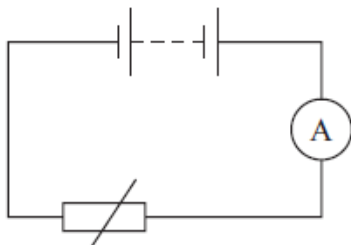


Questions

Q1.

The circuit shown includes a thermistor.



Which of the following explains the change in the ammeter reading as the temperature of the thermistor decreases?

- ☐ A The number of conduction electrons decreases so the ammeter reading decreases.
- ☐ B The number of conduction electrons decreases so the ammeter reading increases.
- ☐ C The number of conduction electrons increases so the ammeter reading decreases.
- ☐ D The number of conduction electrons increases so the ammeter reading increases.

(Total for question = 1 mark)

Q2.

Answer the question with a cross in the box you think is correct (☒). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☒).

A current in a wire causes the temperature of the wire to increase.

Which row of the table describes the changes to the wire as the temperature increases?

	Amplitude of lattice vibrations in the wire	Resistance of the wire
☐ A	decreases	decreases
☐ B	increases	decreases
☐ C	decreases	increases
☐ D	increases	increases

(Total for question = 1 mark)

Q3.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

As the temperature of the filament in a bulb decreases, the resistance of the filament changes.

Which of the following is the reason for this change in resistance of the filament?

- ☐ A Lattice vibrations decrease
- ☐ B Lattice vibrations increase
- ☐ C Number of conduction electrons decreases
- ☐ D Number of conduction electrons increases

(Total for question = 1 mark)

Q4.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

The temperature of a thermistor is increased.

Which row in the table identifies the effect of the temperature increase on the number of conduction electrons and the amplitude of lattice vibrations?

	Number of conduction electrons	Amplitude of lattice vibrations
☐ A	increases	increases
☐ B	decreases	increases
☐ C	increases	stays the same
☐ D	decreases	stays the same

(Total for question = 1 mark)

Q5.

Answer the question with a cross in the box you think is correct (☐). If you change your mind, put a line through the box (☒) and then mark your new answer with a cross (☐).

The number of conduction electrons in a light dependent resistor changes as light intensity increases.

Which of the following best explains how the number of conduction electrons changes?

- ☐ A It decreases because the lattice ions vibrate with a larger amplitude.
- ☐ B It increases because the lattice ions vibrate with a larger amplitude.
- ☐ C It increases because the electrons gain energy from the photons of light.
- ☐ D It decreases because electrons are released due to the photoelectric effect.

(Total for question = 1 mark)

Q6.

Answer the question with a cross in the box you think is correct (☐). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☐).

The temperature of a thermistor and the temperature of a metal wire are increased.

Which row of the table gives the changes in resistance of the thermistor and the metal wire as the temperature is increased?

	Resistance of thermistor	Resistance of metal wire
☐ A	decreases	decreases
☐ B	decreases	increases
☐ C	increases	decreases
☐ D	increases	increases

(Total for question = 1 mark)

Q7.

Select one answer from A to D and put a cross in the box ☐. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☐.

As temperature increases, the resistance of a negative temperature coefficient thermistor changes.

Which of the following describes the reason for this change?

- ☐ A Collisions between electrons and ions occur less frequently.
- ☐ B More conduction electrons are released.
- ☐ C The ions in the thermistor vibrate less.
- ☐ D The ions in the thermistor vibrate more.

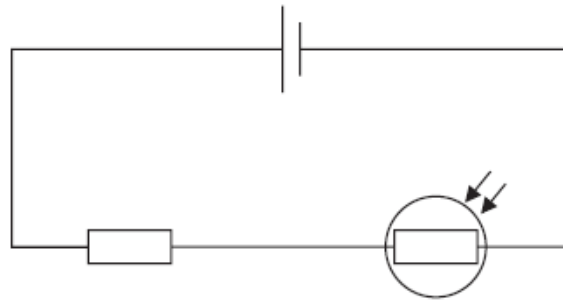
(Total for question = 1 mark)

Q8.

Select one answer from A to D and put a cross in the box ☐. If you change your mind

about an answer, put a line through the box ☐ and then mark your new answer with a cross ☒.

A light dependent resistor (LDR) and a fixed resistor are connected in a circuit, as shown.



The intensity of the light incident on the LDR is increased.

Which of the following does **not** take place as the light intensity is increased?

- ☐ **A** The current in the circuit increases.
- ☐ **B** The potential difference across the fixed resistor increases.
- ☐ **C** The total power dissipated in the circuit decreases.
- ☐ **D** The resistance of the LDR decreases.

