PEARSON EDEXCEL IGCSE PHYSICS · 4PH1

PHYSICS



EXAM QUESTION PACK

SECTION 2: ELECTRICITY (PACK 1)

SCORE	PERCENTAGE
/308	%

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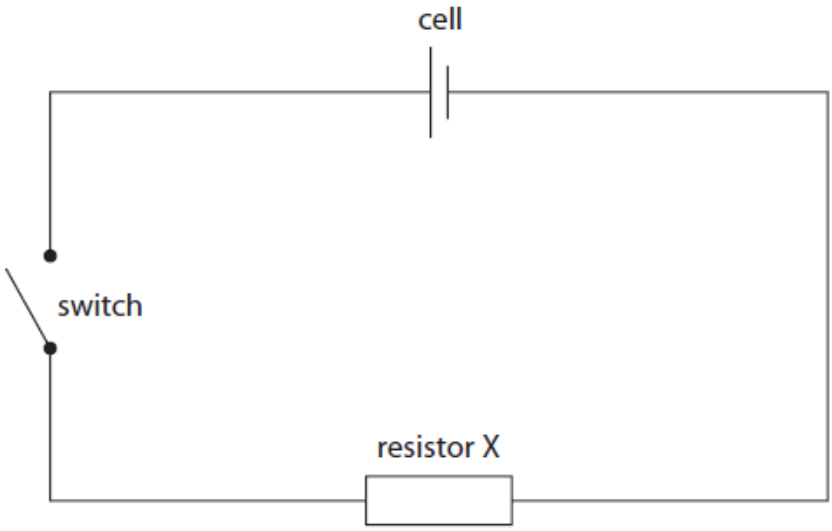
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Q1.

The circuit diagram shows a resistor connected in series with a cell and a switch.



There is an electric current in the circuit when the switch is closed.

(a) Describe how another component could be added to the circuit to show that there is a current in resistor X when the switch is closed.

(2)

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(b) The electric current in the circuit is a flow of charged particles.

Each charged particle has a charge of -1.6×10^{-19} C.

(i) Give the name of the charged particle.

(1)

.....

(ii) When the switch is closed, the current in the cell is 160 mA.

Calculate the number of charged particles that pass through the cell in 25 s.

[charge transferred = current × time taken]

(4)

number of charged particles =.....

(iii) Resistor X in the circuit is replaced by resistor Y.

Resistor Y has a higher resistance than resistor X.

Explain how the number of charged particles passing through the cell each second changes when resistor X is replaced by resistor Y.

(3)

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Q2.

Diagram 1 shows a simple loudspeaker.

The coil is connected to an alternating current (a.c.) supply.

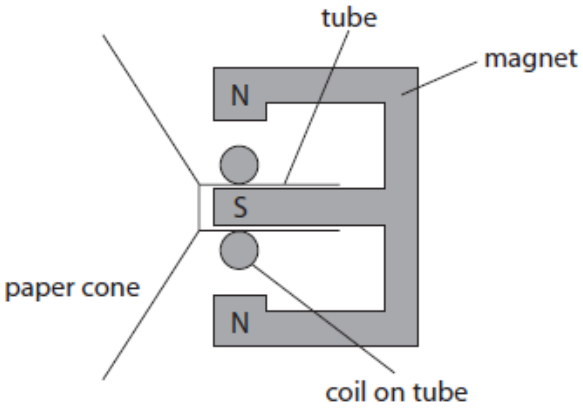


Diagram 1

(a) Describe how the loudspeaker produces sound.

(4)

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(b) Diagram 2 shows two loudspeakers connected in series with a variable resistor.

The variable resistor is set to 5.0 Ω.

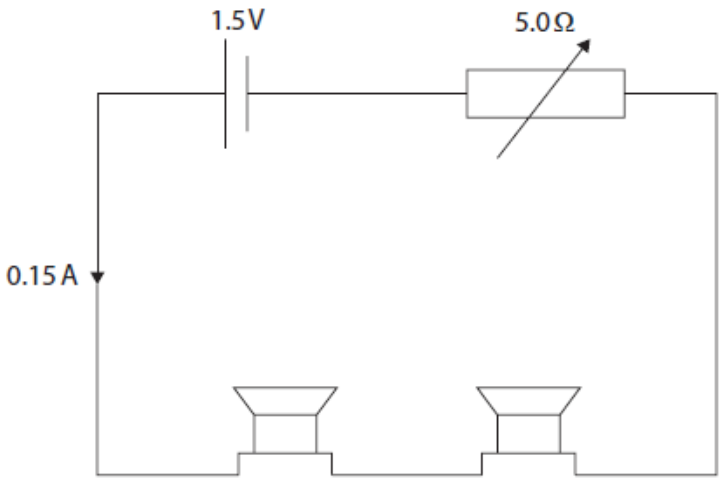


Diagram 2

(i) The total voltage across the two loudspeakers is 0.75 V and the current in the circuit is 0.15 A.

Show that the total power of the two loudspeakers is about 0.1 W.

[power = current × voltage]

(2)

(ii) A student varies the resistance of the variable resistor.

The table shows the power of the loudspeakers for different resistance values of the variable resistor.

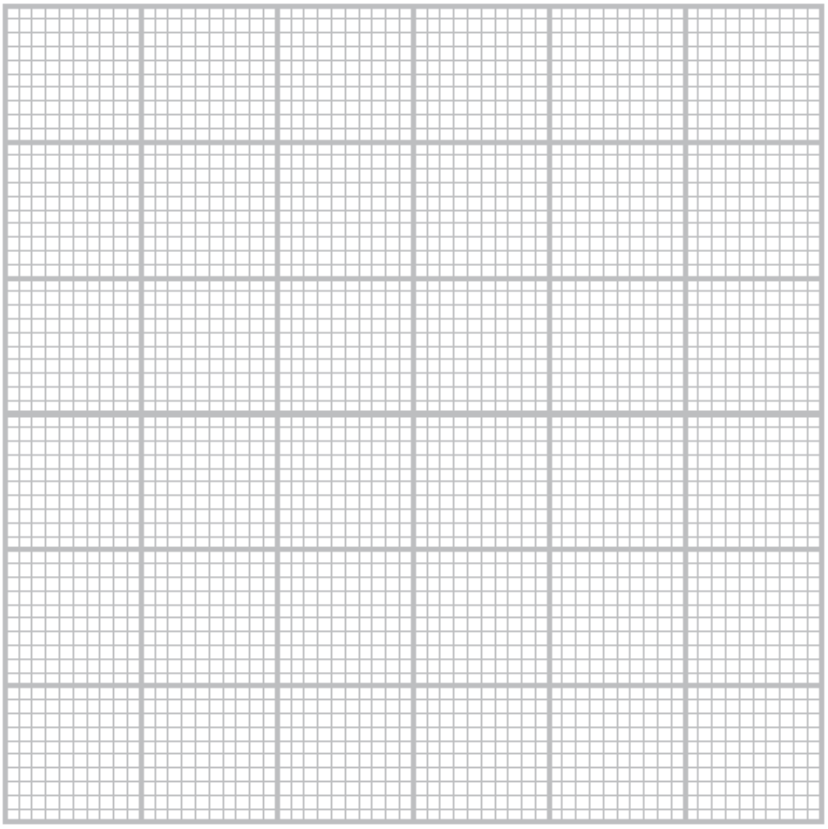
Resistance of variable resistor in Ω	Power of loudspeakers in W
0.0	0.000
2.5	0.100
5.0	0.113
7.5	0.108
10.0	0.100
12.5	0.092
15.0	0.084

Plot the student's results on the grid.

(3)

(iii) Draw a curve of best fit.

(2)



(c) Diagram 3 shows the loudspeakers connected in series to a cell.

Diagram 4 shows the loudspeakers connected in parallel to the same cell.

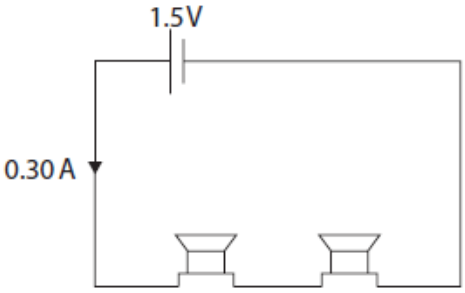


Diagram 3

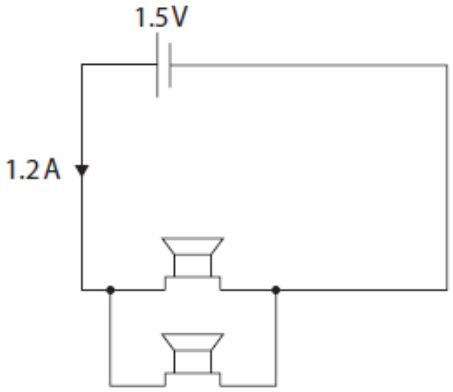


Diagram 4

Comment on how the total resistance of the loudspeakers in diagram 3 compares with the total resistance of the loudspeakers in diagram 4.

(4)

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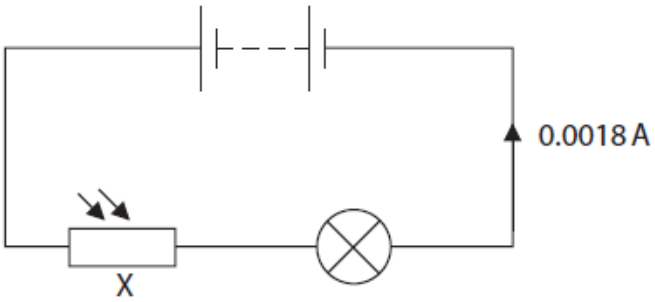
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(Total for question = 15 marks)

Q3.

The diagram shows an electric circuit containing component X and a lamp connected in series.



(a) (i) Add another component to the diagram to measure the voltage of component X.

