Name:

Date:

P2 - Test 2
ELECTRICITY
Beginner

GCSE

PHYSICS

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

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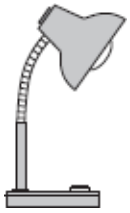
1. Each letter, **A**, **B**, **C**, **D** and **E**, represents an energy transformation.

A electrical to chemical
B electrical to heat
C electrical to kinetic
D electrical to light
E electrical to sound

Match each of the following devices to the useful energy transformation that the device is designed to make.

Write the correct letter, **A**, **B**, **C**, **D** or **E**, in the box below each device.

Use each letter no more than once.

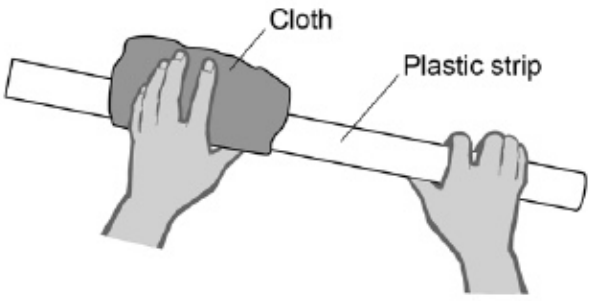
Fan	Kettle	Lamp	Radio
			
☐	☐	☐	☐

(Total 4 marks)

2. A student used some everyday items to investigate static electricity.

Figure 1 shows a flexible plastic strip being rubbed with a cloth.

Figure 1



(a) Complete the sentence.

Choose the answer from the box.

electrons	**neutrons**	**protons**

Rubbing the plastic strip with the cloth causes the strip to become negatively charged because _____ move from the cloth onto the plastic strip.

(1)

(b) Complete the sentence.

Choose the answer from the box.

a negative	**a positive**	**zero**

The cloth is left with _____ charge.

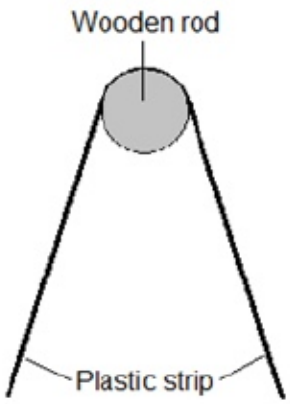
(1)

(c) The student hung the plastic strip over a wooden rod.

The ends of the strip moved away from each other.

Figure 2 shows the position of the plastic strip on the wooden rod.

Figure 2



What **two** conclusions should the student make about the forces acting on the two halves of the plastic strip?

1. _____

_____

2. _____

_____

(2)

(d) Another student repeated the experiment using the same method and found the plastic strip moved in the same way.

Complete the sentence.

Choose the answer from the box.

an anomaly	**repeatable**	**reproducible**

The investigation was _____ .

(1)

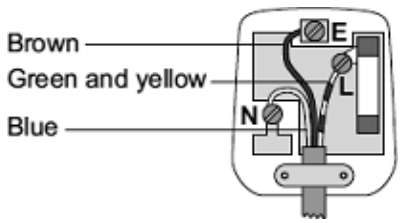
(Total 5 marks)

3. The diagrams show the inside of a 13 amp plug.

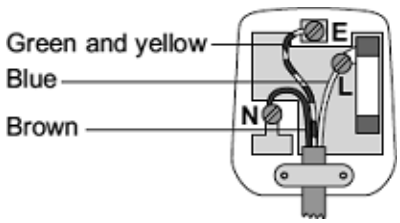
(a) (i) Which **one** of the plugs, **A**, **B**, **C** or **D**, is correctly wired?

Write your answer, **A**, **B**, **C** or **D**, in the box.

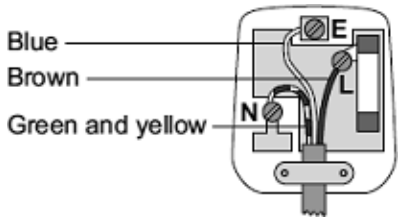
A



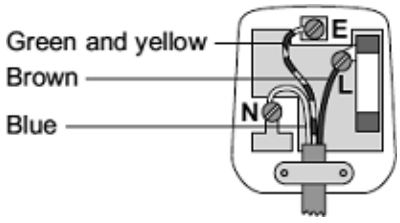
B



C



D



The plug that is correctly wired is ☐

(1)

(ii) What material is the outside casing of a plug made from?

