Questions

Q1.

A student sets up an experiment to measure the specific heat capacity of a metal.

Figure 8 shows the apparatus.

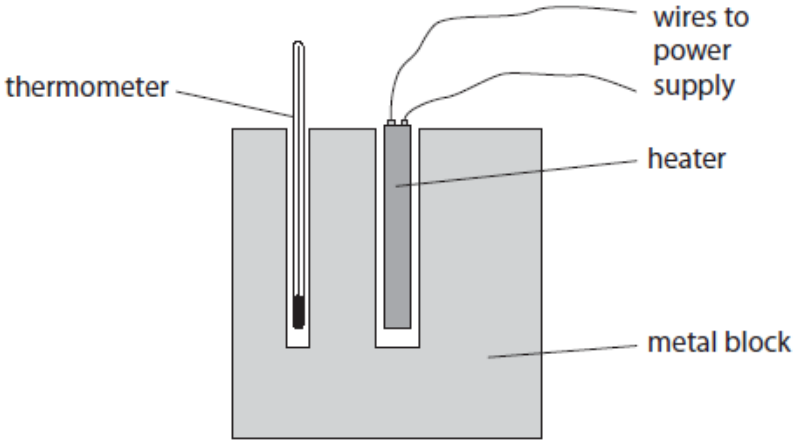

Figure 8

The heater is connected to a power supply and has a power of 50 W.

The student switches on the heater and measures the temperature rise after 5 minutes.

(i) State **two** improvements the student could make to the experiment.

(2)

1 .....

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2 .....

.....

(ii) Figure 9 shows the student's results.

mass of metal block	0.92 kg
power of heater	50 W
starting temperature	20 °C
finishing temperature	54 °C
time	300 s

Figure 9

Use the data in Figure 9 to calculate a value for the specific heat capacity of the metal.

Use the equation

$$\text{specific heat capacity} = \frac{\text{power} \times \text{time}}{\text{mass} \times \text{temperature rise}}$$

(3)

specific heat capacity = ... J/kg °C

(Total for question = 5 marks)

Q2.

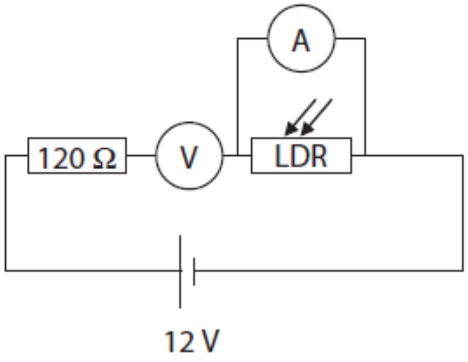
(a) A technician investigates a light-dependent resistor (LDR) connected in series with a 120 Ω resistor and a voltage source.

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

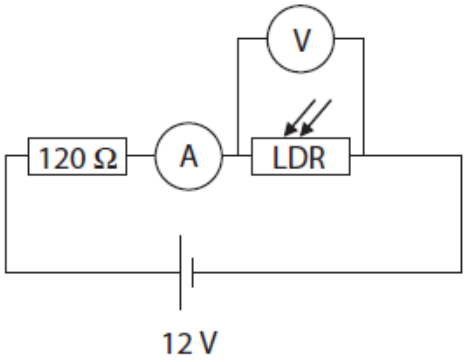
(i) Which **one** of these circuits should the technician use?

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

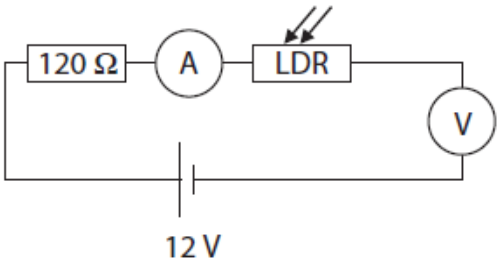
(1)



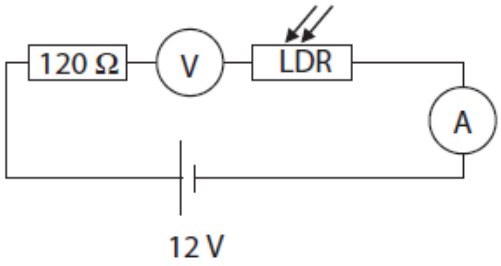
☒ **A**



☒ **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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Q3.