(Total for question = 1 mark)

Q9.

Answer the question with a cross in the box you think is correct ☒. If you change your mind about an answer, put a line through the box ☐ and then mark your new answer with a cross ☒.

When the temperature of a metal wire increases, the resistance of the wire increases.

Which of the following explains this increase in resistance?

- ☐ **A** the amplitude of the lattice vibrations decreases
- ☐ **B** the amplitude of the lattice vibrations increases
- ☐ **C** the number of conduction electrons decreases
- ☐ **D** the number of conduction electrons increases

(Total for question = 1 mark)

Q10.

Answer the question with a cross in the box you think is correct ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.

There is an increase in the intensity of light incident on a light dependent resistor (LDR). This causes a change in the number of conduction electrons and a change in the resistance of the LDR.

Which row of the table describes these changes?

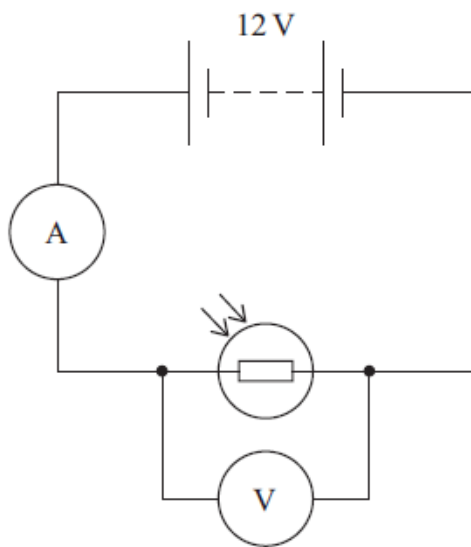
	Number of conduction electrons	Resistance of LDR
☐ A	decreases	decreases
☐ B	decreases	increases
☐ C	increases	decreases
☐ D	increases	increases

(Total for question = 1 mark)

Q11.

Answer the question with a cross in the box you think is correct (☐). If you change your mind about an answer, put a line through the box (☒) and then mark your new answer with a cross (☐).

A light dependent resistor (LDR) is connected in a circuit, as shown.



The internal resistance of the battery is negligible.

The light intensity incident on the LDR increases.

Which row of the table describes what happens to the readings on the voltmeter and the ammeter?

	Voltmeter reading	Ammeter reading
☐ A	decreases	decreases
☐ B	stays the same	increases
☐ C	stays the same	decreases
☐ D	increases	increases

(Total for question = 1 mark)

Q12.

The filament in a lamp is a metal wire. A current in the filament causes heating.

Explain how the resistance of the filament changes as the temperature of the filament increases.

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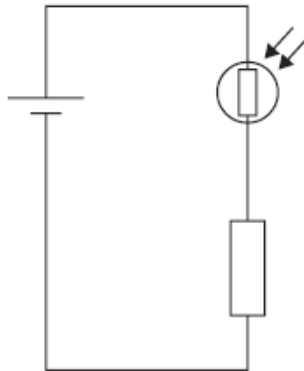
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(Total for question = 3 marks)

Q13.

A security lamp automatically switches on when the intensity of light incident on an LDR decreases.

Part of the electrical circuit in the security lamp is shown. The cell has negligible internal resistance.



(a) The light intensity incident on the LDR decreases.

Explain what happens to the potential difference across the fixed resistor.

(2)

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(b) The security lamp switches on when the potential difference across the fixed resistor is 0.62 V.

When the lamp switches on, the ratio of the resistance of the LDR to the resistance of the fixed resistor is 3 : 2

The current in the circuit is 28 mA.

Calculate the resistance of the LDR when the security lamp switches on.

(3)

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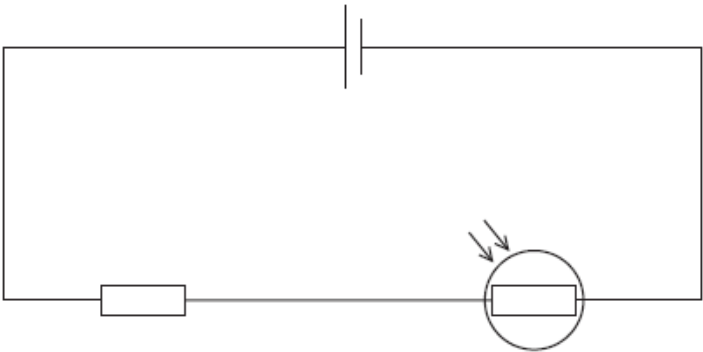
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Resistance =

(Total for question = 5 marks)

Q14.

