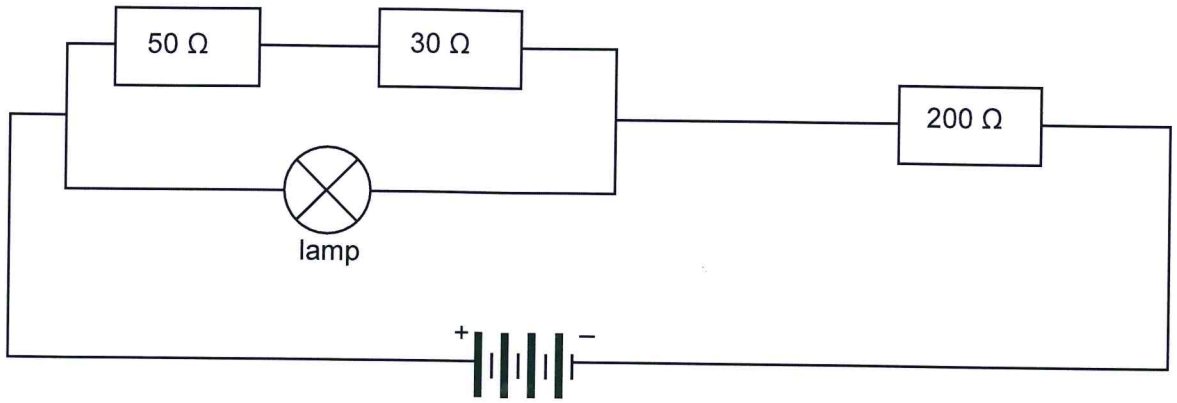
Chapter 5·2 & 5·3 Exam Q Year 11

Question 1

(5 marks)

To the circuit diagram below, add:

- an ammeter to measure the current through the 50 Ω resistor, indicating which connection is positive and which is negative
- a voltmeter to measure the potential difference across the 200 Ω resistor, indicating which connection is positive and which is negative
- a switch to allow the lamp to be turned on and off without switching the rest of the circuit on or off.



Question 2

(4 marks)

On a stormy night, lightning struck the ground. It took 0.200 s for 1.50×10^{20} electrons to travel from the cloud to the ground.

(a) Calculate the current, in amperes, between the cloud and the ground. (2 marks)

(b) If the potential difference between the storm cloud and the Earth was 7.00×10^{8} V, calculate the energy, in joules, that was released by the lightning during the strike. (2 marks)

Question 3

(5 marks)

A beam of electrons in the electron gun of a cathode ray tube is accelerated from rest through a potential difference of 80 kV.

(a) How much energy in joules does each of these electrons gain in being accelerated in this field? (2 marks)

(b) If the energy gained by each electron is all kinetic, what velocity will an electron have after undergoing this acceleration? (3 marks)

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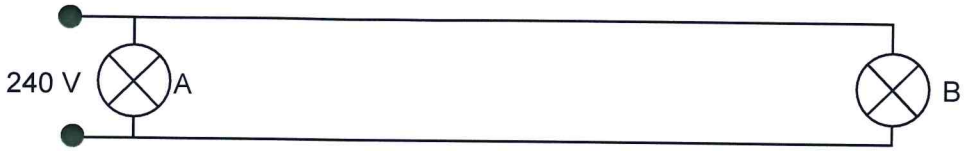
Question 4

(4 marks)

An outdoor lighting system uses two identical lamps plugged into the same double power outlet. One lamp is on the end of a 20 m extension cord and the other is plugged directly into the power outlet, as shown below. Assume that the lamps are ohmic and that the wire has a resistance.



(a) Circle the correct response. (1 mark)

When the lamps are turned on,

lamp A is brighter than lamp B.	the lamps are the same brightness.	lamp B is brighter than lamp A.

(b) Explain your answer to Part (a) with reference to Ohm's law. (3 marks)

Question 5

(6 marks)

A power pack for a laptop computer delivers 19.5 V with a current of 2.05 A. It is connected to the computer to recharge the battery for 2.50 hours.

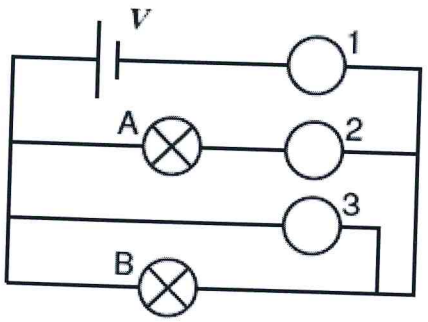
(a) How much charge flows from the power pack to the battery in that time? (3 marks)

(b) How much work is done in moving this charge? (3 marks)

Question 6

(3 marks)

A lighting circuit diagram includes a cell and two globes A and B as shown below.



(a) Indicate in circle 1 the direction of the conventional current through this point. (1 mark)

(b) In circles 2 and 3, place a V or A to indicate if a voltmeter or ammeter would be most appropriate to complete the circuit diagram. (2 marks)

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Question 7

(5 marks)

The average power supplied by an adult's heart for circulating blood is about 1.5 watts.

(a) How much work does an adult human heart do in one hour? (2 marks)

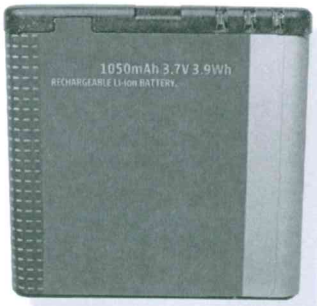
(b) If this amount of work is used to lift a 50.0 kg object with a constant velocity, what is the theoretical maximum height to which the object can be raised? Use an energy value of 5000 J if you were unable to determine an answer for (a). (3 marks)

Question 8

(16 marks)

Photographs of three rechargeable batteries/cells are shown below. For each of the following questions, assume they are fully charged.

Photograph A: AA Rechargeable cell



Photograph B: Rechargeable mobile phone battery

Photograph C: Rechargeable camera battery

(a) The unit mAh is a common unit referring to the amount of stored charge that is available, where 1mAh (one milliamp hour) is equal to 3.6 coulombs. Show by appropriate calculation(s), that 1mAh = 3.6 C. (3 marks)

(b) Fill in the first two columns of the table for the three power sources using information from the photographs. Then calculate the stored charge and enter the value in the third column. The first row has been completed for you. (4 marks)

Photograph	Potential difference (V)	mAh	Stored charge (C)
A	1.2	2450	8820
B			
C			

(c) Calculate the work that can be done by the AA rechargeable cell in Photograph A, assuming all of the charge could be released at the given potential difference of 1.2 V. (2 marks)

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Question 8 continued

(d) Determine whether the following statements are true or false. (3 marks)

	Statement	True or False
(i)	The battery in Photograph C, at 3.7 V has more stored charge than the one at 1.2 V in Photograph A.	
(ii)	The batteries in Photographs B and C at 3.7 V will both light the same type of globe for the same length of time.	
(iii)	A globe will be brighter when connected to the cell in Photograph A than when connected to the battery in Photograph B.	

(e) The cell in Photograph A completely discharges in one hour (3600 s) when connected to a circuit. Calculate the resistance of the circuit. Assume the potential difference of the cell remains constant during this time. (4 marks)