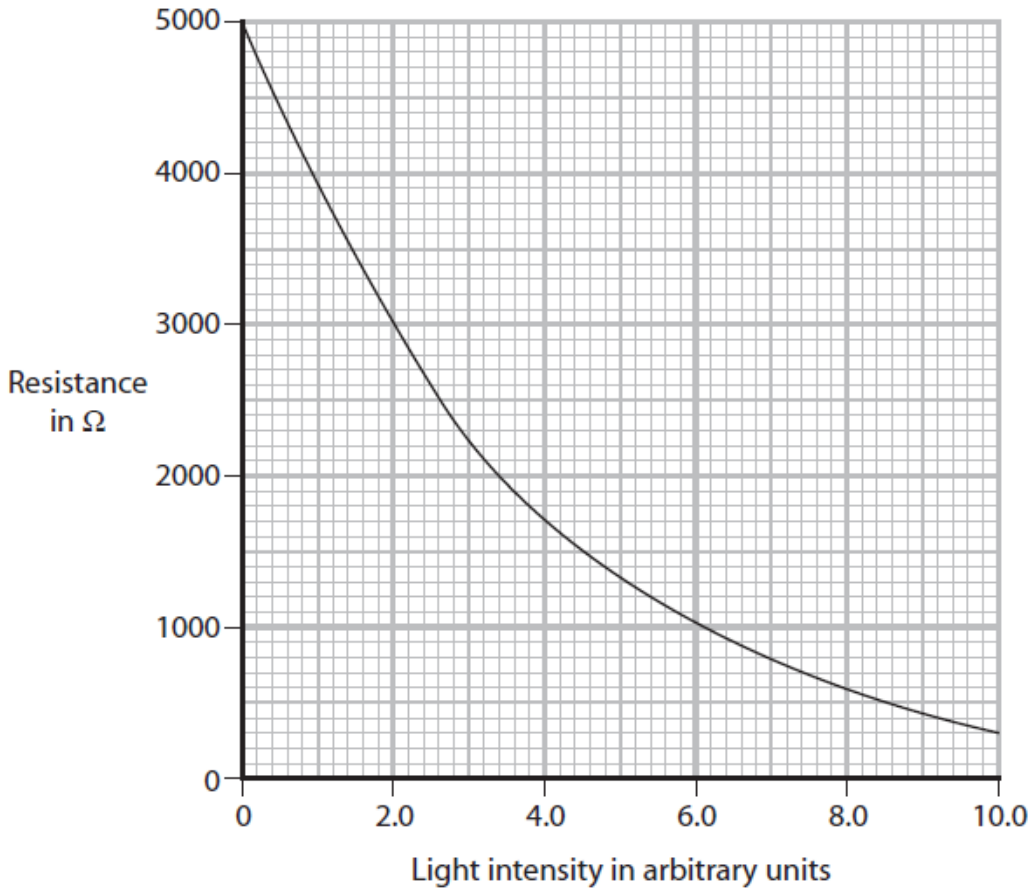
(1)

(ii) Give the name of component X.

(1)

.....

(b) The graph shows how the resistance of component X changes with light intensity.



(i) Use the graph to determine the resistance of component X when the light intensity is 4.0 arbitrary units.

(2)

resistance = ... Ω

(ii) The current in the circuit is 0.0018 A.

Calculate the voltage across component X at a light intensity of 4.0 arbitrary units.

(3)

voltage = ... V

(iii) Explain what happens to the brightness of the lamp when component X is covered with a dark sheet of paper.

(2)

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(Total for question = 9 marks)

Q4.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross and then mark your new answer with a cross ☒.

(a) Which of these astronomical objects is the largest?

(1)

☒ **A** a comet

☒ **B** the Earth

☒ **C** the Moon

☒ **D** the Sun

(b) Which of these types of radiation is the most ionising?

(1)

☒ **A** alpha

☒ **B** beta

☒ **C** gamma

☒ **D** ultraviolet

(c) Which of these is the unit for resistance?

(1)

☒ **A** ampere

☒ **B** ohm

☒ **C** volt

☒ **D** watt

(d) Which of these parts of the electromagnetic spectrum has the shortest wavelength?

(1)

☒ **A** infrared

☒ **B** microwave

☒ **C** ultraviolet

☒ **D** x-ray

(e) Which of these temperatures is the same as 0 °C?

(1)

☒ **A** -273 K

☒ **B** 3 K

☒ **C** 273 K

☒ **D** 373 K

(Total for question = 5 marks)

Q5.

This question is about an electric fan.

(a) A battery supplies a voltage of 12 V and a current of 0.25 A to the fan.

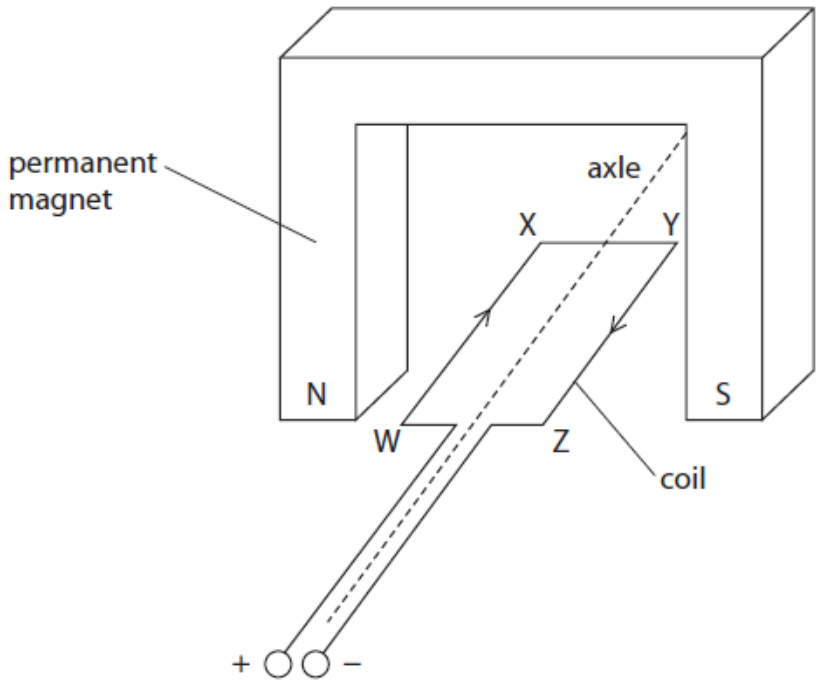
The fan is switched on for 12 seconds and the fan gains 25 J in its kinetic energy store.

Calculate the efficiency of this energy transfer.

(4)

efficiency = ... %

(b) The diagram shows part of the electric motor inside the fan.



(i) Explain why the coil starts to rotate when there is a current in the coil.

(4)

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(ii) Which side of the coil moves vertically upwards?

(1)

☒ **A** WX

☒ **B** XY

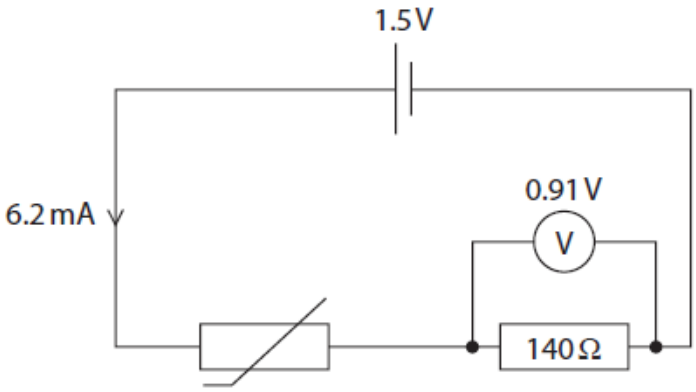
☒ **C** YZ

☒ **D** ZW

(Total for question = 9 marks)

Q6.

A teacher uses this circuit to investigate how the current in a circuit changes with the temperature of a room.



(a) (i) Calculate the voltage across the thermistor.

(2)

voltage = ... V

(ii) State the formula linking voltage, current and resistance.

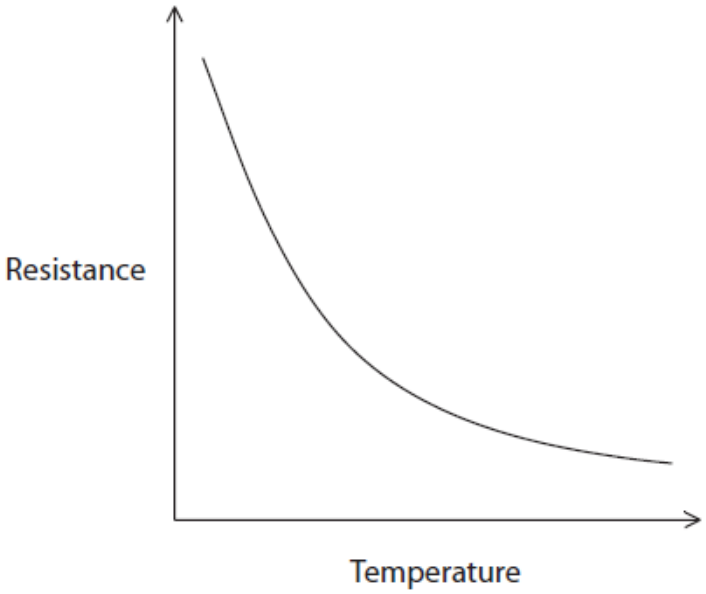
(1)

(iii) Calculate the resistance of the thermistor.

(3)

resistance = ... Ω

(b) The graph shows how the resistance of the thermistor changes with temperature.



(i) Describe the relationship between the temperature and the resistance of the thermistor.

(2)

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(ii) Explain how the reading on the voltmeter changes when the temperature of the room decreases.

(3)

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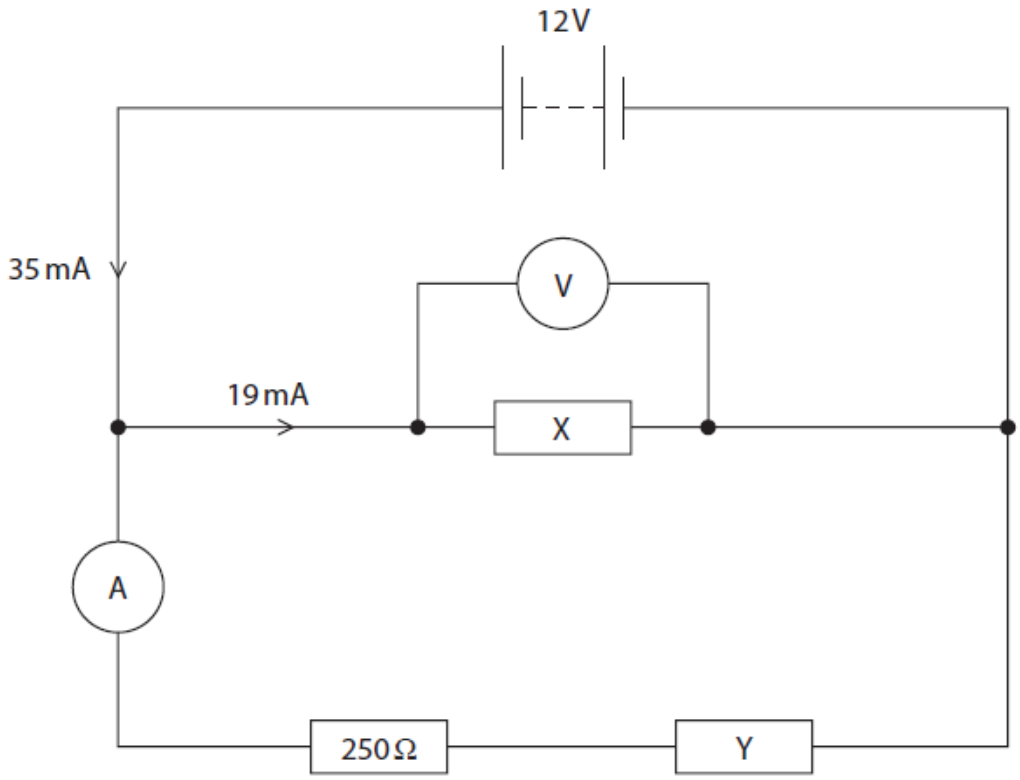
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(Total for question = 11 marks)

Q7.

The diagram shows a circuit that includes a battery, an ammeter, a voltmeter and three different resistors.



(a) (i) Give the voltmeter reading.

(1)

voltage = ... V

(ii) State the formula linking voltage, current and resistance.

(1)

(iii) Calculate the resistance of resistor X.

(3)

resistance = ... Ω

(b) (i) Give the reason why the reading on the ammeter would be 16 mA.

(1)

.....

.....

(ii) Calculate the resistance of resistor Y.

(4)

resistance = ... Ω

(c) Resistor X and the voltmeter are removed from the circuit, leaving a break in this part of the circuit.

Explain how the current in the battery changes when these components are removed.

(2)

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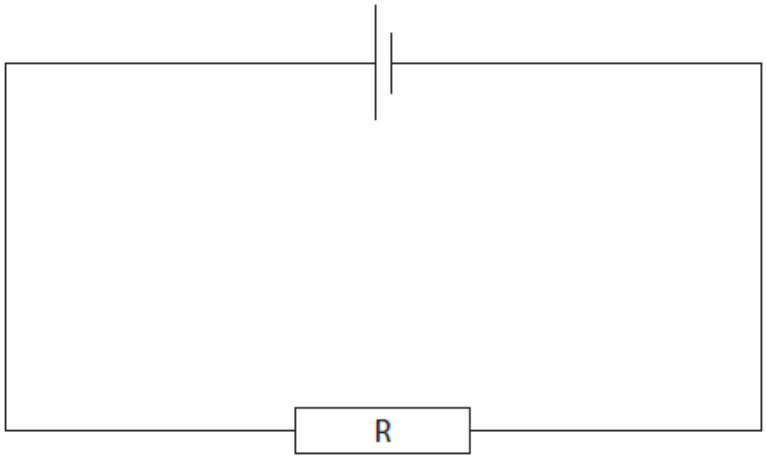
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(Total for question = 12 marks)

Q8.

The circuit diagram shows a resistor, R, connected to a cell.



(a) Draw additional components on the circuit diagram to measure the voltage of the resistor and the current in the resistor.

(3)

(b) The voltage across the resistor is 9.00 V and the current in the resistor is 1.91 mA.

(i) State the formula linking power, current and voltage.

(1)

(ii) Calculate the power dissipated by the resistor.

(2)

power = ... W

(c) The cell in the circuit is a source of direct current.

State what is meant by the term **direct current**.

(1)

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(d) Explain how the current in the circuit changes when an identical resistor is connected in series with resistor R.

(2)

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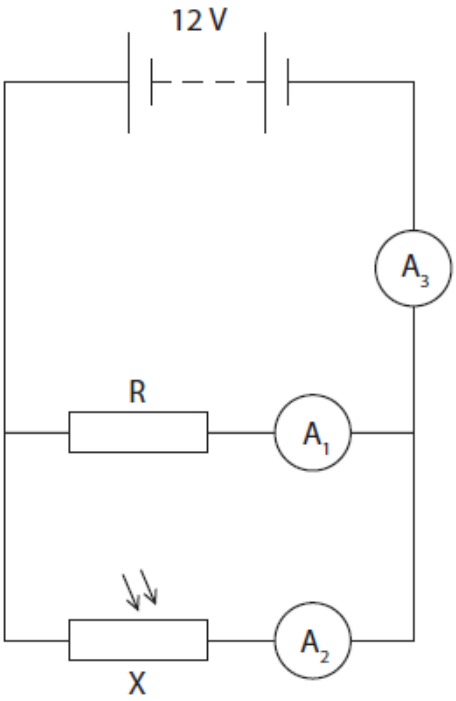
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(Total for question = 9 marks)

Q9.

A 12 V battery is connected to a component, X, and a fixed resistor, R, as shown



(a) (i) State the name of component X.

(1)

.....

(ii) Draw a voltmeter on the circuit diagram connected to show the voltage of component X.

(2)

(b) The voltage across component X is 12 V.

The resistor R has a value of 840 Ω.

Show that the current in ammeter A_1 is approximately 0.01 A.

Use the equation

$$\text{voltage} = \text{current} \times \text{resistance}$$

(2)

(c) When the circuit is placed in daylight, the current in A_2 is 0.011 A.

(i) Calculate the value of the current through A_3.

(1)

current = ... A

(ii) Explain what happens to the current through A_3 when the circuit is placed in a darkened room.

(2)

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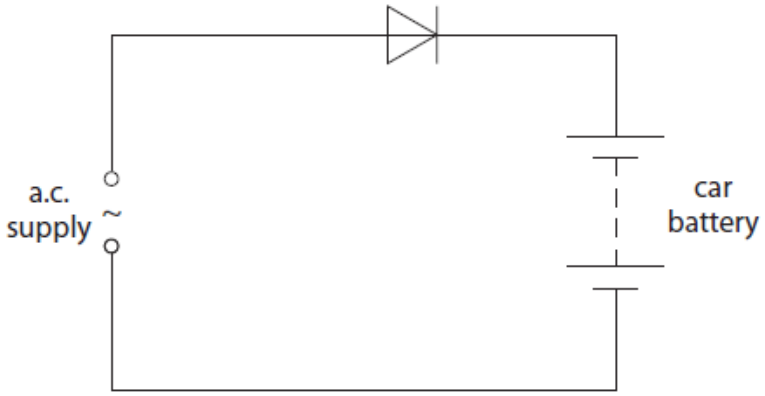
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(Total for question = 8 marks)

Q10.

The circuit shows a car battery charging from an alternating current (a.c.) supply.



(a) Sketch a graph to show what is meant by a.c.

(2)

(b) State the reason why the circuit contains a diode.

(1)

.....

.....

(c) The 12 V car battery is connected to two identical filament lamps so that the voltage across each lamp is 6.0 V.

(i) Draw the circuit diagram.

(2)

(ii) State the equation relating power, current and voltage.

(1)

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(iii) The power of each lamp is 330 mW.

Calculate the current in a lamp.

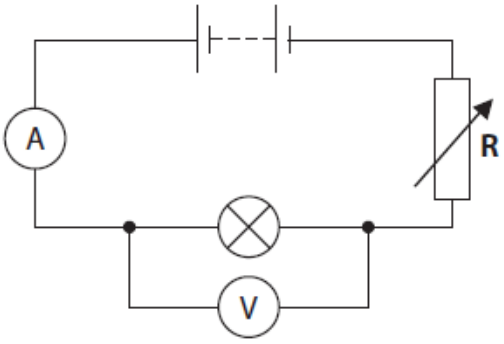
(2)

current = ... A

(Total for question = 8 marks)

Q11.

A student investigates how the resistance of a lamp varies as the current is changed.
She sets up the circuit shown.



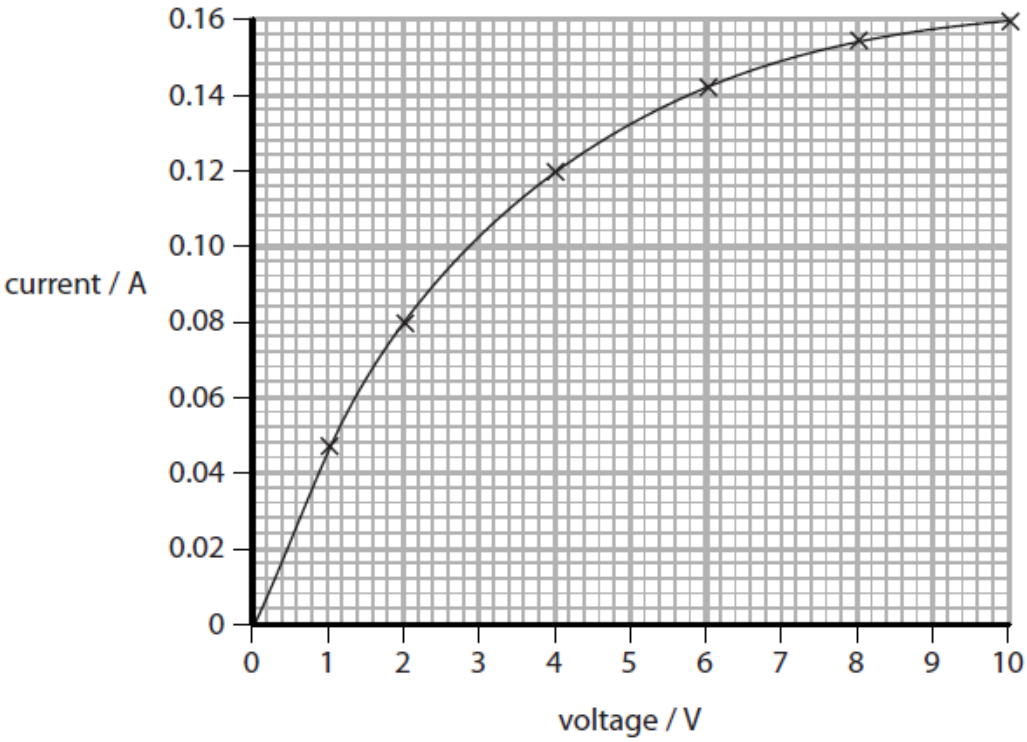
(a) Give a reason why component **R** is included in the circuit.

(1)

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(b) The student draws a graph of his results.



(i) Describe how the current in the lamp changes as the voltage changes.

Use data from the graph to support your answer.

(3)

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(ii) State the relationship between voltage, current and resistance.

(1)

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(iii) Calculate the resistance of the lamp when the voltage is 2.5 V.

(3)

resistance = ... Ω

(c) State what happens to the resistance of a lamp when the current increases.

(1)

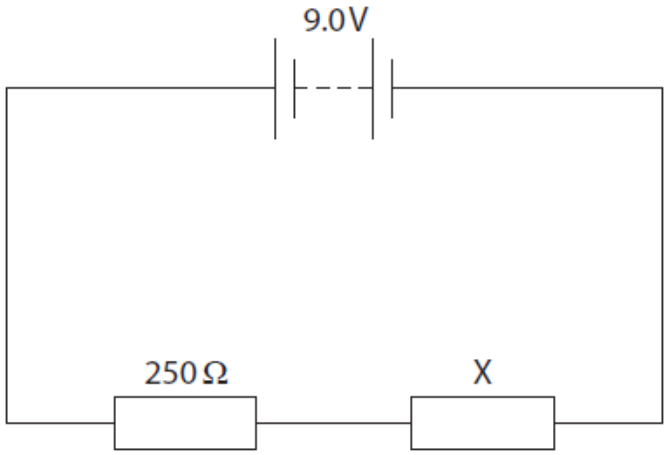
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(Total for question = 9 marks)

Q12.