_____

(1)

(b) An electric drill draws a current of 2 amps from the 230 volt mains electricity supply.

Use the equation in the box to calculate the power of the drill.

power = current × potential difference

Show clearly how you work out your answer.

_____

_____

Power _____ watts

(2)

(c) A householder needs to replace a damaged plug. Most replacement plugs are sold with a 13 amp fuse fitted inside. The householder thinks it would be better for shops to sell the plugs without a fuse. He could then buy either a 3 A, 5 A or 13 A fuse to fit inside the plug.

Explain an advantage of selling plugs without a fuse, rather than with a 13 amp fuse fitted.

_____

_____

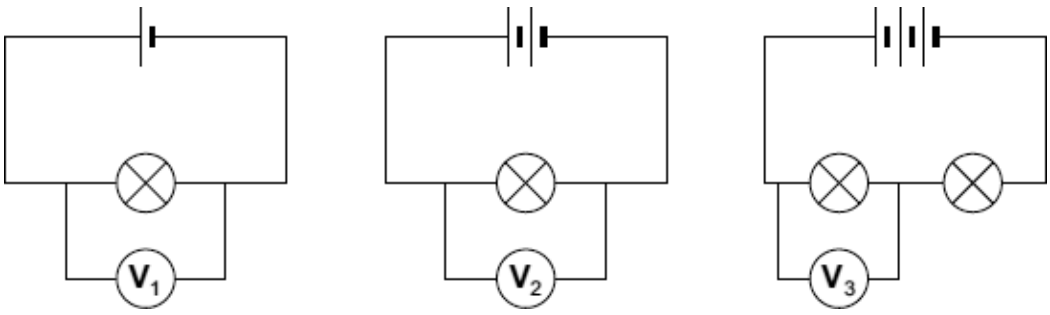
_____

_____

(2)

(Total 6 marks)

4. (a) The lamps in the circuits drawn below are all identical.
Each of the cells has a potential difference of 1.5 volts.



(i) What is the potential difference across the 3 cells that are joined in series?

_____

Potential difference = _____ V

(1)

(ii) What will be the reading on the voltmeter labelled $\mathbf{V_3}$?

Voltmeter reading $\mathbf{V_3}$ = _____ V

(1)

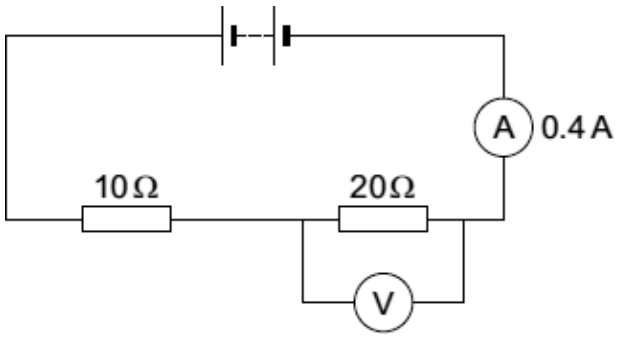
(iii) Which voltmeter, $\mathbf{V_1}$, $\mathbf{V_2}$ or $\mathbf{V_3}$, will give the highest reading?

Draw a ring around your answer.

$\mathbf{V_1}$ $\mathbf{V_2}$ $\mathbf{V_3}$

(1)

(b) The diagram below shows a simple circuit.



(i) Calculate the total resistance of the two resistors in the circuit.

_____

Total resistance = _____ Ω

(1)

(ii) Use the equation in the box to calculate the reading on the voltmeter.

potential difference = current × resistance

Show clearly how you work out your answer.

