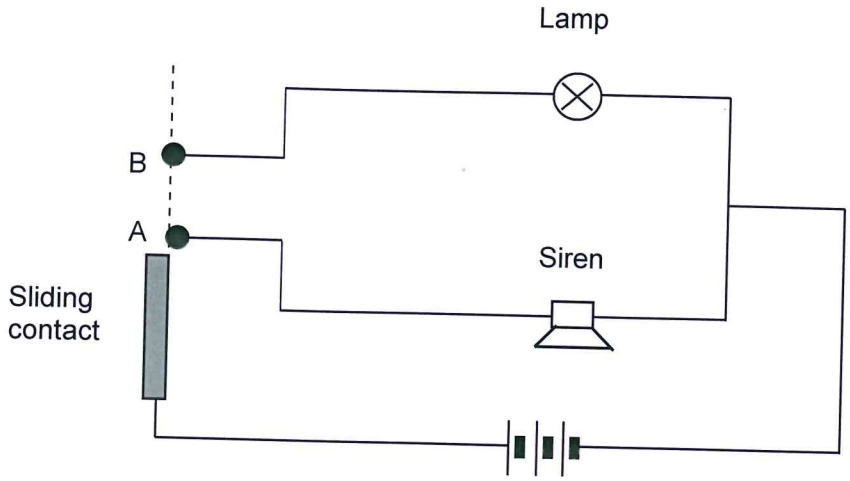
# Chapter 6·1 & 6·2 Exam Q Year 11
# Question 1

**(16 marks)**

A toy police car can have a light on, a siren, on or both light and siren on at the same time. A simplified circuit, showing how a sliding switch achieves these three options, is shown below.




Points 'A' and 'B' are both contact points. The sliding contact may be moved so that

- only Point A is in contact
- Points A and B are both in contact
- only Point B is in contact.

(a) When the sliding contact is in contact with Point A only, is the circuit a series or parallel circuit? Circle the correct response. (1 mark)

(b) When the sliding contact is in contact with both Points A and B, is the circuit a series or parallel circuit? Circle the correct response. (1 mark)

(c) The siren has a resistance of 3.00 Ω. If the circuit is powered by a 9.00 V battery, calculate the current in amperes, when only the siren is operating. (2 marks)

(d) When both the lamp and the siren are on, the current supplied by the battery is 1.5 times higher than when the siren is on by itself.

(i) Determine the current, in amperes, in the operating lamp. (3 marks)

(ii) Calculate the resistance, in ohms, of the operating lamp. (2 marks)

(e) The contact is first placed so that only the lamp comes on. The contact is then moved so that only the siren comes on. Which of these two components has the greater power consumption? Explain. (4 marks)

(f) Calculate the total power drawn from the battery when both components are switched on. Include the correct unit in your answer. (3 marks)

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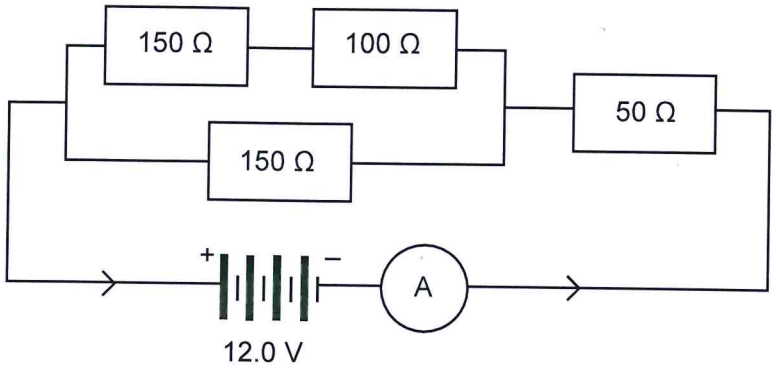
## Question 2

**(5 marks)**

The diagram below illustrates a simple circuit.