The circuit diagram shows a 9.0 V battery connected in series with a 250 Ω resistor and another resistor, X.



(a) Draw a voltmeter on the circuit diagram to measure the voltage of resistor X.

(2)

(b) The current in the circuit is 0.012 A.

Calculate the resistance of resistor X.

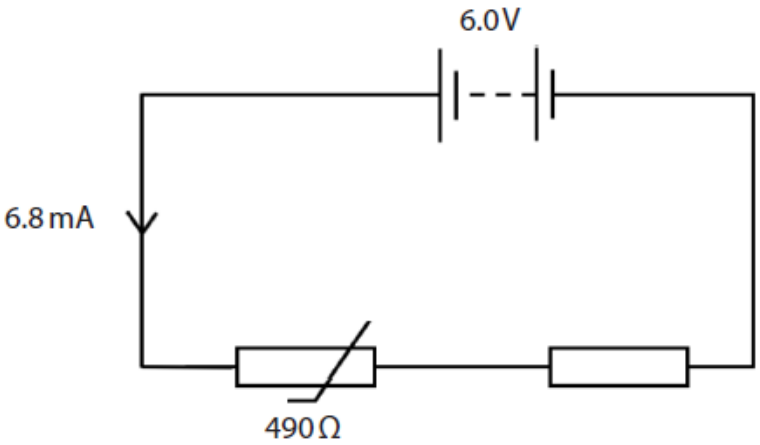
(4)

resistance = ... Ω

(Total for question = 6 marks)

Q13.

The diagram shows an electric circuit.



(a) When the thermistor is in hot water, its resistance is 490 Ω.

Show that the resistance of the fixed resistor is about 400 Ω.

(5)

(b) Explain how the voltage across the fixed resistor changes when the hot water is replaced with cold water.

(3)

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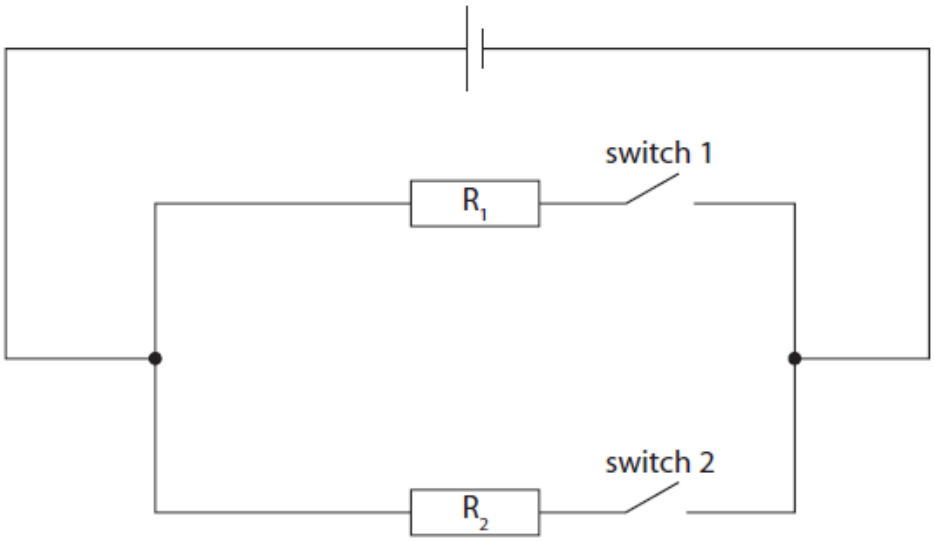
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(Total for question = 8 marks)

Q14.

The diagram shows a circuit containing a cell, two switches and two resistors, R_1 and R_2.



(a) A light emitting diode (LED) is represented using the symbol



Draw a LED on the circuit diagram that will indicate when there is a current in resistor R_1 .

(2)

(b) Both switches in the circuit are now closed.

(i) Draw an ammeter on the circuit diagram that will measure the current in the cell.

(1)

(ii) The voltage across the cell is 4.5 V.

Explain how the voltage across R_2 compares with the voltage across the cell.

(2)

.....

.....

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.....

(c) Switch 1 is now opened whilst switch 2 remains closed.

(i) State the formula linking energy transferred, charge and voltage.

(1)

(ii) The voltage across the cell stays constant at 4.5 V.

Calculate the charge transferred through the cell when the cell transfers 4.1 J of energy.

(3)

charge transferred C

(iii) A student investigates how the current in resistor R_2 varies with the voltage across it.

Describe how the circuit could be modified for the student to do this investigation.

(3)

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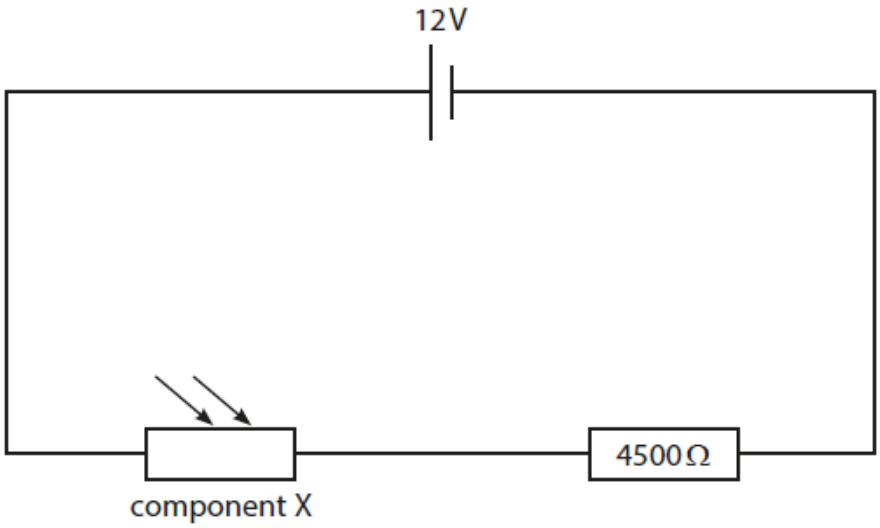
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(Total for question = 12 marks)

Q15.

The diagram shows part of a circuit used for an outdoor lighting system.



(a) Draw a voltmeter on the diagram to measure the voltage of the 4500 Ω resistor.

(2)

(b) Give the name of component X.

(1)

.....

(c) The voltage across component X is 3.0 V.

(i) Calculate the voltage across the 4500 Ω resistor.

(1)

voltage = ... V

(ii) Calculate the current in the circuit.

[voltage = current × resistance]

(2)

current = ... A

(iii) Calculate the resistance of component X.

Give your answer in kΩ.

(3)

resistance = ... kΩ

(d) Explain where a lamp should be connected in this circuit, so that the voltage across it increases as the light received by component X decreases.

(3)

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(Total for question = 12 marks)

Q16.

This is a question about electric circuits.

(a) Diagram 1 shows a 19 Ω resistor connected to a 1.6 V cell.

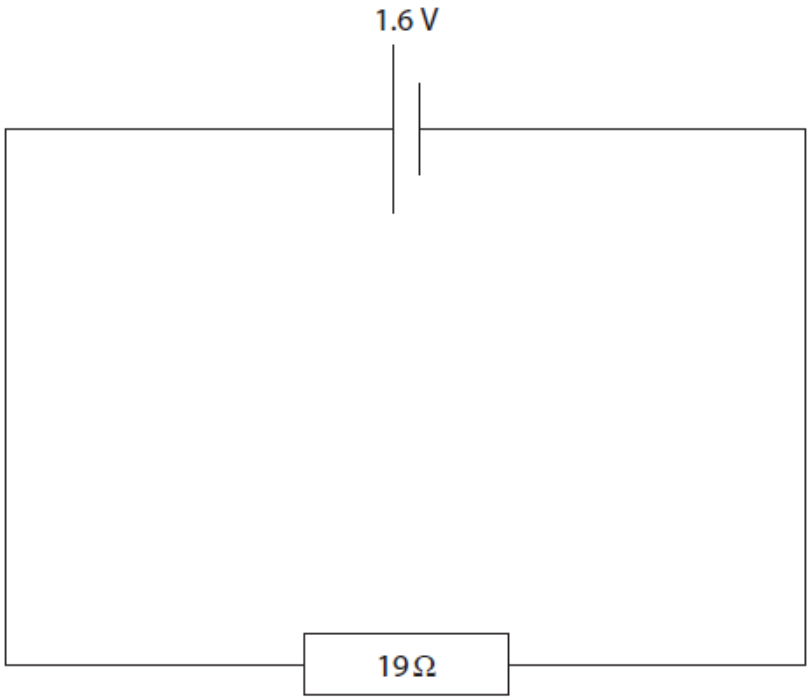


Diagram 1

(i) State the formula linking voltage, current and resistance.

(1)

(ii) Calculate the current in the 19 Ω resistor.

(3)

current = ... A

(b) Diagram 2 shows two different resistors connected in series to the same cell.

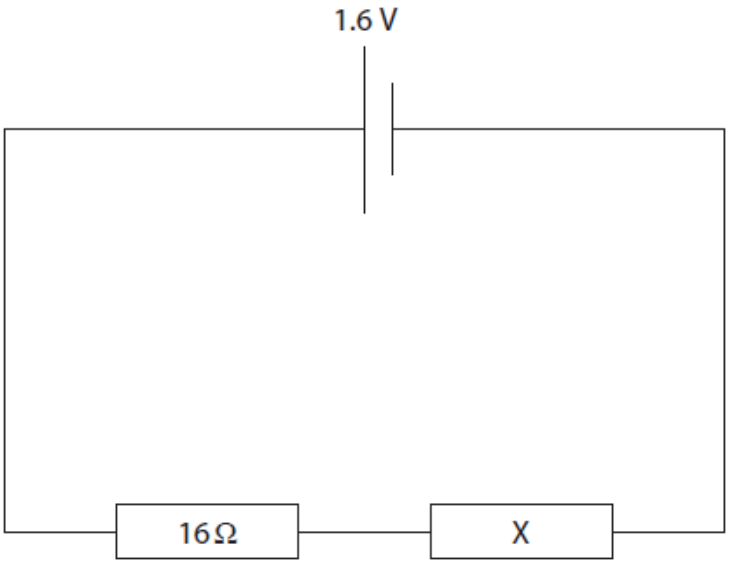


Diagram 2

(i) Draw a component on diagram 2 to measure the voltage of resistor X.

(2)

(ii) The voltage of the 16 Ω resistor is 0.91 V.

Calculate the voltage of resistor X.

(2)

voltage = ... V

(Total for question = 8 marks)

Q17.

This question is about electric circuits.

(a) Which quantity is defined as the rate of flow of charge?

(1)

☒ **A** current

☒ **B** power

☒ **C** resistance

☒ **D** voltage

(b) Which quantity is defined as the energy transferred per unit charge passed?

