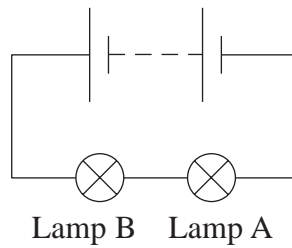


1 (a) Two lamps A and B are connected in series with a battery.



Lamp B glows more brightly than lamp A. Complete each of the sentences by choosing one of the phrases in the box.

(3)

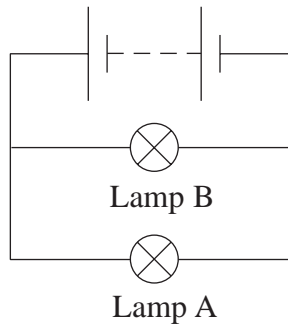
equal to	greater than	less than
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The current in lamp A is the current in lamp B.

The p.d. across lamp A is the p.d. across lamp B.

The resistance of lamp A is the resistance of lamp B.

(b) The same bulbs are now connected in parallel with the battery.



State which bulb will be brighter and explain your answer.

(3)

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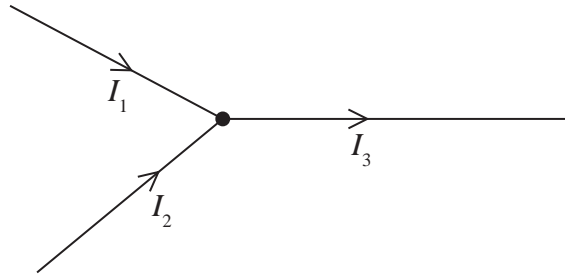
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2 The diagram shows the current in part of an electrical circuit.



State the relationship between I_1 , I_2 and I_3 and explain it in terms of charge.

(3)

(Total for Question = 3 marks)

3 Explain why an ammeter

- must be placed in series to measure current through a component
- must have a very low resistance.

(3)

(Total for Question = 3 marks)

4 A rechargeable AA cell is labelled 2.0 Ah (ampere hours), 1.2 V.

(a) Show that Ah is a unit of charge.

(2)

(b) When charging the cell, the current is 0.19 A and the potential difference is 1.5 V for 10 hours.

Calculate the electrical energy supplied while the cell is being charged.

(2)

Electrical energy supplied =

(c) The maximum charge that can be delivered from a fully charged cell is 7200 C.

Calculate the maximum energy which could be transferred by the cell if the output potential difference remained constant at 1.2 V.

(2)

Maximum energy =

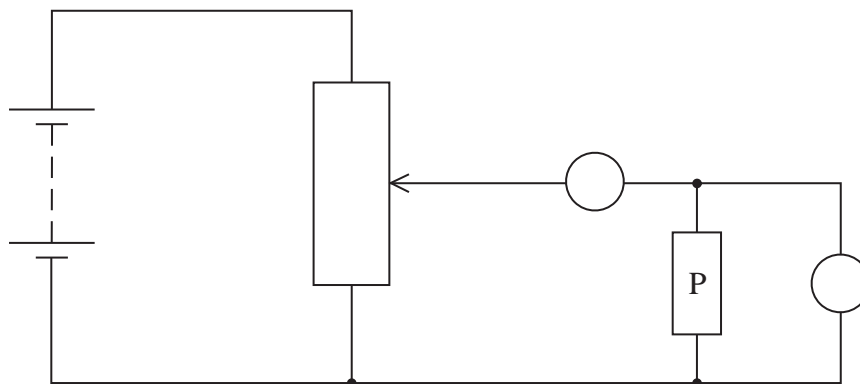
(d) Calculate the efficiency of the charging process.

(2)