(a) Do the arrows on the diagram indicate conventional current or electron current? Circle the correct response. (1 mark)

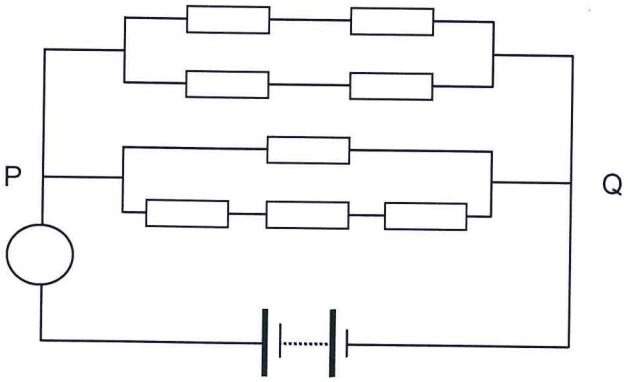
Conventional current  Electron current

(b) Calculate the current, in amperes, through the ammeter shown in the circuit diagram above. Show **all** workings. (4 marks)

## Question 3

**(7 marks)**

Eight equal value resistances are connected between P and Q. The resistance of each of these resistors is 10.0 Ω.




(a) Calculate the total resistance of the circuit, excluding the meter and the power source. (5 marks)

(b) The circle represents a meter. What is the reading on this meter (include the unit)? (2 marks)

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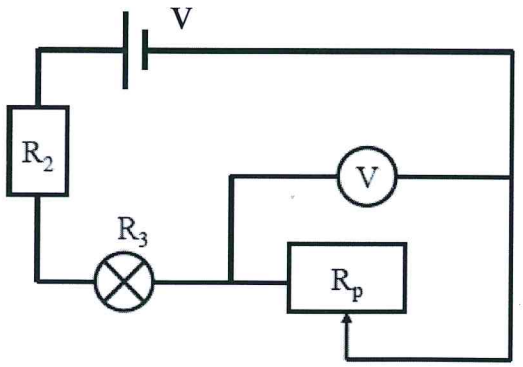
## Question 4

**(3 marks)**

A circuit diagram is shown below. The voltage V of the power supply is constant. $R_p$ is a potentiometer (variable resistor). $R_2$ has a constant value.




When the resistance of the potentiometer ($R_p$) increases (the resistance of $R_2$ and globe $R_3$ remaining the same), which of the following happens (ignore the resistance of the globe)?

(i) The reading of the voltmeter increases and the globe is brighter.
(ii) The reading of the voltmeter decreases and the globe is darker.
(iii) The reading of the voltmeter increases and the globe is darker.
(iv) The reading of the voltmeter decreases and the globe is brighter.

**Answer:** _____

Give reasons for your choice by completing the statements below.

The voltmeter reading _____

The globe is _____

## Question 5

**(4 marks)**

(a) Sketch a diagram of a circuit that has a total resistance of 15.0 Ω, consisting of only 10.0 Ω resistors. Include a power supply and a switch in your circuit. (2 marks)

(b) Calculate the potential difference required to provide a total current of 1.50 A through the circuit. (2 marks)

## Question 6

**(15 marks)**

A set of 16 party lights is purchased to decorate the back patio of a house for a birthday party. When all lights are functional they draw a current of 3.20 A from the 24.0 V transformer supplied. When one globe is removed, half of the globes go out, leaving the other half working. When one of these working globes is removed, the remaining seven working globes go out.

(a) Explain why the other seven globes went out when the second globe was removed, but not when the first globe was removed. (2 marks)

(b) Draw a simple circuit diagram to show how to wire all 16 globes to the 24 V power supply. (2 marks)

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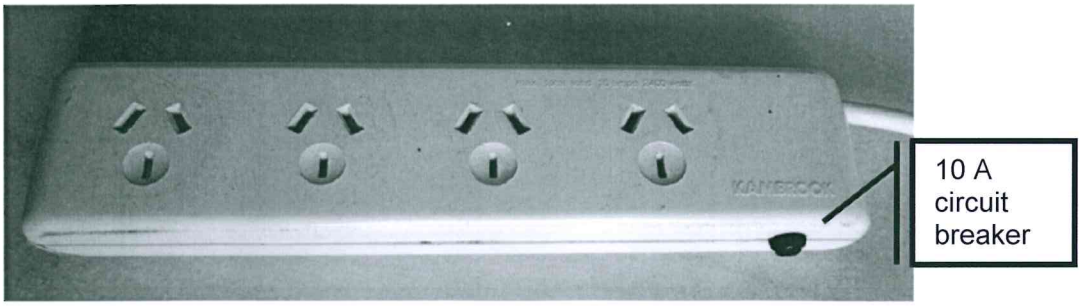
# Question 6 continued