_____

_____

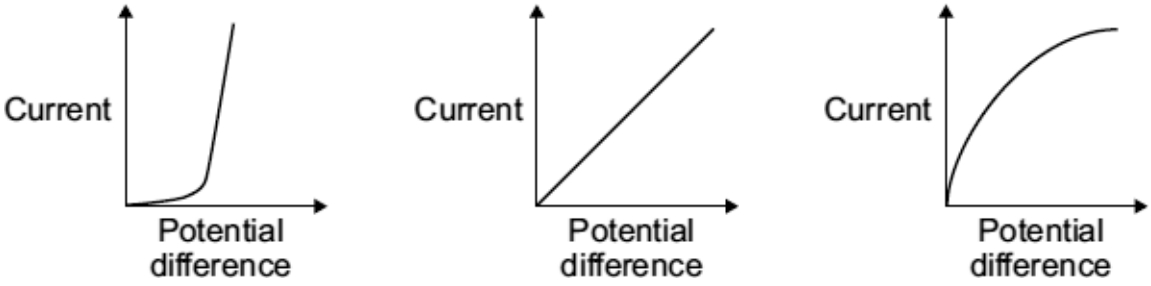
Voltmeter reading = _____ V

(2)

(iii) The current through a resistor at constant temperature changes when the potential difference across the resistor changes.

Which **one** of the graphs, **X**, **Y** or **Z**, shows how the current changes?

Write your answer, **X**, **Y** or **Z**, in the box.



X **Y** **Z**

Graph ☐

(1)

(Total 7 marks)

5. (a) Electrical circuits often contain resistors.

The diagram shows **two** resistors joined in series.

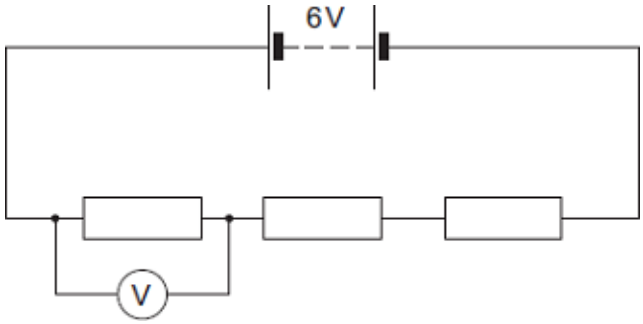
Calculate the total resistance of the **two** resistors.

_____

Total resistance = _____ Ω

(1)

(b) A circuit was set up as shown in the diagram. The three resistors are identical.



(i) Calculate the reading on the voltmeter.

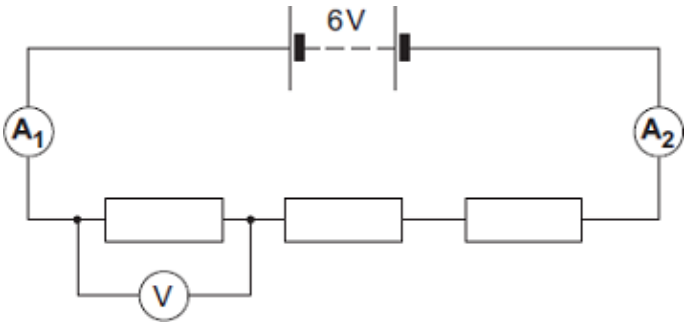
_____

_____

Reading on voltmeter = _____ V

(2)

(ii) The same circuit has now been set up with two ammeters.



Draw a ring around the correct answer in the box to complete the sentence.

The reading on ammeter **A_2** will be

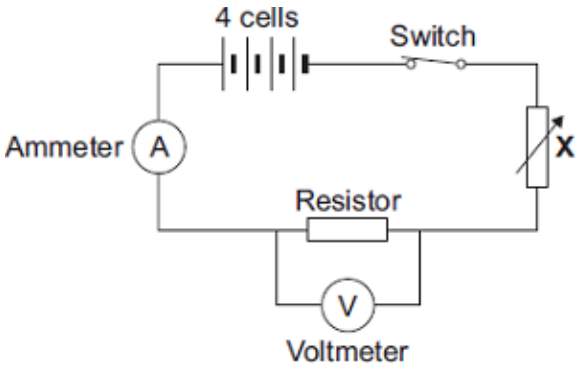
smaller than
equal to
greater than

the reading on ammeter **A_1**.

(1)

(Total 4 marks)

6. (a) The diagram shows the circuit that a student used to investigate how the current through a resistor depends on the potential difference across the resistor.



(i) Each cell provides a potential difference of 1.5 volts.

What is the total potential difference provided by the four cells in the circuit?

_____

Total potential difference = _____ volts

(1)

(ii) The student uses the component labelled **X** to change the potential difference across the resistor.

What is component **X**?

Draw a ring around your answer.

light-dependent resistor **thermistor** **variable resistor**

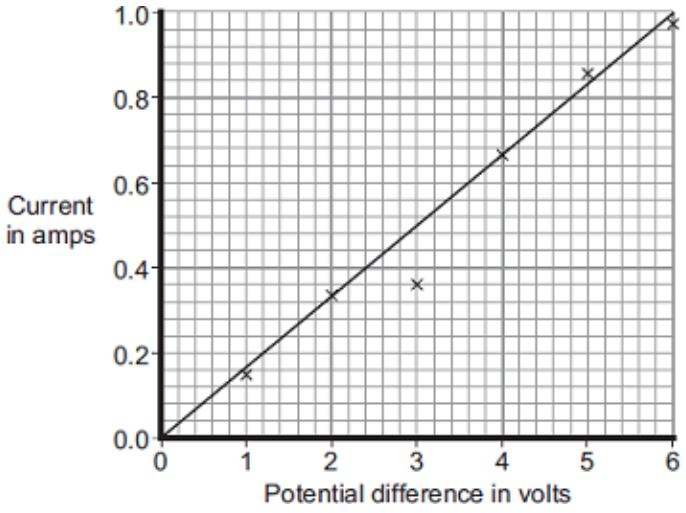
(1)

(iii) Name a component connected in parallel with the resistor.

_____

(1)

(b) The results obtained by the student have been plotted on a graph.



(i) One of the results is anomalous.

Draw a ring around the anomalous result.

(1)

(ii) Which **one** of the following is the most likely cause of the anomalous result?

Put a tick (✓) in the box next to your answer.

The student misread the ammeter. ☐

The resistance of the resistor changed. ☐

The voltmeter had a zero error. ☐

(1)

(iii) What was the interval between the potential difference values obtained by the student?

_____

_____

(1)

(c) Describe the relationship between the potential difference across the resistor and the current through the resistor.

_____

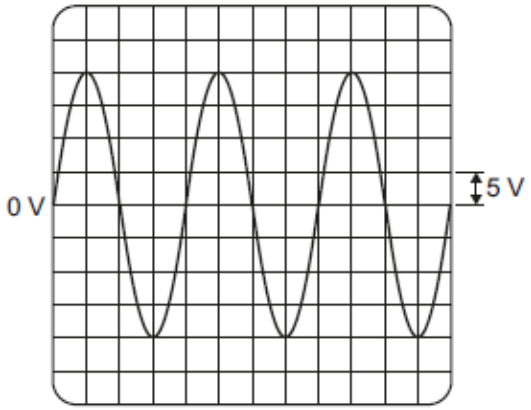
_____

(1)

(Total 7 marks)

7. (a) **Figure 1** shows the oscilloscope trace an alternating current (a.c.) electricity supply produces.

Figure 1



One vertical division on the oscilloscope screen represents 5 volts.

Calculate the peak potential difference of the electricity supply.

_____

Peak potential difference = _____ V

(1)

(b) Use the correct answer from the box to complete the sentence.

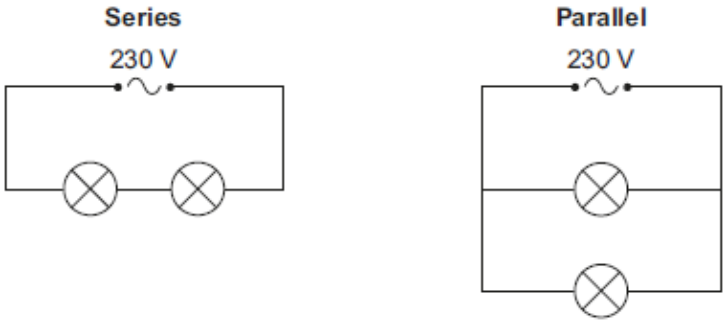
40	**50**	**60**

In the UK, the frequency of the a.c. mains electricity supply is _____ hertz.

