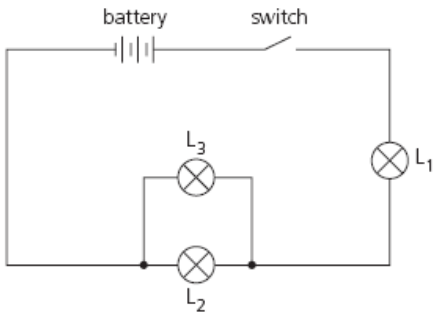
Problems 1 and 2 will be presented/performed on the laboratory lessons…… .

3



The circuit shows a battery connected to a switch and three identical lamps, L_1, L_2 and L_3.

a Copy the diagram and add:

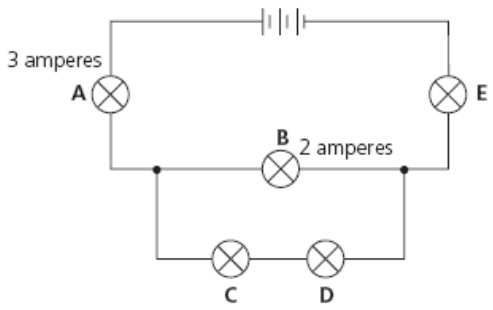
i an arrow to show the conventional current direction in the circuit when the switch is closed [1]

ii a voltmeter V, to measure the voltage across L_1 [1]

iii a switch, labelled S, that controls L_3 only. [1]

b State and explain what effect adding another cell to the battery would have on the lamps in the circuit. [2]

4 The circuit diagram shows a battery connected to five lamps. The currents in lamps **A** and **B** are shown.

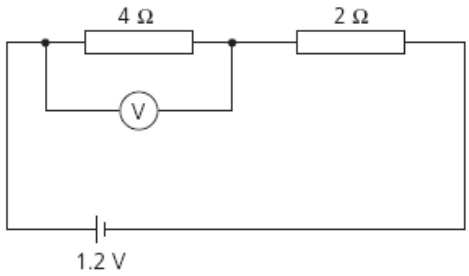


Write down the current flowing in

a lamp **C**, [1]

b lamp **E**. [1]

6 The diagram shows a circuit which contains two resistors.



Calculate

a the total resistance of the two resistors in series, (Ω) [1]

b the current flowing in the cell, (A) [1]

c the current flowing in the 4 Ω resistor, (A) [1]

d the reading of the voltmeter, (V) [1]

e the power produced in the 4 Ω resistor. (W) [1]

7 A small electric hairdryer has an outer case made of plastic. The following information is printed on the case:

500 W	230 V
a.c. only	50 Hz

a Explain the meaning of these terms:
i a.c. only [1]
ii 50 Hz [1]

b* The hairdryer does not have an earth wire. Instead, it is **double insulated**. Explain what this means. [2]

c What current does the hairdryer take? [2]

d The hairdryer is protected by its own fuse.
i What is the purpose of the fuse? [1]
ii Given a choice of a 3 A or a 13 A fuse for the hairdryer, which would you select, and why? [2]

e* If the hairdryer were used in a country where the mains voltage was only 110 V, what difference would this make, and why? [3]

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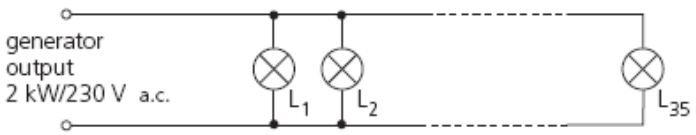
8 A small generator is labelled as having an output of 2 kW, 230 V a.c. (at constant frequency). It is used to provide emergency lighting for a large building in the event of a breakdown of the mains supply. The circuit is shown below.



There are 30 light fittings on the circuit, each with a 230 V, 28 W halogen lamp.

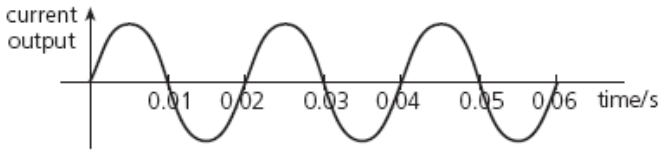
a Calculate the maximum current which the generator is designed to supply. [2]

b *i* Calculate the power needed when all the lamps are turned on at the same time.
ii Explain why this generator is suitable for supplying the power required but would not be suitable if all the lamps were exchanged for 100 W lamps. [4]

c Write down two reasons why all the lamps are connected in parallel rather than in series. In each answer, you should refer to both types of circuit. [4]

d Calculate the resistance of the filament of each 28 W lamp. [4]

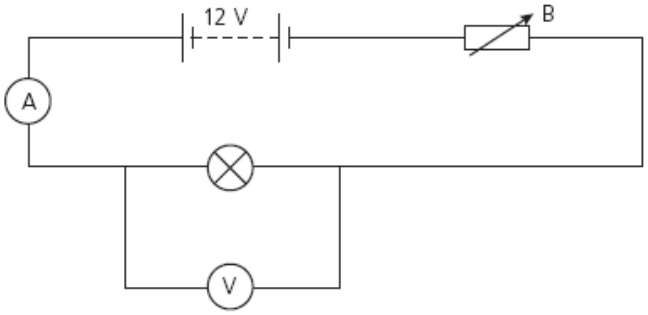
e The figure below shows the current output of the generator when it is supplying all 30 of the 28 W lamps.



*i** Calculate the frequency of the supply from the generator.

ii Copy the diagram and sketch another graph to show the approximate current output of the generator when 15 lamps are removed from their fittings. [4]

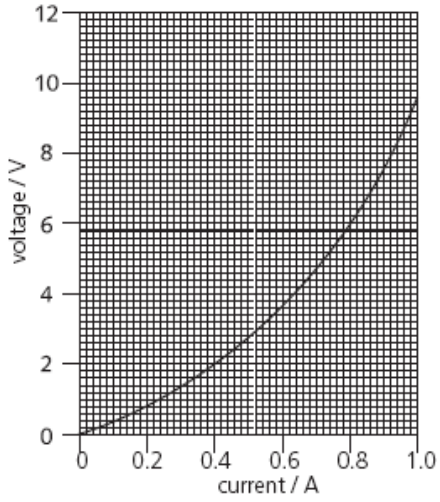
9 A student investigates how the current in a lamp varies with the voltage (p.d) across it. She uses the circuit shown below.



a Three of the components are labelled, A, V, and B. Write down what each one is. [3]

b Describe how the student should carry out the experiment. [3]

From her results, the student plots this graph:



c What is the current when the voltage across the lamp is 2.0 V? [1]

d What is the resistance of the lamp when the voltage across it is 2.0 V? [2]

e What is the resistance of the lamp when the voltage across it is 6.0 V? [2]

f What happens to the resistance of the lamp as the voltage across it is increased? [1]

10 A small electric heater takes a power of 60 W from a 12 V supply.

a What is the current in the heater? [2]

b What is the resistance of the heater? [2]

c How much charge (in C) passes through the heater in 20 seconds? [2]

d How much energy (in J) is transformed by the heater in 20 seconds? [2]