(1)

☒ **A** current

☒ **B** power

☒ **C** resistance

☒ **D** voltage

(c) Diagram 1 shows an electric circuit with two resistors, R and S.

Some of the values of the current are also shown.

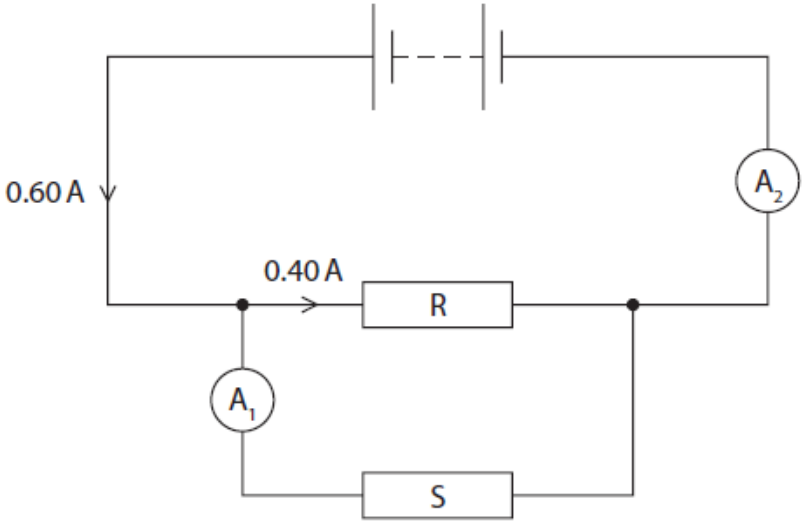


Diagram 1

(i) On Diagram 1, draw a voltmeter to measure the voltage of resistor S.

(2)

(ii) Deduce the readings on the ammeters.

(2)

current measured by A_1 = ... A

current measured by A_2 = ... A

(iii) Resistor R has a resistance of 11 Ω.

Calculate the voltage across resistor R.

(3)

voltage = ... V

(iv) Explain how the voltage across resistor R compares with the voltage across the battery.

(2)

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(d) Diagram 2 shows a different circuit containing a battery, an ammeter and a thermistor.

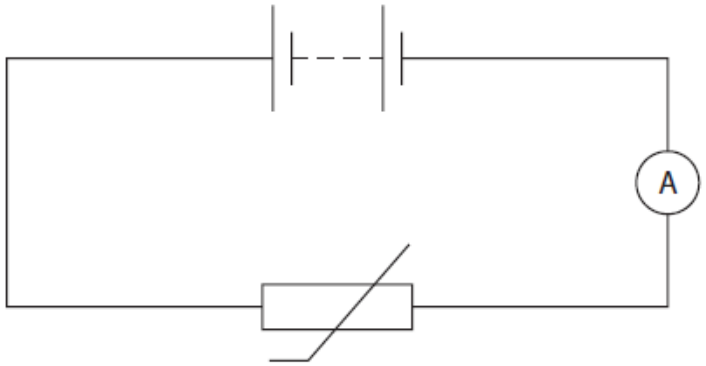


Diagram 2

Explain how the thermistor can be used to vary the current in this circuit.

(3)

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(Total for question = 14 marks)

Q18.

A toaster is an electrical device used for toasting bread.



© Levent Konuk/Shutterstock

The toaster contains thin metal wires.

These wires get hot when there is a current in them.

The wires transfer energy to the bread by heating and by radiation.

(a) Give a reason why the wires in the toaster are connected in parallel.

(1)

.....

.....

(b) (i) State the formula linking power, current and voltage.

(1)

(ii) The power rating of the toaster is 2.8 kW.

Calculate the total current in the toaster.

[mains voltage = 230 V]

(3)

current = ... A

(iii) The toaster contains 48 thin metal wires.

Calculate the current in each of the thin metal wires.

(1)

current = ... A

(Total for question = 6 marks)

Q19.

This question is about electric current.

(a) State what is meant by the term **electric current**.

(1)

.....

.....

(b) Give the name of the particles that flow if there is an electric current in a wire.

(1)

.....

(c) An electric heater contains wires that heat up when there is a current in the wires.

The electric heater has a power of 1.4 kW when connected to a mains voltage of 230 V.

(i) State the formula linking power, current and voltage.

(1)

(ii) Calculate the current in the wires.

(3)

current = ... A

(iii) Explain why the current in the wires causes the temperature of the wires to increase.

(2)

.....

.....

.....

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(Total for question = 8 marks)

Q20.

(a) State what is meant by the term **electric current**.

(1)

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.....

(b) Diagram 1 shows an electric circuit used to test a fuse.

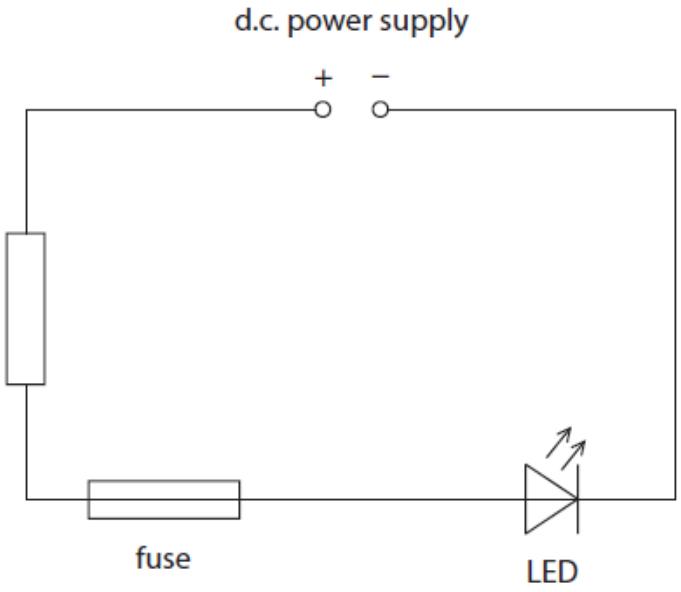


Diagram 1

(i) Give a reason why an LED is included in the circuit.

(1)

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.....

(ii) Add another component to the circuit in diagram 1 to measure the current in the fuse.

(1)

(c) Diagram 2 shows a different electric circuit containing three different lamps.

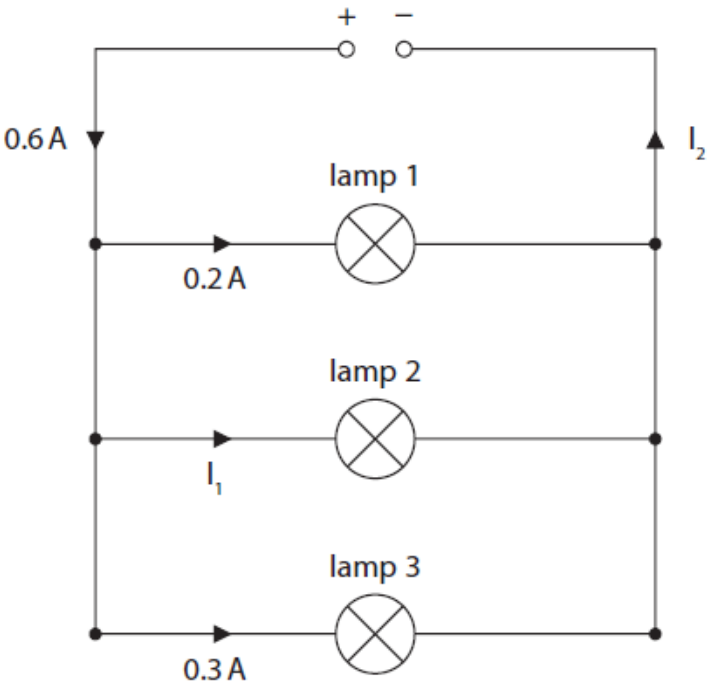


Diagram 2

(i) Calculate the current I_1.

(1)

I_1 ..... A

(ii) State the current I_2.

(1)

I_2 ..... A

(iii) Explain which lamp is the brightest.

(3)

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(Total for question = 8 marks)

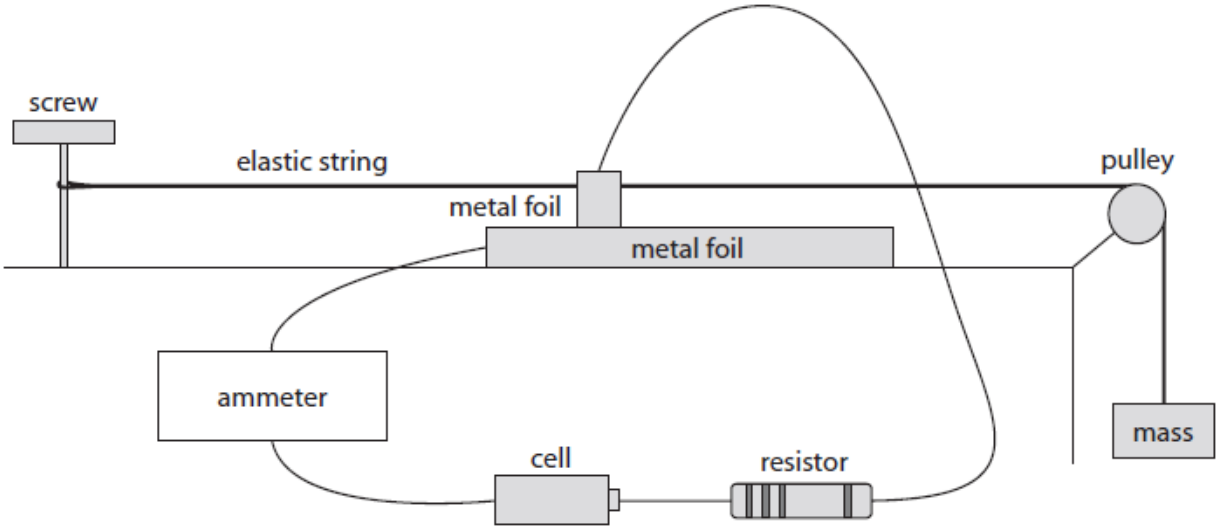
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Q21.

The diagram shows some apparatus used to find the mass of an object.

The two pieces of metal foil act as a variable resistor.

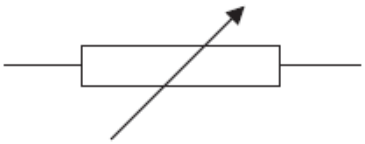
When more mass is added, the elastic string stretches and the small piece of metal foil moves to the right.



(a) (i) Draw the circuit diagram for this electrical circuit.

The variable resistor has been drawn for you.

(4)



(ii) Draw a voltmeter on the diagram to measure the voltage of the variable resistor.

(2)

(b) Explain how the voltage across the variable resistor changes if more mass is added to the end of the elastic string.