(1)

(c) **Figure 2** shows how two lamps may be connected in series or in parallel to the 230 volt mains electricity supply.

Figure 2



(i) Calculate the potential difference across each lamp when the lamps are connected in **series**.

The lamps are identical.

_____

Potential difference when in series = _____ V

(1)

(ii) What is the potential difference across each lamp when the lamps are connected in **parallel**?

Tick (✓) **one** box.

115 V ☐ 230 V ☐ 460 V ☐

(1)

(iii) Give **one** advantage of connecting the lamps in parallel instead of in series.

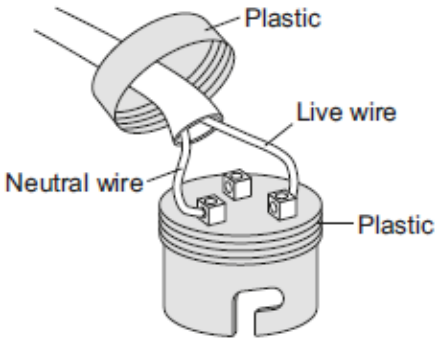
_____

_____

(1)

(d) **Figure 3** shows the light fitting used to connect a filament light bulb to the mains electricity supply.

Figure 3



The light fitting does **not** have an earth wire connected.

Explain why the light fitting is safe to use.

_____

_____

_____

_____

(2)

(e) A fuse can be used to protect an electrical circuit.

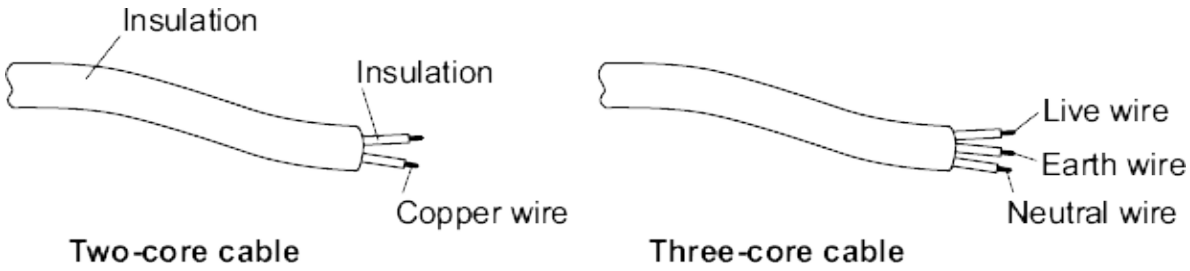
Name a different device that can also be used to protect an electrical circuit.

_____

(1)

(Total 8 marks)

8. (a) The diagram shows a piece of two-core cable and a piece of three-core cable.



(i) Which **one** of the wires inside a three-core cable is missing from a two-core cable?

Draw a ring around your answer.

earth wire **live wire** **neutral wire**

(1)

(ii) Use a word from the box to complete the following sentence.

double	**extra**	**totally**

A pottery table lamp fitted with a two-core cable is safe to use because it is

_____ insulated.

(1)

(b) The cables connecting the power sockets in a building contain wires 1.8 mm thick. The maximum current that can safely pass through these wires is 20 amps. A fuse is included in the circuit to protect the wiring.

Explain how a fuse protects the wiring of a circuit.

_____

_____

_____

_____

_____

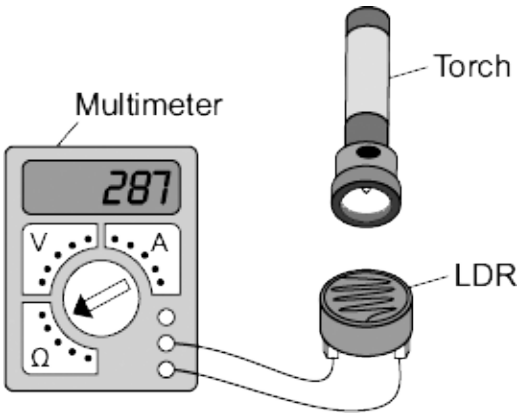
_____

_____

(3)

(Total 5 marks)

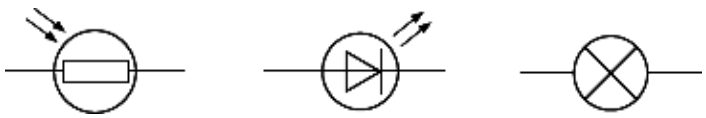
9. A student used the apparatus below to find out how the resistance of a light-dependent resistor (LDR) depends on light intensity.