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)

Q4.

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 17.

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 17

(i) One value of resistance is missing from the table in Figure 17.

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 17 in your answer.

(3)

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(Total for question = 6 marks)

Q5.

A student measures the current in the lamp for several values of potential difference across the

lamp.

Figure 13 shows the student's results.

potential difference across the lamp in volts (V)	current through the lamp in amps (A)
0.06	0.05
0.12	0.08
0.18	0.10
0.24	0.12
0.30	0.13
0.36	0.13

Figure 13

The student uses the results in Figure 13 to write this conclusion.

'As the potential difference across the lamp increases, the current in the lamp increases and the relationship is directly proportional.'

Comment on the student's conclusion.

(3)

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(Total for question = 3 marks)

Q6.

A student is investigating a filament lamp.

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

The current in the filament lamp is a flow of

(1)

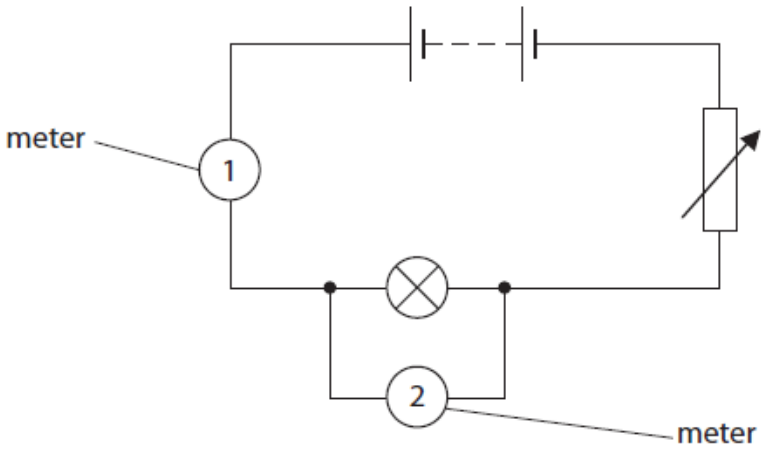
☒ **A** protons

☒ **B** neutrons

☒ **C** electrons

☒ **D** atoms

(ii) The student uses this circuit in his investigation.



State what is measured by the meters.

(2)

Meter 1 measures
.....

Meter 2 measures
.....

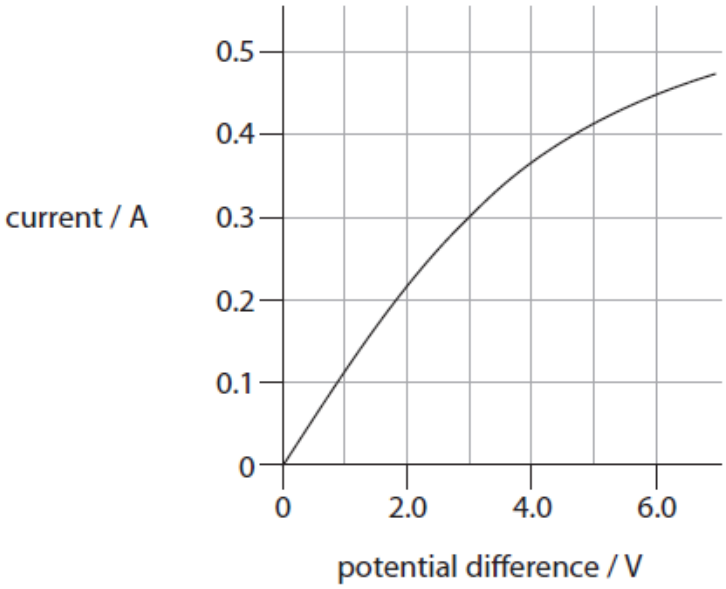
(b) The normal operating potential difference (voltage) and current of the filament lamp is 6 V, 0.4 A.

Calculate the energy supplied to the lamp under these conditions in 20 s.

(2)

energy = ... J

(c) The graph shows how current varies with potential difference (voltage) for another filament lamp.



Calculate the resistance of the lamp when the current in the lamp is 0.3 A.

resistance = potential difference ÷ current ($R = V / I$)

(3)

resistance = ... Ω

(Total for Question = 8 marks)