* The circuit shown contains a fixed resistor and a light dependent resistor (LDR).



Explain why the power dissipated by the whole circuit changes as the intensity of the light incident on the LDR increases.

You should refer to why the resistance of an LDR changes as light intensity increases.

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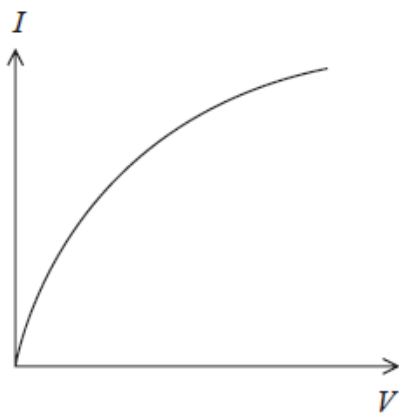
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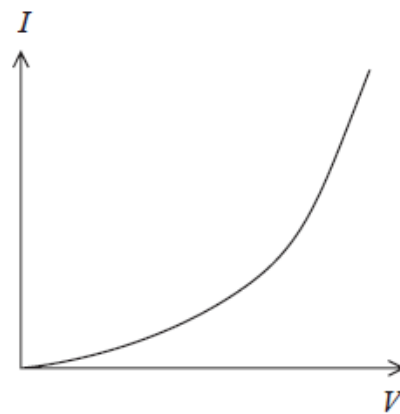
(Total for question = 6 marks)

Q15.

* The graphs show how current I varies with potential difference V for a filament bulb and for a negative temperature coefficient thermistor.



Filament bulb



Thermistor

Explain the shape of each graph. Your answer should include reference to the movement of conduction electrons in each component.

(6)

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(Total for question = 6 marks)

Q16.

Resistors are included in circuits that are used as potential dividers.

(a) Derive an equation for the combined resistance R_T for two resistors, R_1 and R_2 , in series.

(3)

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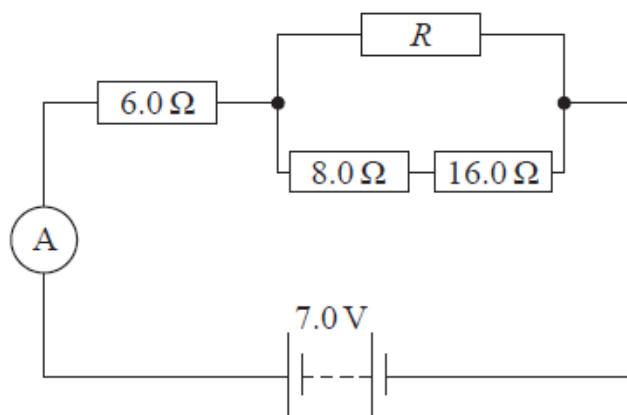
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(b) The diagram shows a circuit that includes a resistor combination. The battery has negligible internal resistance.



The ammeter displays a current of 0.50 A.

Calculate the resistance R .

(3)

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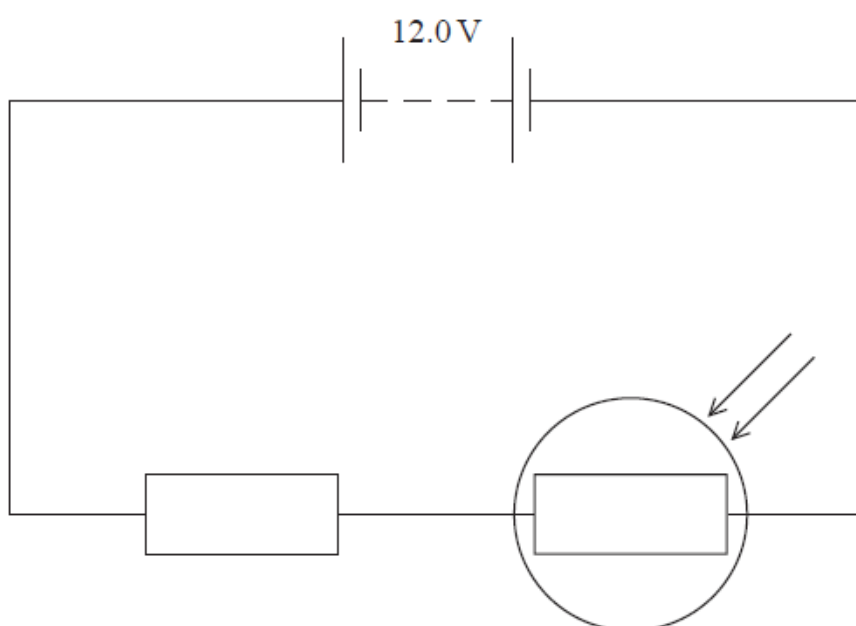
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Resistance R

(c) The circuit shown below includes a light dependent resistor (LDR). The battery has no internal resistance.