The resistance of the LDR was measured directly using a multimeter.

(a) (i) Which **one** of the following is the correct circuit symbol for a LDR?

Draw a ring around your answer.



(1)

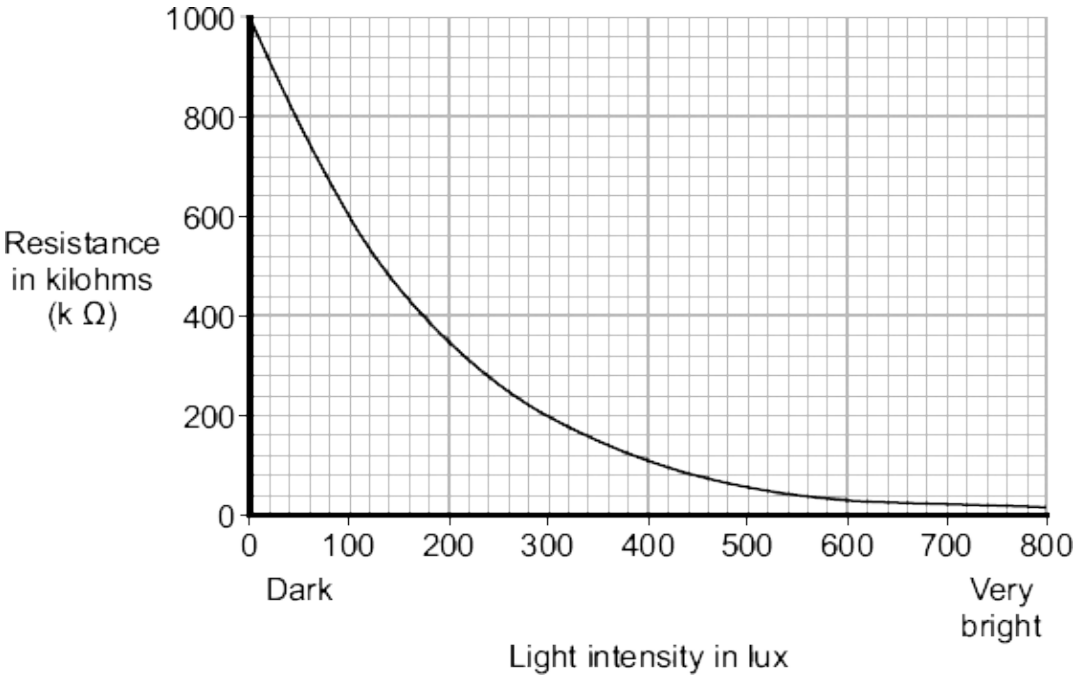
(ii) Name **one** factor that will affect the intensity of the light hitting the LDR.

_____

_____

(1)

(b) The manufacturer of the LDR provides data for the LDR in the form of a graph.



Describe how the resistance of the LDR changes when the light intensity increases from 100 lux to 300 lux.

_____

_____

_____

(2)

(c) The student only obtained three results. These are given in the table.

Light intensity	Resistance in kilohms
Dark	750
Bright	100
Very bright	1

(i) The student could **not** use the results to draw a line graph.
Why not?

_____

_____

(1)

(ii) Do the student's results agree with the data the manufacturer provided?

Draw a ring around your answer. YES NO

Give a reason for your answer.

_____

_____

_____

(1)

(d) Which **one** of the following circuits probably includes a LDR?

Tick (✓) **one** box.