Efficiency =

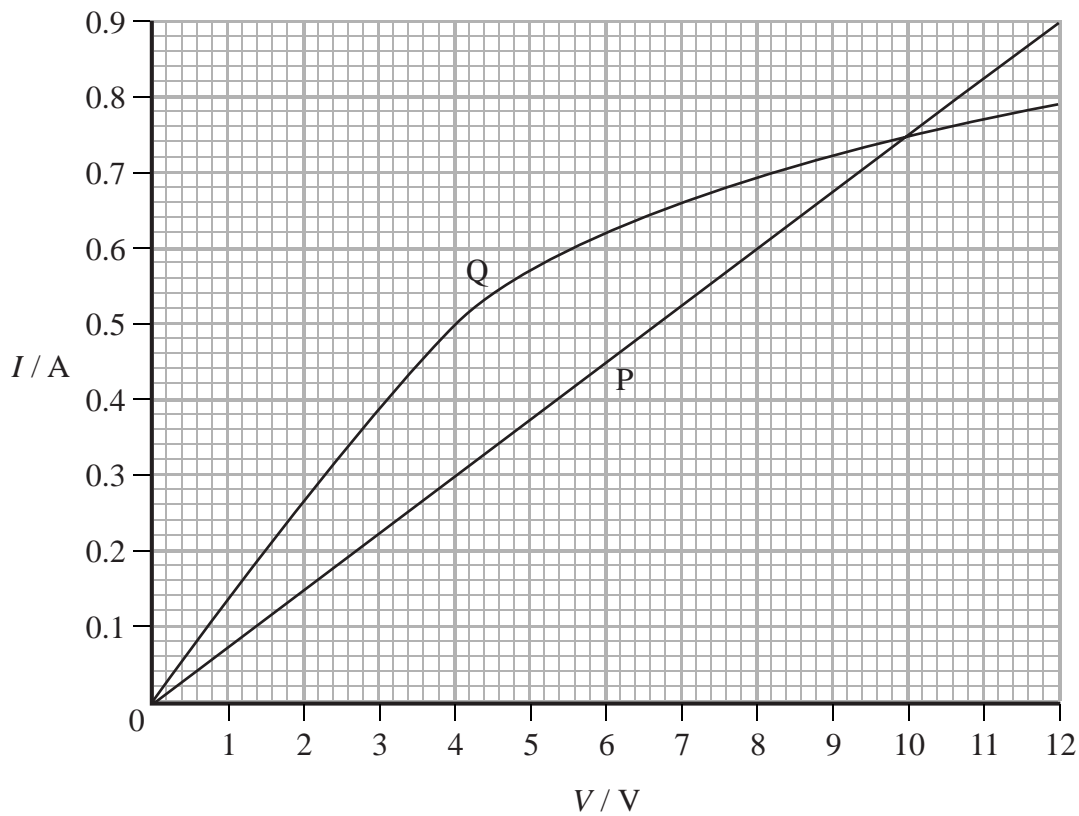
(Total for Question = 8 marks)

- 5 (a) The diagram shows the circuit used to investigate how the current varies with potential difference for an electrical component P. The circuit contains an ammeter and a voltmeter.



- (i) On the diagram, label the ammeter A and the voltmeter V. (1)
- (ii) The position of the contact of the potential divider is moved so that the reading on the voltmeter becomes zero. Label this position Z. (1)

(b) The graph shows how the current I varies with potential difference V for two electrical components P and Q.



(i) State the value of the current for which the resistance of P is the same as the resistance of Q and determine this value of resistance.

(3)

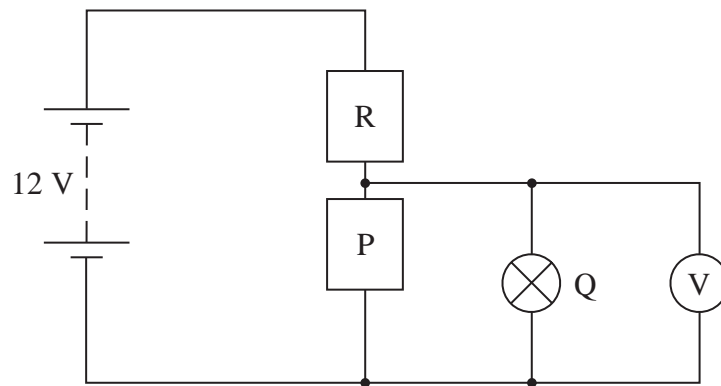
Current =

Resistance =

*(ii) Component Q is a filament lamp. Explain the shape of its graph.

(3)

- (c) A potential divider consisting of component P and a resistor R is connected to a 12 V supply. The lamp Q and a voltmeter are connected to the circuit as shown.



The supply has a negligible internal resistance. The reading on the voltmeter is 4.0 V.

- (i) Use the graph in part (b) to determine the current in the resistor R.

(2)

Current =

- (ii) Calculate the resistance of the resistor R.

(2)

Resistance =

(iii) The lamp Q is removed.

Explain, without further calculation, how the voltmeter reading would change.

(3)

(Total for Question = 15 marks)

- 6 (a) A student uses a computer for an average of 5 hours every day. The battery supplies a current of 3.5 A to the computer.

Calculate how many electrons flow through the computer's battery in 5 hours.

(4)

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Number of electrons

- (b) The computer's screen emits visible light photons with an average frequency of 5.5×10^{14} Hz. The power of the light emitted is 10 W.

Calculate the number of photons emitted per second from the computer screen.

(3)

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Number of photons

(Total for Question 7 marks)