(4)

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(c) The student extends the investigation by keeping the mass constant and replacing the cell with a variable power supply.

The student measures the current in the circuit for different voltages.

These are the results.

Voltage in V	Current in mA
0.0	0.0
2.0	4.0
4.0	7.0
6.0	11.0
8.0	14.0

(i) State the independent variable in the student's investigation.

(1)

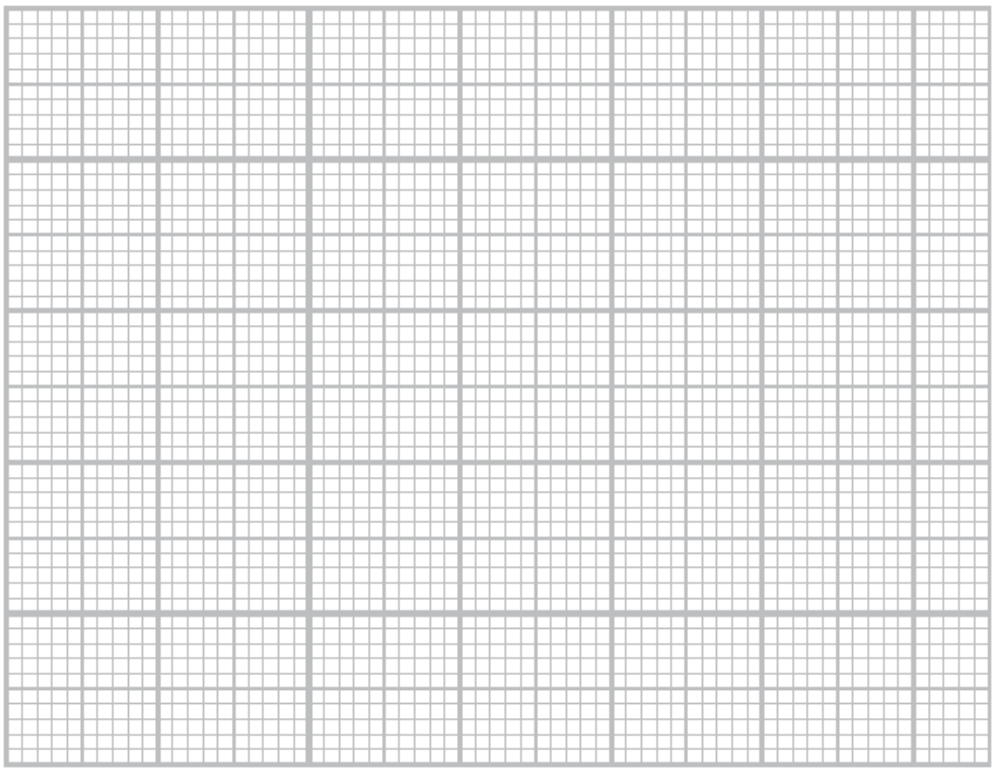
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(ii) Plot the student's results on the grid.

(3)

(iii) Draw a line of best fit.

(1)



(Total for question = 15 marks)

Q22.

The photograph shows a hair dryer plugged into the mains supply.

The hair dryer contains a fuse.



© Cristina Bernardo/Shutterstock

(a) State which wire in the hair dryer should be in series with the fuse.

(1)

.....

(b) The fuse is an electrical safety feature used in mains-operated domestic appliances.

State two other electrical safety features that can be used in mains-operated domestic appliances.

(2)

1 .....

.....

2 .....

.....

(c) The hair dryer has a current of 9.6 A.

The mains supply voltage is 230 V.

(i) State the formula linking power, current and voltage.

(1)

(ii) Calculate the power of the hair dryer.

Give the unit.

(3)

power = ... unit .....

(iii) The hair dryer contains a coil of wire which is used to heat air passing through the hair dryer.

Explain why the coil of wire heats up when there is a current in it.

(3)

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(d) Explain how a fuse protects a domestic appliance.

(3)

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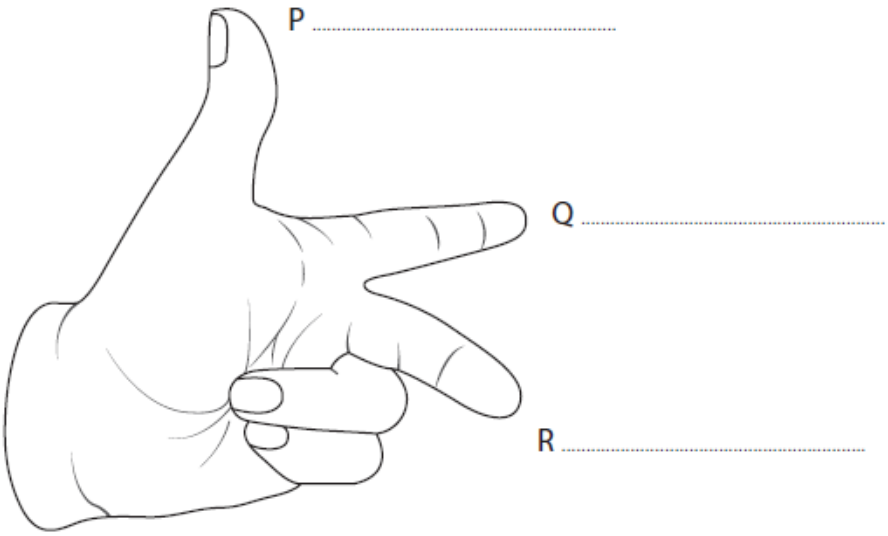
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(Total for question = 13 marks)

Q23.

This is a question about how a loudspeaker works.

(a) Diagram 1 shows a student's left hand.



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Diagram 1

Label diagram 1 to show what P, Q and R represent in the left-hand rule.

(3)

(b) Diagram 2 shows part of the permanent magnet taken from a loudspeaker.

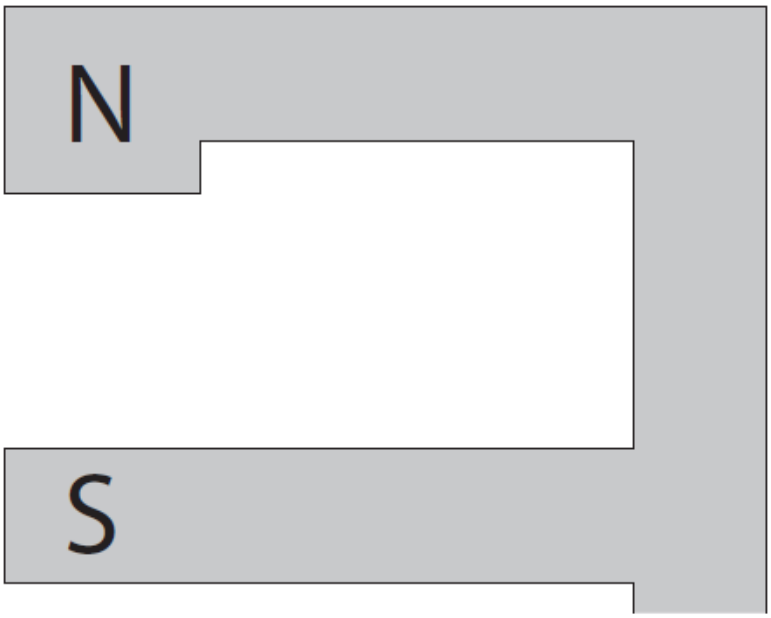


Diagram 2

There is a uniform magnetic field between the north pole and the south pole of the permanent magnet.

On diagram 2, draw three field lines to show this uniform magnetic field.

(2)

(c) The loudspeaker is connected to an alternating current supply.

(i) Describe the difference between alternating current (a.c.) and direct current (d.c.).

(2)

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(ii) Diagram 3 shows a cross-section of the loudspeaker with a current in the coil.

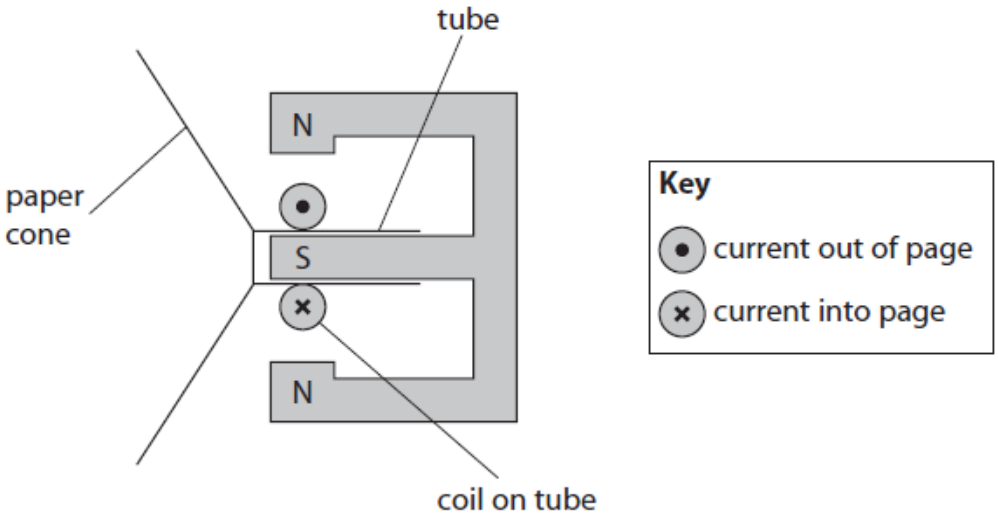


Diagram 3

The coil is attached to the tube.

The tube is attached to the paper cone.

State the direction of motion of the paper cone when the current is in the direction shown in diagram 3.

(1)

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(iii) Explain why the loudspeaker does not work when the coil is connected to a battery.

(2)

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(Total for question = 10 marks)

Q24.

(a) (i) A student investigates how current varies with voltage for a metal filament lamp.

Draw a diagram of the circuit that a student could use for this investigation.

(4)

(ii) Describe a method the student could use for their investigation.

(4)

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(b) The student extends the investigation by recording additional data for the lamp.

This is her method.

For each voltage

- switch the current on for 45 seconds
- record the current and colour of the lamp
- calculate the power and the energy transferred by the lamp

The table shows the student's results.

Voltage in V	Current	Power in W	Energy in J	Colour of lamp
0.0	0.00	0.0	0.0	off
2.0	0.40	0.8	36	red
4.0	0.90	3.6		orange
6.0	1.60	9.6	430	yellow
8.0	2.80	22.4	1000	white

(i) State the unit for current.

(1)

.....

(ii) Calculate the missing value of energy for the voltage of 4.0 V.

Give your answer to 2 significant figures.

(2)

energy = ... J

(iii) The colour of a star is related to its surface temperature.

The Sun is yellow.

Use the student's results to identify a colour for a star that is cooler than the Sun.

(1)

.....

(Total for question = 12 marks)

Q25.

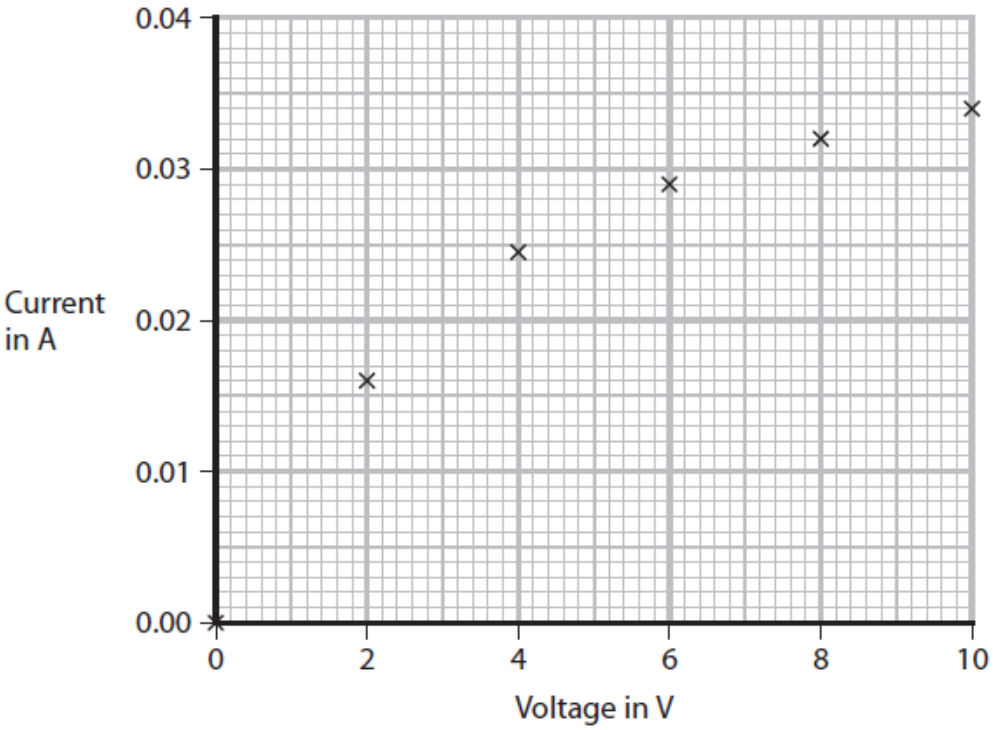
A student investigates how the current in a filament lamp varies as the voltage across the lamp is changed.

(a) Draw a circuit that the student could use for this investigation.

(4)

(b) The student completes the investigation.

The graph shows their results.



(i) Draw a curve of best fit.

(1)

(ii) Use the graph to determine the resistance of the filament lamp when the voltage across the lamp is 2.0 V.

(3)

resistance = ... Ω

(iii) Explain the change in the resistance of the filament lamp as the voltage across the lamp is increased from 2.0 V.

(2)

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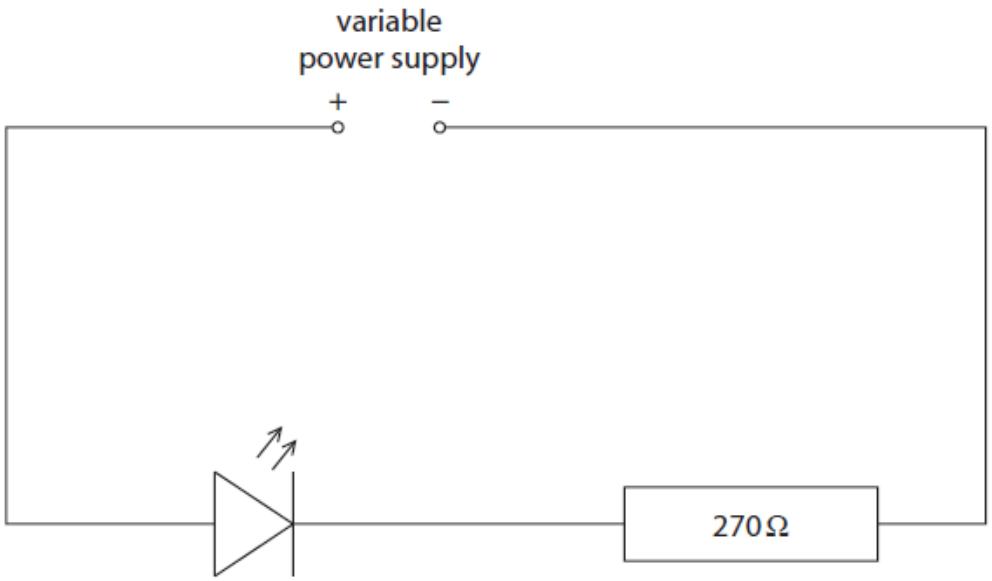
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(Total for question = 10 marks)

Q26.

The diagram shows a circuit used to investigate the relationship between current and voltage for a light-emitting diode (LED).



(a) Draw meters on the diagram to measure the voltage of the LED and the current in the LED.

(3)

(b) The table shows the results of the investigation.

Voltage in V	Current in mA
0.00	0.0
0.30	0.5
0.35	2.5
0.40	1.5
0.45	2.0
0.50	4.5
0.55	9.0
0.60	15.0

(i) Plot the results on the grid.

(3)

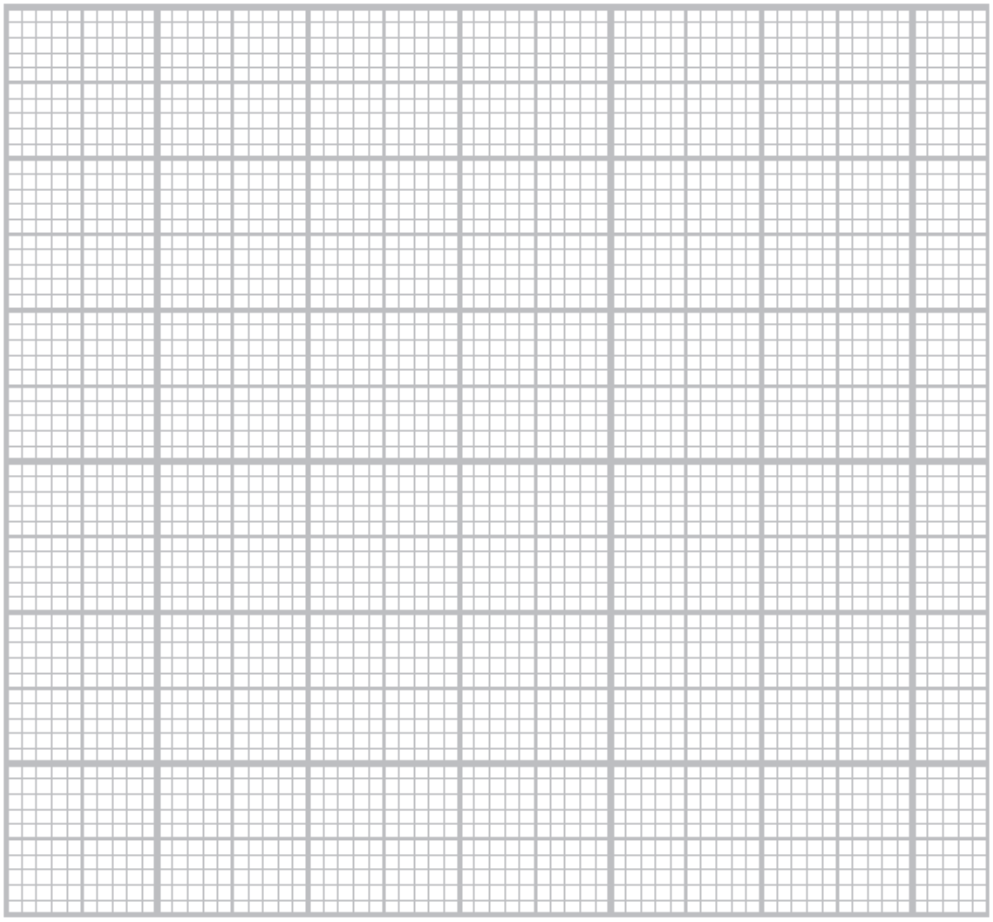
(ii) One of the results is anomalous.

On the graph, draw a circle around the anomalous result.

(1)

(iii) Draw a curve of best fit.

(1)



(iv) Give a reason why a line graph is the best way of showing these results.

(1)

.....

.....

.....

(v) State the formula linking voltage, current and resistance.

(1)

(vi) Any current larger than 15 mA will permanently damage the LED.

The resistor in the circuit has a resistance of 270 Ω.

Use the results from the investigation to determine the maximum voltage of the power supply without damaging the LED.

(4)

maximum voltage = ... V

(Total for question = 14 marks)

Q27.

A student does an investigation to determine the current-voltage graph for an unknown component, X.

The student uses this equipment

- component X
- cell
- variable resistor
- ammeter
- voltmeter
- connecting wires

(a) Complete the circuit diagram to show how the student should set up this equipment for her investigation.

(4)



(b) The student completes her investigation.

The table shows her results.

Voltage in V	Current in mA
0.00	0
0.10	0
0.20	0
0.30	0
0.40	0
0.50	2
0.60	8
0.70	33
0.80	140

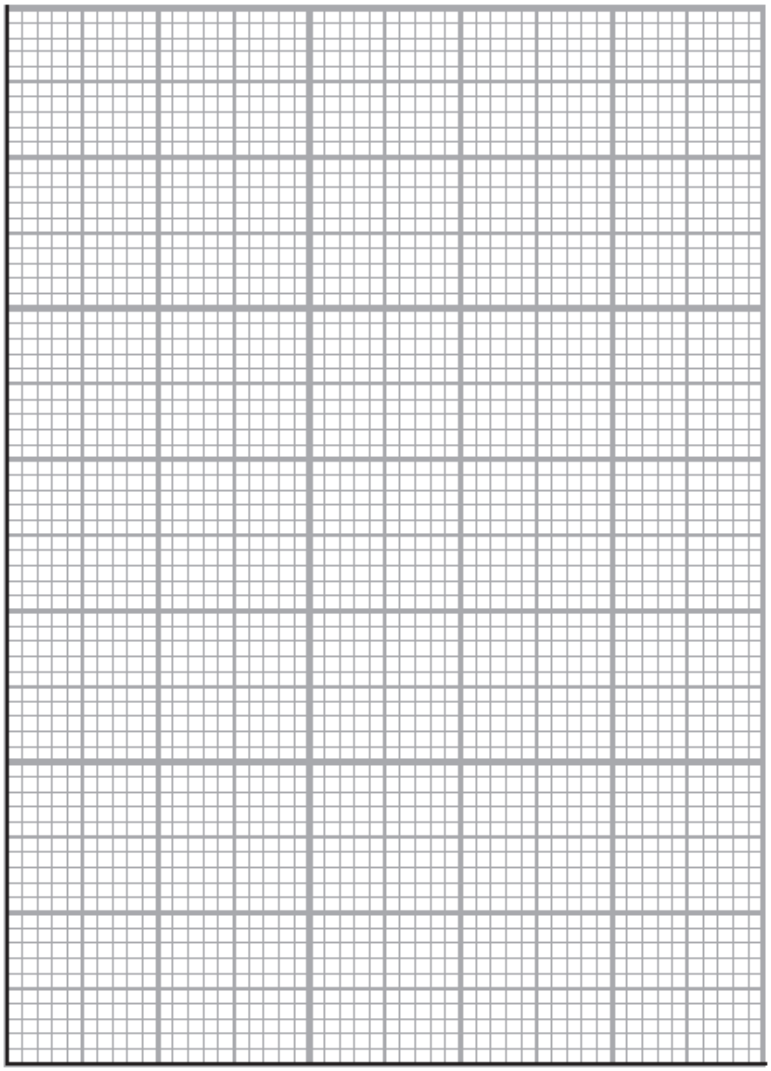
(i) Plot a graph of the student's results on the grid.

Plot current on the y-axis and voltage on the x-axis.

(3)

(ii) Draw a curve of best fit.

(1)



(iii) State the name of component X.

(1)

.....

(Total for question = 9 marks)

Q28.

The photograph shows a mains-operated, decorative lamp, X.



Lamp X has seven identical bulbs that are connected in series.

(a) Give a disadvantage of connecting the bulbs in series.

(1)

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.....

(b) Suggest an advantage of connecting the bulbs in series.

(1)

.....

.....

(c) Each bulb has a working resistance of 390 Ω.

The voltage across each bulb is 33 V.

(i) State the formula linking voltage, current and resistance.

(1)

(ii) Calculate the current in each bulb.

(3)

current = ... A

(iii) Calculate the energy transferred to lamp X when it is used for 2.5 hours.

(4)

energy transferred = ... J

(d) Another decorative lamp, Y, uses five of the same 390 Ω bulbs connected in series.

Both lamps are mains operated.

Explain how the brightness of a single bulb in lamp Y compares to the brightness of a single

bulb in lamp X.

(3)

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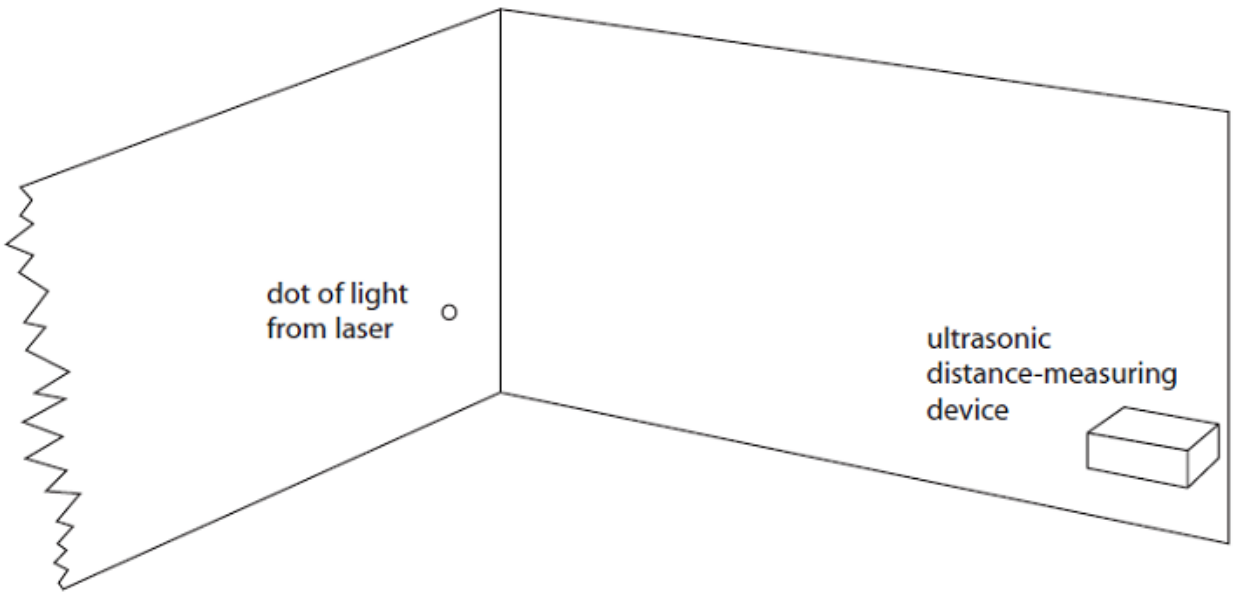
(Total for question = 13 marks)

Q29.

An ultrasonic distance-measuring device can be used to measure the length of a room.

The device emits a pulse of sound with a frequency of 40 kHz.

The device also emits a bright beam of red visible light.



(a) Explain what is meant by a frequency of 40 kHz.

(2)

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.....

(b) A sound wave from the device travels at 345 m / s.

(i) State the formula linking wave speed, frequency and wavelength.

(1)

(ii) Calculate the wavelength of the sound wave.

(3)

wavelength = ... m

(iii) The device emits a sound wave.

The sound wave travels to the wall, reflects back to the device and is received by the device.

The distance from the device to the wall is 2.35 m.

Calculate the time between the sound wave being emitted and received by the device.

(4)

time = ... s

(c) Suggest why the device emits visible light.

(1)

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.....

.....

(d) Sound waves and light waves can have different frequencies and wavelengths.

Describe three other differences between sound waves and light waves.

You may draw diagrams to support your answer.

(3)

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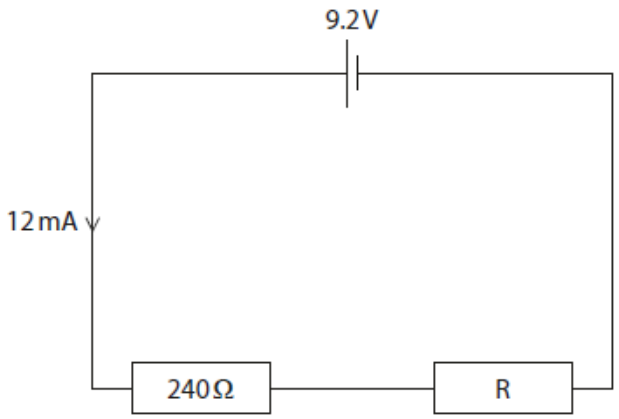
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(Total for question = 14 marks)

Q30.

This question is about voltage and current.

(a) The diagram shows two resistors connected to a battery.



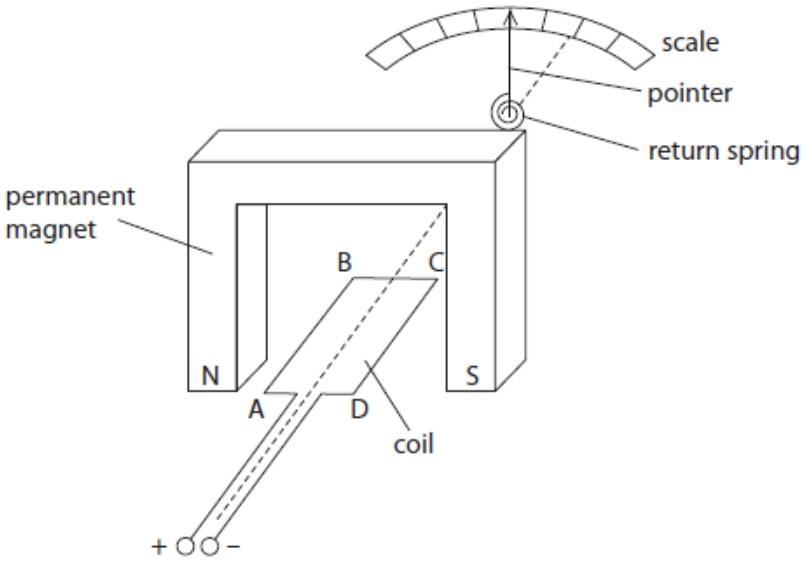
Calculate the voltage across resistor R.

(4)

voltage = ... V

(b) The diagram shows the parts of an ammeter.

The pointer is connected to the coil so they can move together.



(i) Explain what happens when there is a current in the coil.

(3)

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(ii) Draw an arrow on the diagram to show the force acting on side CD of the coil when there is a current in the coil.

(1)

(iii) Explain how the ammeter could be changed so that it could measure smaller currents.

(3)

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(Total for question = 11 marks)

Q31.

Diagram 1 shows a trolley seen from above.

A copper rod is attached to the front of the trolley.

The rod is connected to a voltmeter fixed to the trolley.

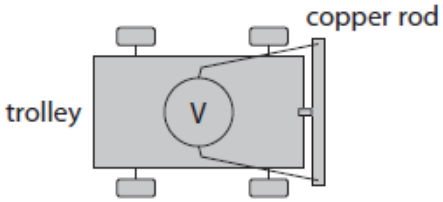


Diagram 1

(a) Diagram 2 shows the path of the trolley, backwards and forwards through a very strong magnetic field directed into the page.

The shaded area shows the magnetic field.

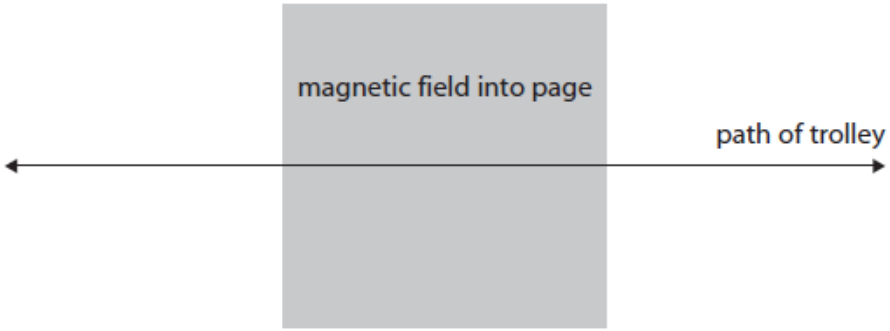


Diagram 2

(i) A voltage is induced in the copper rod as the trolley moves through the magnetic field.

Explain why the sign of the voltmeter reading changes as the trolley moves backwards and forwards.

(3)

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.....

(ii) Give a reason why the magnitude of the induced voltage might change.

(1)

.....

.....

(b) The voltmeter is replaced by a resistor.

A charge of 1.4×10^{-4} C flows in the resistor during a time of 0.78 s.

(i) Calculate the mean current in the resistor.

(3)

mean current = ... A

(ii) The thermal energy store of the resistor increases by 2.3×10^{-6} J as energy is transferred to it electrically.

Calculate the mean voltage across the resistor when a charge of 1.4×10^{-4} C transfers this energy.

(3)

mean voltage = ... V

(Total for question = 10 marks)