A circuit that automatically switches outside lights on when it gets dark. ☐

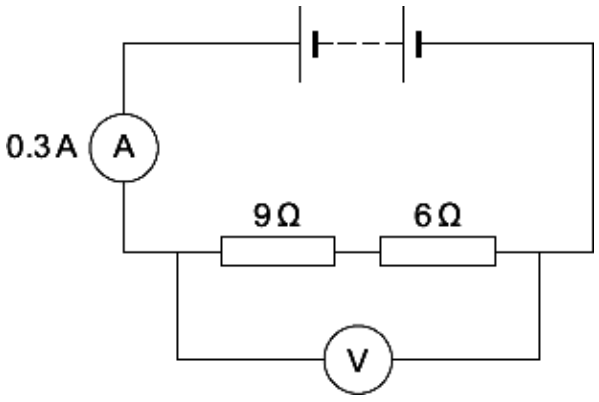
A circuit that automatically switches central heating on and off. ☐

A circuit that automatically turns lights off when no one is in the room. ☐

(1)

(Total 7 marks)

10. (a) The diagram shows a simple circuit.



(i) Calculate the total resistance of the two resistors in the circuit.

_____

Total resistance = _____ Ω

(1)

(ii) Calculate the reading on the voltmeter.

Show clearly how you work out your answer.

_____

_____

Voltmeter reading = _____ V

(2)

(iii) Draw a ring around the correct answer in the box to complete the sentence.

Replacing one of the resistors with a resistor of higher value will

decrease
not change
increase

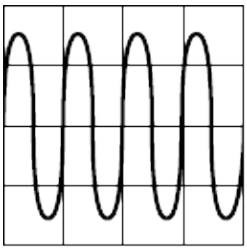
the reading on the ammeter.

(1)

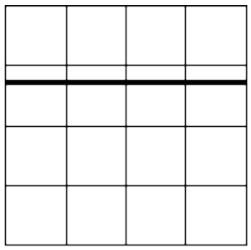
(b) The voltmeter in the circuit is replaced with an oscilloscope.

Which one of the diagrams, **X**, **Y** or **Z**, shows the trace that would be seen on the oscilloscope?

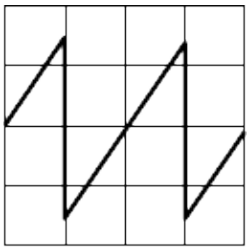
Write your answer, **X**, **Y** or **Z**, in the box.



X



Y



Z

Diagram ☐

Give a reason for your answer.

_____

_____

_____

(2)

(Total 6 marks)

11. Many electrical appliances are connected to the mains supply using a three-core cable and a three-pin plug.

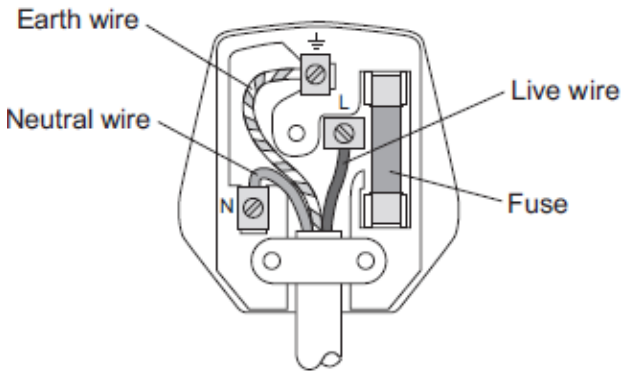
(a) Use the correct answer from the box to complete the sentence.

charge	energy	power

Electric current is the rate of flow of _____ .

(1)

(b) The diagram shows a three-pin plug connected to a three-core cable.



(i) The three wires of the three-core cable have different coloured coverings.

State the colour of the covering of the neutral wire.

_____

(1)

(ii) Which **two** parts of the plug shown above protect the wiring of a circuit?

Tick (✓) **two** boxes.

	Tick (✓)
Earth wire	
Fuse	
Live wire	
Neutral wire	

(2)

(c) Some electrical appliances are connected to the mains supply using a two-core cable and a three-pin plug. Appliances that are double insulated do not require all three wires.

(i) What does 'double insulated' mean?

_____

_____

(1)

(ii) State which of the three wires is **not** required.

_____

(1)

(d) (i) An electrical appliance is connected to a 20 V supply.

The current in the appliance is 3 A.

Calculate the power of the appliance.

_____

_____

Power = _____ W

(2)

(ii) Another electrical appliance is connected to a 20 V supply.

The appliance transfers 300 J of energy.

Calculate the charge.

Give the unit.

_____

_____

Charge = _____

Unit _____

(3)

(Total 11 marks)