(i) In normal daylight, this particular type of LDR has a resistance of $670\ \Omega$.

Calculate the power dissipated in the fixed resistor in normal daylight.

resistance of fixed resistor = 8.00 kΩ

(3)

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Power =

(ii) As the light intensity incident upon the LDR decreases, the power dissipated in the fixed resistor decreases.

Explain why the power in the fixed resistor decreases. Your answer should include reference to the electrons in the LDR.

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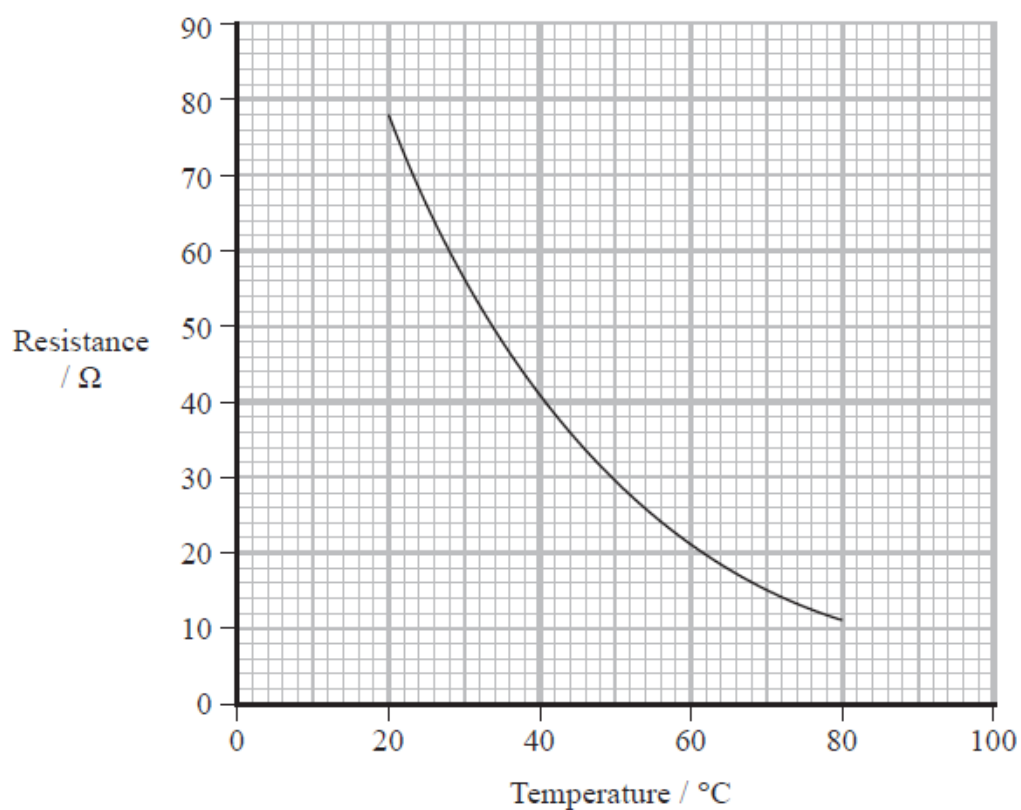
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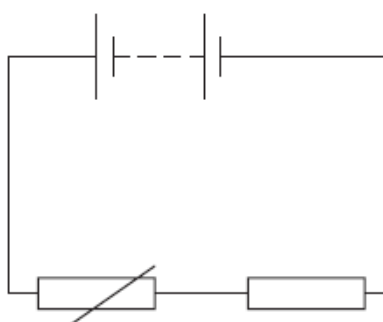
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Q17.

The resistance of a particular thermistor varies with temperature, as shown.



(a) A student connected the thermistor in series with a battery and a resistor, as shown. The resistor was made from a long length of wire.



At a temperature of 45°C , the resistance of the thermistor was four times the resistance of the resistor. The power P dissipated in the resistor was 0.38 W .

(i) Derive the equation $P = \frac{V^2}{R}$

(2)

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(ii) Determine the potential difference across the battery.

(4)

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Potential difference =

(b) (i) Explain why the resistance of a thermistor decreases as the temperature increases.

(2)

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(ii) The student increased the temperature of both the wire resistor and the thermistor from 80 °C to 90 °C.

Explain why the current in the circuit decreased.

(5)

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(Total for question = 13 marks)