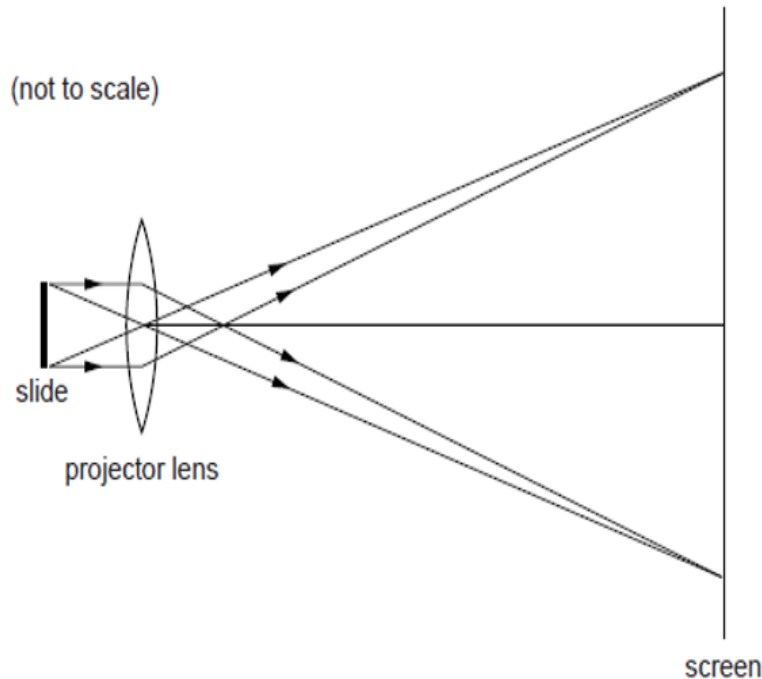


Which diagram shows the stress–strain graph for a rubber polymer?

[1]

18

A slide projector has a lens of focal length f . It is set up to give a large, magnified focused image on a screen. The screen is further than $2f$ from the lens centre.



Where is the slide (object) placed?

- A further than $2f$ from the lens centre
- B at $2f$ from the lens centre
- C between $2f$ and f from the lens centre
- D at f from the lens centre

[1]

19

A signal is digitised by sampling at 22 kHz.

The total voltage variation is 2.0V and the noise voltage variation is 1.0 mV.

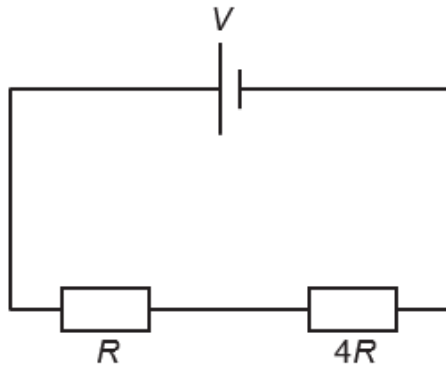
Which statement is correct?

- A The highest frequency accurately sampled will be 11 kHz.
- B The recommended number of bits per sample is 8.
- C The voltage resolution of the sampling should be about 0.1 mV.
- D $\frac{V_{\text{total}}}{V_{\text{noise}}} \approx 11 \times 10^3$

[1]

20

The circuit shows a potential divider with resistors of R and $4R$.



What is the ratio $\frac{\text{power dissipated in resistor } R}{\text{power dissipated in resistor } 4R}$?

A $\frac{1}{16}$

B $\frac{1}{4}$

C $\frac{4}{5}$

D 4

[1]

21

A student is calculating the charge carrier number density of a metal. She knows how many free electrons each atom contributes, the density of the metal and the molar mass of the metal.

Which further piece of information does she need to calculate the charge carrier number density?

- A the Avogadro constant
- B the charge on the electron
- C the crystal structure of atomic packing
- D the electrical conductivity of the metal

[1]

22

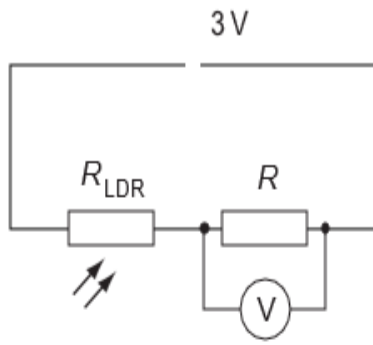
A nickel wire has conductance of 0.43S, a length of 2.0m and a cross-sectional area of $5.0 \times 10^{-7} \text{m}^2$.

What is the conductivity of nickel in S m^{-1} ?

- A** 1.1×10^{-7}
- B** 5.9×10^{-7}
- C** 1.7×10^6
- D** 9.3×10^6

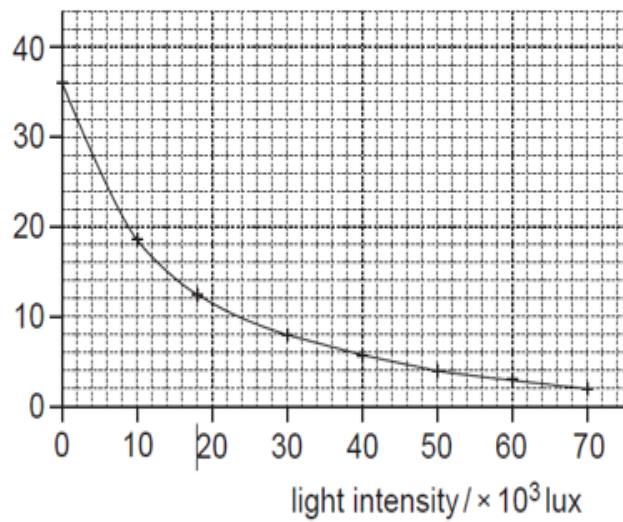
[1]

An LDR is used in a potential divider circuit.



The graph shows the LDR resistance against light intensity.

LDR resistance $R_{LDR}/k\Omega$



When the light intensity on the LDR is 30×10^3 lux, the reading on the voltmeter is 2.0V. What is the resistance R of the resistor?

- A 4.0 $k\Omega$
- B 8.0 $k\Omega$
- C 12 $k\Omega$
- D 16 $k\Omega$

[1]

Total Marks for Question Set 1: 23

OCR

Oxford Cambridge and RSA

Copyright Information

OCR is committed to seeking permission to reproduce all third-party content that it uses in its assessment materials. OCR has attempted to identify and contact all copyright holders whose work is used in this paper. To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced in the OCR Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download from our public website (www.ocr.org.uk) after the live examination series.

If OCR has unwittingly failed to correctly acknowledge or clear any third-party content in this assessment material, OCR will be happy to correct its mistake at the earliest possible opportunity.

For queries or further information please contact The OCR Copyright Team, The Triangle Building, Shaftesbury Road, Cambridge CB2 8EA.

OCR is part of the Cambridge Assessment Group; Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge