PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

PHYSICS



EXAM QUESTION PACK

TOPIC 10: ELECTRICITY AND CIRCUITS (PAPER 2)

SCORE	PERCENTAGE
/155	%

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Q1.

* Explain, with the aid of a circuit diagram, the method a student could use to investigate how the resistance of a single lamp changes with the potential difference across the lamp.

(6)

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(Total for question = 6 marks)

(**Q16 1SC0/2PH, June 2018**)

Q2.

A student investigates resistors connected in parallel using a number of resistors.
Each resistor has the same resistance.

Figure 10 shows a circuit diagram with one resistor, R.

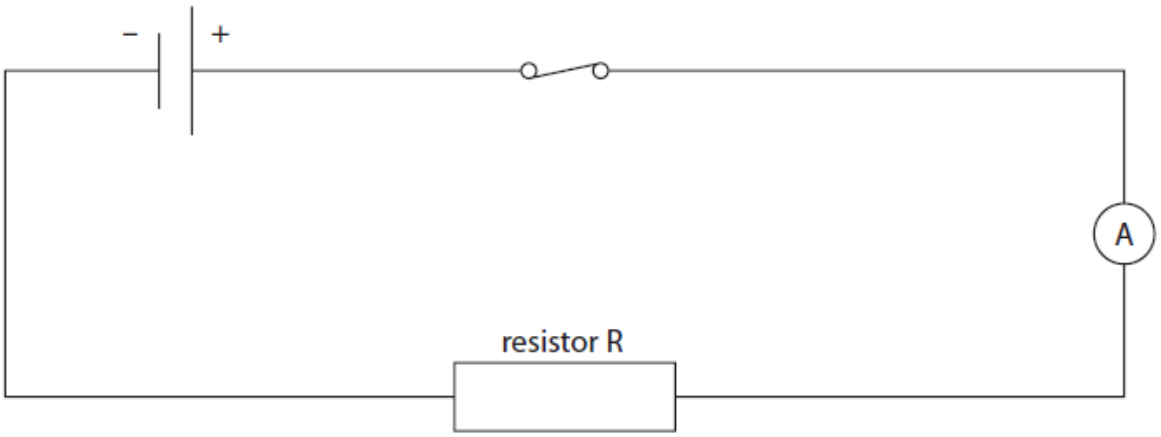


Figure 10

(i) Add to Figure 10:

- a voltmeter to find the potential difference across resistor R
- another resistor in parallel with resistor R.

(2)

(ii) State the measurements that the student must take to find the overall resistance of the resistors in parallel.

(2)

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(iii) The student investigates how the overall resistance of the circuit changes when additional resistors are added in parallel to R.

Each resistor has the same resistance.

Figure 11 shows the results of the student's investigation.

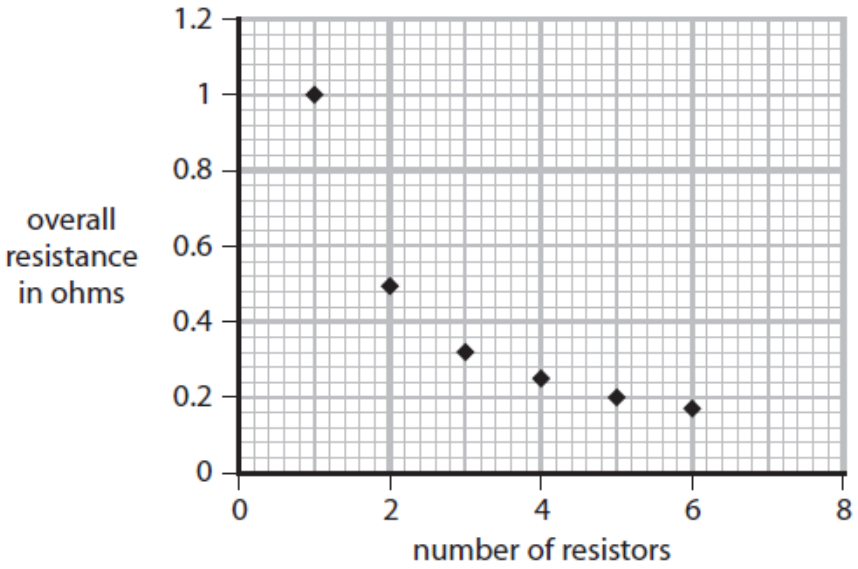


Figure 11

State the resistance of a single resistor.

(1)

resistance = ... Ω

(iv) Comment on the relationship between the overall resistance of the circuit and the number of resistors in parallel.

Use information from Figure 11 to support your answer.

(3)

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(Total for question = 8 marks)

(**Q05a 1SC0/2PH, Nov 2020**)

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 (☒).

A plug connects a television to the mains supply.

(i) The plug contains a fuse that is connected to the

(1)

☒ **A** live pin

☒ **B** negative pin

☒ **C** neutral pin

☒ **D** positive pin

(ii) A 3 A fuse is used in the plug.

Explain what happens if a fault causes the current to rise to more than 3 A.

(2)

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(iii) A fuse is a safety device.

State **one** other safety device that can be used in domestic electrical wiring.

(1)

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(Total for question = 4 marks)

(QU06c 1SC0/2PF, June 2025)

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 (☒).

A plug connects a television to the mains supply.

(i) The plug contains a fuse that is connected to the

(1)

☒ **A** live pin

☒ **B** negative pin

☒ **C** neutral pin

☒ **D** positive pin

(ii) A 3 A fuse is used in the plug.

Explain what happens if a fault causes the current to rise to more than 3 A.

(2)

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(iii) A fuse is a safety device.

State **one** other safety device that can be used in domestic electrical wiring.

(1)

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(Total for question = 4 marks)

(**QU02c 1SC0/2PH, June 2025**)

Q5.

Some students investigate resistors in parallel.

The students set up a circuit containing **four** identical resistors.

The circuit used is shown in Figure 11.

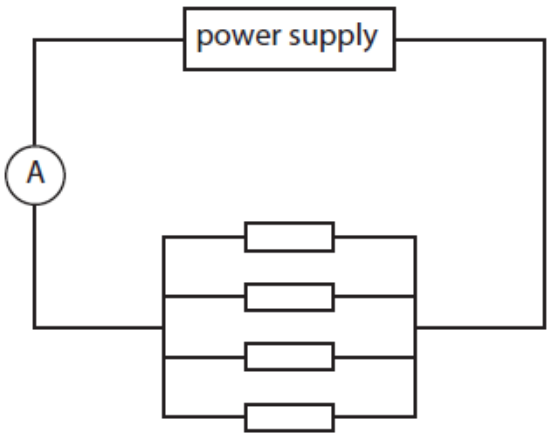


Figure 11

The students measure the current from the power supply and the voltage (p.d.) across the resistors.

(i) On Figure 11, draw a voltmeter connected to measure the voltage (p.d.) across the resistors.

(1)

The students remove one resistor and measure the current and voltage again with only 3 resistors in the circuit.

They repeat the measurements of current and voltage with only 2 resistors in the circuit and then with only 1 resistor in the circuit.

Figure 12 is a table of their results.

number of resistors	current in mA	voltage in V
4		6.00
3	27.3	6.00
2	18.2	6.00
1	9.1	6.00

Figure 12

(ii) Using data from the table in Figure 12, predict the current from the power supply when there are 4 resistors in the circuit.

(1)

current = ... mA

(iii) Using data from the table in Figure 12, calculate the resistance of **only 1** resistor.

(3)

resistance = ...Ω

(iv) Using data from the table in Figure 12, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

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(Total for question = 8 marks)

(**QU05b 1SC0/2PF, June 2024**)

Q6.

Some students investigate resistors in parallel.

The students set up a circuit containing **four** identical resistors.

The circuit used is shown in Figure 2.

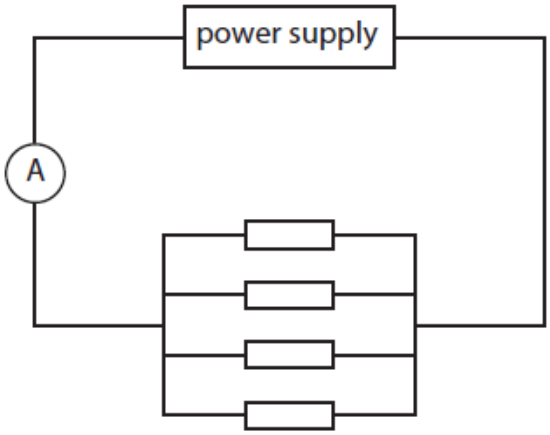


Figure 2

The students measure the current from the power supply and the voltage (p.d.) across the resistors.

(i) On Figure 2, draw a voltmeter connected to measure the voltage (p.d.) across the resistors.

(1)

The students remove one resistor and measure the current and voltage again with only 3 resistors in the circuit.

They repeat the measurements of current and voltage with only 2 resistors in the circuit and then with only 1 resistor in the circuit.

Figure 3 is a table of their results.

number of resistors	current in mA	voltage in V
4		6.00
3	27.3	6.00
2	18.2	6.00
1	9.1	6.00

Figure 3

(ii) Using data from the table in Figure 3, predict the current from the power supply when there are 4 resistors in the circuit.

(1)

current = ... mA

(iii) Using data from the table in Figure 3, calculate the resistance of **only 1** resistor.

(3)

resistance = ... Ω

(iv) Using data from the table in Figure 3, explain what happens to the **total resistance of the circuit** as the number of resistors in parallel decreases.

(3)

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(Total for question = 8 marks)

(**QU01b 1SC0/2PH, June 2024**)

Q7.

Figure 10 shows an electrical device connected to the wheels of an electric car.

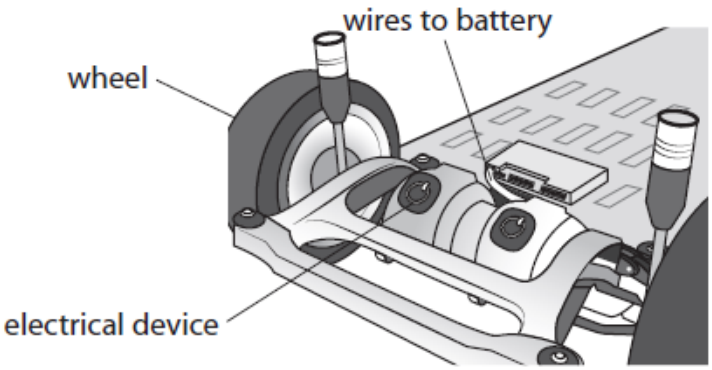


Figure 10

The battery can be recharged at a charging point.

The charging point provides an average current of 15.0 A to the battery, at a potential difference (voltage) of 400 V.

It is claimed that 126 MJ of energy can be transferred to the battery in less than 6 hours.

(i) Comment on this claim.

Use this equation to support your answer

$$t = \frac{E}{I \times V}$$

(3)

.....

.....

(ii) Calculate the total charge that moves into the battery while it is being recharged.

Use the equation

$$E = Q \times V$$

(2)

charge = ... C

(Total for question = 5 marks)

(**QU05b 1SC0/2PH, June 2023**)

Q8.

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 technician connects four devices to the car battery.

Each device is connected to its own switch and its own fuse.

Figure 9 shows how the four devices, fuses and switches are connected.

The current in each device is shown next to the device.

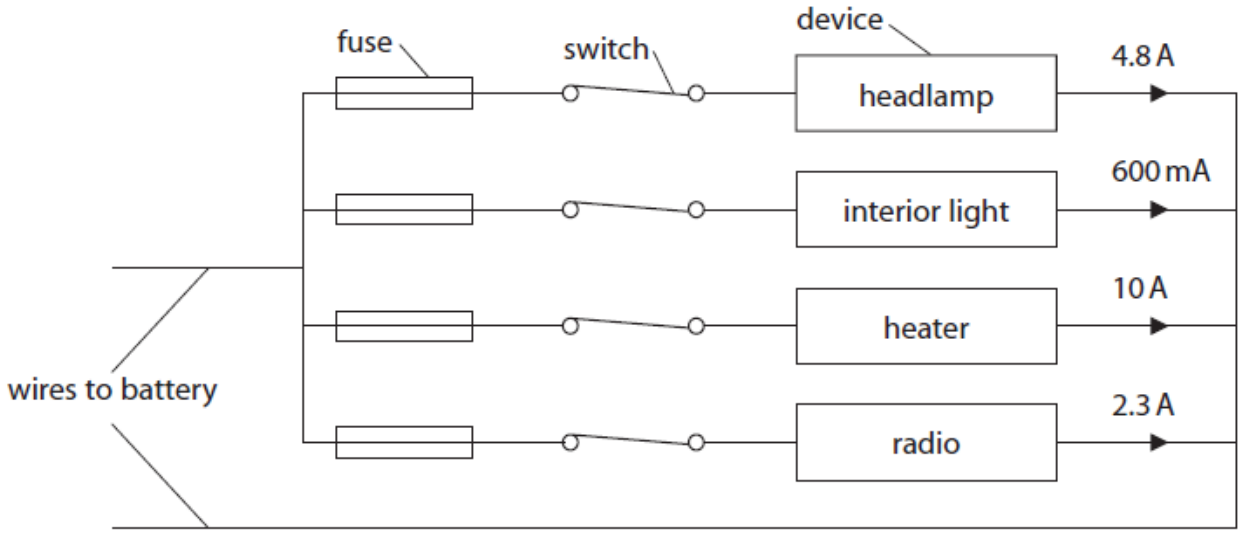


Figure 9

(i) Calculate the current in the wires to the battery when all the devices are switched on.

(1)

current = ... A

(ii) State how the overall resistance of the circuit changes when any one of the devices is switched off.

(1)

.....

.....

(iii) There is a current of 2.3 A in the radio when the radio is working correctly.

Which of these should the technician choose to protect the radio circuit?

(1)

☒ **A** 2 A fuse

☒ **B** 5 A fuse

☒ **C** 10 A fuse

☒ **D** 13 A fuse

(iv) Explain why the wires to the battery in a car are thicker than the wires that connect each device to its switch and its fuse.

(2)

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.....

(Total for question = 5 marks)

(**Q05b 1SC0/2PH, Nov 2021**)

Q9.

The circuit in Figure 1 is switched on.

A charge of 1.2 C leaves the battery in a time of 4.0 s.

Calculate the current in the circuit.

Use the equation

$$\text{current} = \frac{\text{charge}}{\text{time}}$$

current = ... A

(Total for question = 2 marks)

(**QU01b 1SC0/2PF, June 2024**)

Q10.

An electric heater is connected to a 230 V supply.

The power supplied to the heater is 2.6 kW.

Calculate the current in the heater.

(3)

current = ... A

(Total for question = 3 marks)

(**Q06a 1SC0/2PF/S2, SAM**)

Q11.

An electric heater is connected to a 230 V supply.

The power supplied to the heater is 2.6 kW.

Calculate the current in the heater.

(3)

current = ... A

(Total for question = 3 marks)

(**Q02a 1SC0/2PH/S2, SAM**)

Q12.

This question is about using the mains electricity supply.

(i) An electric kettle is used to boil some water.

The mains supply voltage is 230 V.
The power supplied to the kettle is 1.9 kW.

Calculate the current in the kettle.
Use the equation

$$I = \frac{P}{V}$$

(2)

current supplied to the kettle = ... A

(ii) A coffee machine takes 120 s to heat some water.

Mains supply voltage = 230 V
Current in this coffee machine = 7.4 A

Calculate the energy transferred to the coffee machine in 120 s.

Use an equation selected from the list of equations at the end of the paper.

(2)

energy transferred to coffee machine = ... J

(Total for question = 4 marks)

(**Q03a 1SC0/2PF, Nov 2021**)

Q13.

An electric water pump is powered by the 230 V mains supply.

The 230 V mains supply transfers 9000 J of energy to the pump motor in 1 minute.

Calculate the current in the pump motor.

Use the equation

$$I = \frac{E}{V \times t}$$

(3)

current = ... A

(Total for question = 3 marks)

(**QU03b 1SC0/2PF, June 2022**)

Q14.

Figure 2 shows the junction of three wires, F, G and H, in a circuit.
The current in wire F is 6.0 A.
The current in wire G is 3.5 A.

Calculate the current in wire H.

(1)

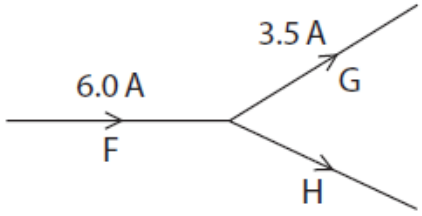


Figure 2

current in wire H = ... A

(Total for question = 1 mark)

(**Q01b 1SC0/2PF, June 2019**)

Q15.

(i) Figure 6 shows an electric kettle.

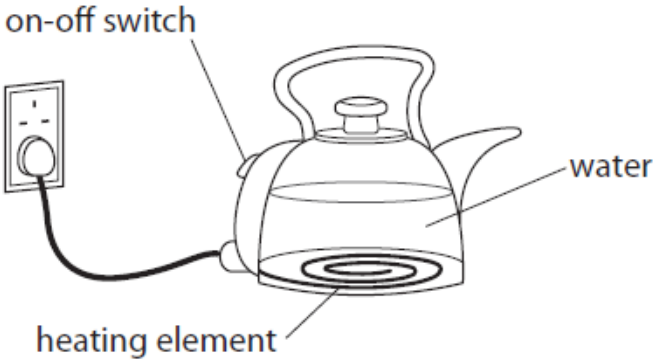


Figure 6

The kettle contains 1.5 kg of water.

The kettle is switched on.

Calculate the energy needed to raise the temperature of the water by 50 °C.

Specific heat capacity of water = 4200 J/kg °C

Use the equation

$$\Delta Q = m \times c \times \Delta\theta$$

(2)

energy needed = ... J

(ii) The amount of energy, E, needed to bring the water to boiling point is 670 000 J.

The kettle has a power of 3500 W.

Calculate the time, *t*, it takes to bring the water to boiling point.

Use the equation

$$P = \frac{E}{t}$$

(3)

time to bring the water to boiling point = ... s

(Total for question = 5 marks)

(**Q04c 1SC0/2PF, June 2019**)

Q16.

The voltage (potential difference) across a length of wire is 1.5 V.

A charge of 0.042 C flows through the wire.

Calculate the energy transferred.

Use the equation

$$E = Q \times V$$

(2)

E = ... J

(Total for question = 2 marks)

(**QU05a 1SC0/2PF, June 2023**)

Q17.

A different circuit is then set up with two resistors as shown in Figure 12.

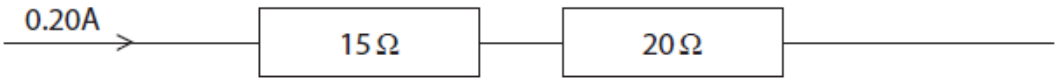


Figure 12

(i) Calculate the potential difference across the 15 Ω resistor.

(2)

potential difference = ... V

(ii) Calculate the total power dissipated when there is a current of 0.20 A in the two resistors.

Use the equation

$$P = I^2 \times R$$

(2)

power produced ..... W

(Total for question = 4 marks)

(**Q05b 1SC0/2PH, Nov 2020**)

Q18.

Figure 7 shows details of a transformer.

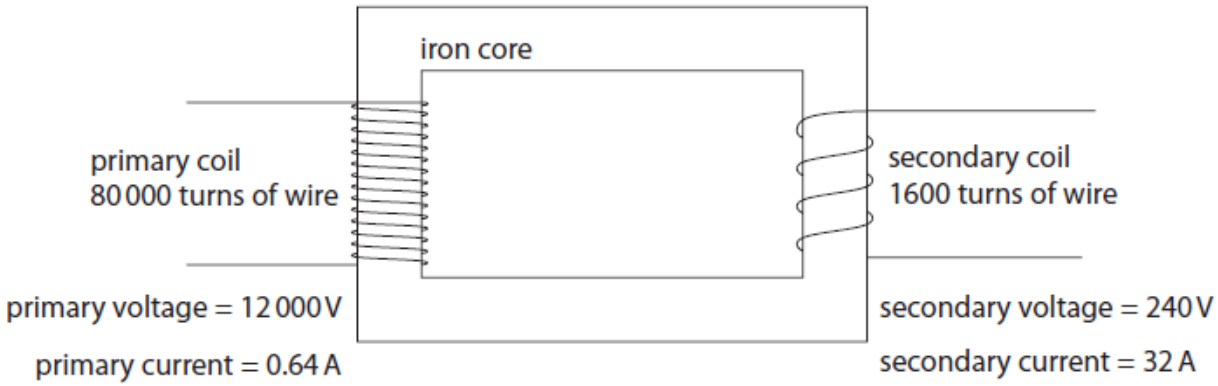


Figure 7

(i) Calculate the power in the primary coil.

Use the equation

$$P = V \times I$$

(2)

power in the primary coil = ... W

(ii) Calculate the following for the transformer in Figure 7.

$$\frac{\text{number of turns in secondary coil}}{\text{number of turns in primary coil}}$$

(2)

.....

(iii) For the transformer in Figure 7, evaluate, in its simplest form, the ratio

secondary voltage : primary voltage

(2)

..... : .....

(Total for question = 6 marks)

(**QU03c 1SC0/2PF, June 2023**)

Q19.

The mains supply to the television is 230 V.

The current supplied to the television is 0.53 A.

Calculate the power input to the television.

Use the equation

$$P = I \times V$$

(2)

power = ... W

(Total for question = 2 marks)

(**QU06b 1SC0/2PF, June 2025**)

Q20.

The mains supply to the television is 230 V.

The current supplied to the television is 0.53 A.

Calculate the power input to the television.

Use the equation

$$P = I \times V$$

(2)

power = ... W

(Total for question = 2 marks)

(**QU02b 1SC0/2PH, June 2025**)

Q21.

Figure 8 shows a saucepan of milk being heated on an electric cooker.



© Por Fabian Ponce Garcia/Shutterstock

Figure 8

The cooker supplies 130 000 J of energy in a time of 87 s.

(i) Calculate the power supplied by the cooker.

Use the equation

$$P = \frac{E}{t}$$

Give your answer to 2 significant figures.

(3)

power = ... W

(ii) The cooker supplies 130 000 J of energy but only 96 000 J of this energy is used to heat the milk.

Calculate the efficiency of heating the milk using this cooker.

Use the equation

$$\text{efficiency} = \frac{\text{useful energy transferred}}{\text{total energy supplied}}$$

(2)

efficiency = ...

(Total for question = 5 marks)

(**QU04b 1SC0/2PF, June 2024**)

Q22.

An electric fire is connected to a 230 V mains supply.

A current of 9.0 A is supplied to the fire.

Calculate the power supplied to the fire.

Use the equation

power = current × voltage

(2)

power = ... W

(Total for question = 2 marks)

(**QU05c 1SC0/2PF, June 2024**)

Q23.

A wire in a circuit carries a current of 0.9 A.
Calculate the quantity of charge that flows through the wire in 50 s.

State the unit of charge with your answer.

Use the equation

charge = current × time

(3)

quantity of charge = ... unit .....

(Total for question = 3 marks)

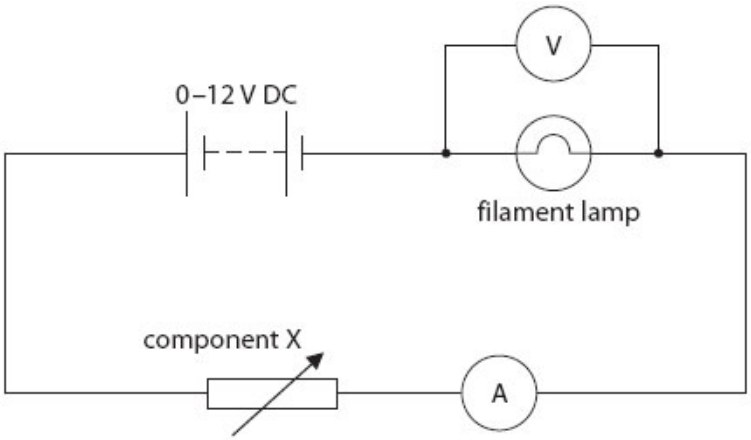
(**Q01c 1SC0/2PF, June 2019**)

Q24.

A student sets up an experiment to measure the potential difference (voltage) across a filament lamp.

She changes the current through the lamp.

The diagram shows the circuit she used.



(c) Calculate the resistance of the lamp when the current is 0.44 A and the potential difference is 10.0 V.

(2)

$$R = \frac{V}{I}$$

resistance = ...**Ω**

(**Q05 1SC0/2PF, Mar 2013**)

Q25.

Figure 10 shows two electrical devices for heating water.

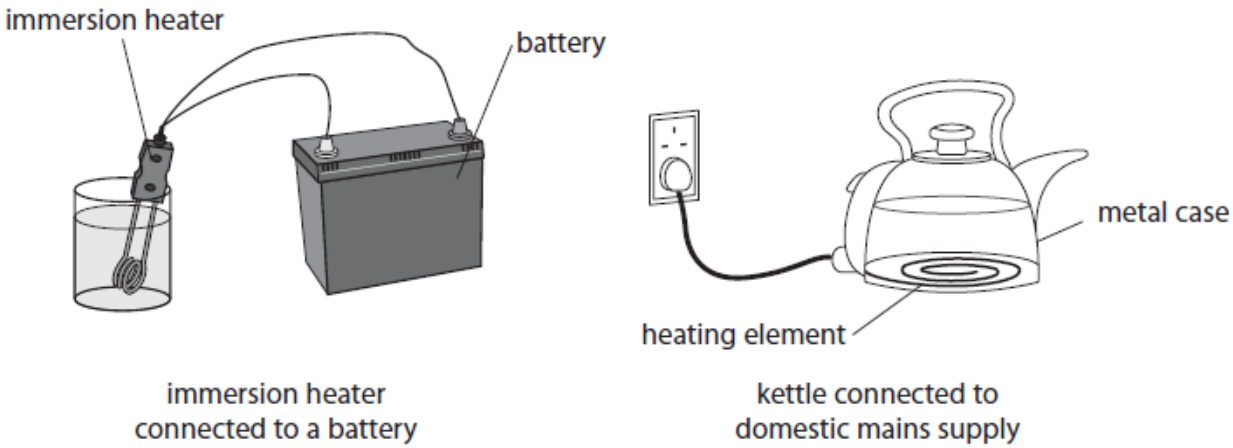


Figure 10

(i) The current in the element of the immersion heater is 14 A.

The power of the immersion heater is 130 W.

Calculate the resistance of the immersion heater.

Give your answer to two significant figures.

(3)

resistance of immersion heater = ... Ω

(ii) The current in the heating element of the kettle is 8.3 A.

State **two** differences between the movement of charge in the heating element of the kettle and the movement of charge in the immersion heater.

(2)

1 .....

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2 .....

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(Total for question = 5 marks)

(**Q06a 1SC0/2PH, June 2019**)

Q26.

Figure 9 shows a lamp connected to a d.c. power supply.

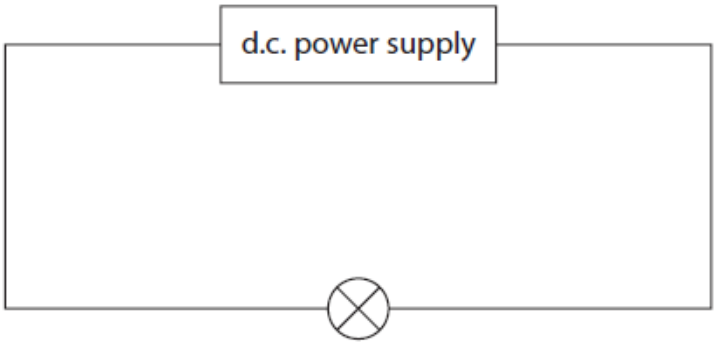


Figure 9

The power supply provides a potential difference (voltage) of 4.5 V.

The current in the lamp is 0.30 A.

(i) Calculate the resistance of the lamp.

Use the equation

$$R = \frac{V}{I}$$

(1)

resistance = ... Ω

(ii) Calculate the power supplied to the lamp.

(2)

power = ... W

(Total for question = 3 marks)

(**QU05a 1SC0/2PF, June 2022**)

Q27.

Figure 1 shows a lamp connected to a d.c. power supply.

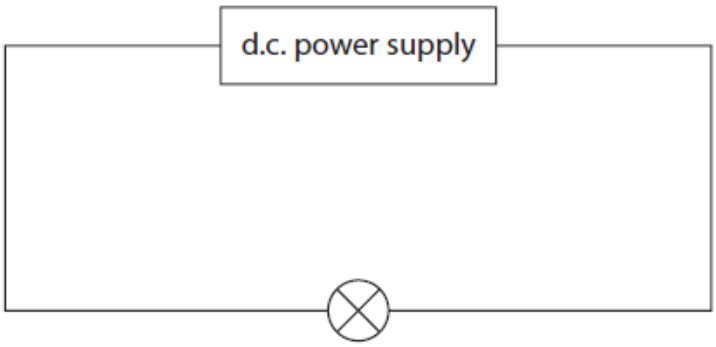


Figure 1

The power supply provides a potential difference (voltage) of 4.5 V.

The current in the lamp is 0.30 A.

(i) Calculate the resistance of the lamp.

Use the equation

$$R = \frac{V}{I}$$

(1)

resistance = ... Ω

(ii) Calculate the power supplied to the lamp.

(2)

power = ... W

(Total for question = 3 marks)

(**QU01a 1SC0/2PH, June 2022**)

Q28.

The potential difference (voltage) across another piece of wire is 1.56 *V*.

The current in the wire is 0.45 *A*.

Calculate the resistance of this piece of wire.

Use the equation

$$V = I \times R$$

(2)

resistance = ... Ω

(Total for question = 2 marks)

(**QU05d 1SC0/2PF, June 2023**)

Q29.

The potential difference (voltage) across another piece of wire is 1.56 *V*.

The current in the wire is 0.45 *A*.

Calculate the resistance of this piece of wire.

Use the equation

$$V = I \times R$$

(2)

resistance = ... Ω

(Total for question = 2 marks)

(**QU01c 1SC0/2PH, June 2023**)

Q30.

(i) There is a current of 0.46 A in a lamp.

Calculate the total charge that flows through the lamp in 30 seconds.

Use the equation

charge = current × time in seconds

(2)

charge = ... C

(ii) The voltage across the lamp is 6.0 V.

The current in the lamp is 0.46 A.

Calculate the energy transferred to the lamp in one minute.

Use the equation

energy transferred = current × voltage × time in seconds

(2)

energy transferred = ... J

(Total for question = 4 marks)

(**QU01c 1SC0/2PF, June 2023**)

Q31.

A student investigates how the current in a lamp changes with the potential difference across the lamp.

The student uses the results to calculate the resistance of the lamp.

The results are shown in the table in Figure 9.

potential difference in V	current in A	resistance in Ω
1.0	0.09	11
2.0	0.14	14
3.0	0.18	17
4.0	0.22	18
5.0	0.26	
6.0	0.30	20

Figure 9

(i) One value of resistance is missing from the table in Figure 9.

Calculate the value of resistance that is missing from the table.

(3)

missing resistance = ... Ω

(ii) The student writes this conclusion:

'The resistance of the lamp is directly proportional to the potential difference.'

Comment on the student's conclusion.
Use information from Figure 9 in your answer.

(3)

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.....

(Total for question = 6 marks)

(**Q06b 1SC0/2PF, June 2019**)

Q32.

A student investigates how the current in a lamp changes with the potential difference across the lamp.

The student uses the results to calculate the resistance of the lamp.

The results are shown in the table in Figure 2.

potential difference in V	current in A	resistance in Ω
1.0	0.09	11
2.0	0.14	14
3.0	0.18	17
4.0	0.22	18
5.0	0.26	
6.0	0.30	20

Figure 2

(i) One value of resistance is missing from the table in Figure 2.

Calculate the value of resistance that is missing from the table.

(3)

missing resistance = ... Ω

(ii) The student writes this conclusion:

'The resistance of the lamp is directly proportional to the potential difference.'

Comment on the student's conclusion.
Use information from Figure 2 in your answer.

(3)

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(iii) The student used a power supply that had fixed output voltage settings.

Each of these outputs was a whole number of volts.

Describe how the student could add a component to the circuit that would provide a continuously variable voltage across the lamp.

(2)

.....

.....

.....

.....

(Total for question = 8 marks)

(**Q02b 1SC0/2PH, June 2019**)

Q33.

When the current in a lamp is 0.15 A, the resistance of the lamp is 40 Ω.

Calculate the voltage across the lamp.

Use the equation

$$V = I \times R$$

(2)

voltage = ... V

(Total for question = 2 marks)

(**Q01b 1SC0/2PF, Nov 2021**)

Q34.

Figure 23 shows an electric car connected to a battery charger.



(Source: © Danil Roudenko/123RF)

Figure 23

The car has a rechargeable battery to drive its motor.

The rechargeable battery provides a potential difference of 330 V and can store up to 64 MJ.

It takes 8 hours for the battery to receive a full charge.

Assume that the charging process is 100% efficient.

(a) Calculate the total charge that flows while the battery is being charged.

(3)

total charge = ... C

(b) Calculate the average charging current.

(3)

current = ... A

(Total for question = 6 marks)

(**Q08ab 1SC0/2PH, SAM 2016**)

Q35.

Figure 1 shows two lamps in series in a circuit.

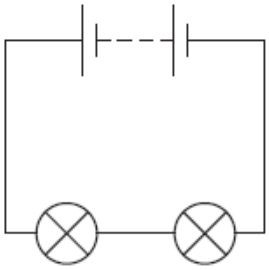


Figure 1

The resistance of each lamp is 12 Ω.

(i) Calculate the total resistance of the lamps in the circuit.

(1)

total resistance of lamps = ... Ω

(ii) The current in a lamp in Figure 1 is 0.50 A.

The resistance of the lamp is 12 Ω.

Calculate the voltage across this lamp.

Use the equation

$$V = I \times R$$

(2)

voltage = ... V

(iii) The voltage across a different lamp is 4.5 V.

The current in this lamp is 0.40 A.

Calculate the energy transferred to the lamp in 5 minutes.

Use the equation

$$E = I \times V \times t$$

(3)

energy transferred = ... J

(Total for question = 6 marks)

(**QU01a 1SC0/2PF, June 2025**)

Q36.

A LED lamp has a power rating of 3 W.
The voltage across the lamp is 12 V.
Calculate the current in the lamp.

(3)

current in the lamp =.....A

(**Q24 1SC0/2PF, June 2013**)

Q37.

A lamp is connected to a potential difference of 0.24 V.

The current in the lamp is 0.12 A.

(i) Calculate the power of the lamp.

Use the equation

$P = I \times V$

(2)

power of the lamp = ... W

(ii) The potential difference is changed to 0.30 V.

The current in the lamp is now 0.13 A.

The lamp is switched on for 35 s.

Calculate the energy that is transferred in this time.
Select an equation from the list of equations at the end of this paper.

(2)

energy transferred = ... J

(iii) The current in the lamp stays at 0.13 A.

Calculate the charge that flows through the lamp in 35 s.
Use the equation

$Q = I \times t$

(2)

charge = ... C

(Total for question = 6 marks)

(**Q14 1SC0/2PF, June 2018**)

Q38.

The espresso machine shown in Figure 27 is an electrical appliance.



(Source: © tanawaty/123RF)

Figure 27

The espresso machine has an electrical heater connected to a 440 V mains supply.

The power of the electrical heater is 3.5 kW.

(i) The rating of a fuse is the current above which it melts.

Which of these is the most suitable fuse for the espresso machine circuit?

(1)

☒ **A** 1 A

☒ **B** 5 A

☒ **C** 10 A

☒ **D** 13 A

(ii) Before the espresso machine can be used, its heater must raise the temperature of some cold water.

The specific heat capacity of water is 4200 J/kg K.

Show that it takes the heater about 90 s to raise the temperature of 1 kg of water from 18°C to 95°C.

Use an equation from the formula sheet.

(3)

(Total for question = 4 marks)

(**Q10a 1SC0/2PH, SAM 2016**)

Q39.

Draw a circuit diagram you could use to investigate the relationship between potential difference, current and resistance for a filament lamp.

(3)

(Total for question = 3 marks)

(**Q05a 1SC0/2PH/S2, SAM**)

Q40.

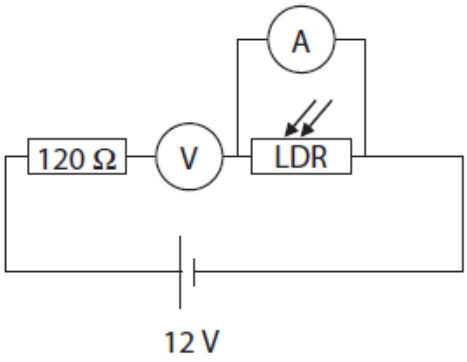
(a) A technician investigates a light-dependent resistor (LDR) connected in series with a 120 Ω resistor and a voltage source.

The technician measures the voltage across the LDR and also the current in the LDR.

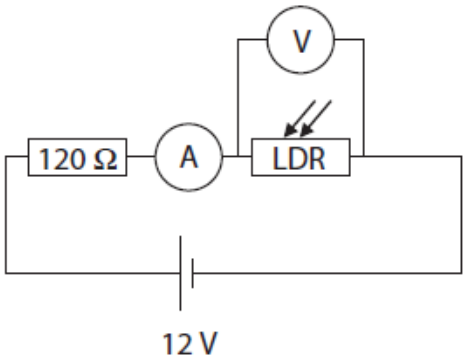
(i) Which **one** of these circuits should the technician use?

Put a cross (☒) in the box next to your answer.

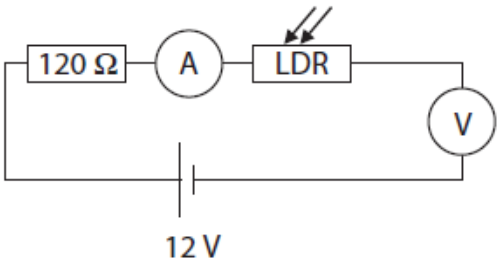
(1)



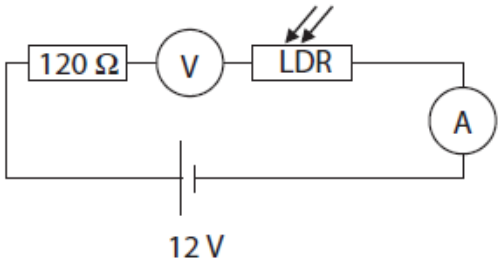
☒ **A**



☒ **B**



☒ **C**



☒ **D**

(ii) When the LDR is in bright sunlight, its resistance is 185 Ω.
The voltage across the LDR is then 7.2V.

Show that the current in the LDR is about 0.039 A.

(2)

(iii) Complete the sentence by putting a cross (☒) in the box next to your answer.

The current in the 120 Ω resistor is

(1)

☒ **A** much more than the current in the LDR

☒ **B** much less than the current in the LDR

☒ **C** the same as the current in the LDR

☒ **D** the opposite of the current in the LDR

(iv) The technician repeats the readings with the LDR in different light conditions.

The table gives two of the readings.

light condition	current in LDR
bright sunlight	0.039 A
cloudy skies	0.028 A

Explain why the two current readings are different.

(2)

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.....

*(b) The photograph shows a temporary traffic sign.



The traffic sign uses many small lights all powered by a rechargeable battery.
These lights need to be very bright during the day so that they can be seen clearly.
They do not need to be as bright at night.

Explain how using a light-dependent resistor can make the energy stored in the battery last longer.

(6)

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(**Q03 1SC0/2PH, June 2015**)