(c) Determine the voltage across each globe. (2 marks)

(d) Determine the current through each globe. (2 marks)

(e) Calculate the power consumed by each globe. (2 marks)

(f) If you wanted to have more than one set of lights, you might use a power board similar to the one below. This power board has a 10.0 A circuit breaker built into it, as shown in the picture.




(i) How many sets of these party lights can operate from the power board before the circuit breaker is overloaded? (2 marks)

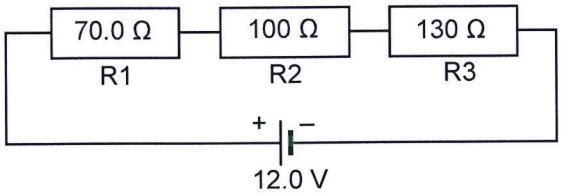
(ii) Explain the purpose of the circuit breaker. (2 marks)

(iii) Is the circuit breaker connected to the power circuit in series or in parallel? (1 mark)

# Question 7

**(4 marks)**

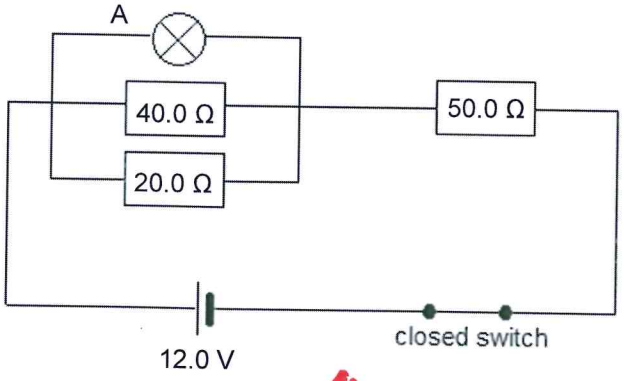
Three resistors R1, R2 and R3 are connected in series as shown below. Calculate the current in amperes through R3.




# Question 8

**(16 marks)**

During a practical lesson a group of students constructed a circuit that contained a 40.0 Ω resistor, a 20.0 Ω resistor and a lamp ('A'), in parallel with each other. This combination was then placed in series with a 50.0 Ω resistor, as shown below. The lamp had a resistance of 40.0 Ω and the circuit was connected to a power pack set on 12.0 V. For this question, assume that Lamp A was an ohmic resistor.



## Question 8 continued

(a) On the diagram above, use an arrow to indicate the direction of electron current in this circuit. (1 mark)

(b) Calculate the total resistance of the circuit. (4 marks)

(c) Calculate the total current in the circuit. (2 marks)

(d) The students then used a voltmeter to measure the potential difference across the 50.0 Ω resistor.

(i) On the diagram on page 20, draw how they connected the voltmeter to the circuit. (1 mark)

(ii) Calculate the potential difference across the 50.0 Ω resistor. (2 marks)

(e) Determine the power dispersed in the 50.0 Ω resistor. (2 marks)

(f) The 20.0 Ω resistor was then removed from the circuit and replaced with another ohmic lamp, 'B', with a resistance of 20.0 Ω.

(i) Circle the correct response. Compared with Lamp B, Lamp A is now

brighter the same brightness dimmer (1 mark)

(ii) Explain your answer. (3 marks)

## Question 9

**(6 marks)**

Complete **two (2)** circuit diagrams, which consist of one 1.5 V cell lighting two light globes.

(a) Draw one circuit with the light globes in parallel and the other with the light globes in series. (3 marks)

| Parallel circuit | Series circuit |
|---|---|
| | |

(b) Assuming that all components are the same in each circuit, explain which circuit will have the brighter light globes. (3 marks)

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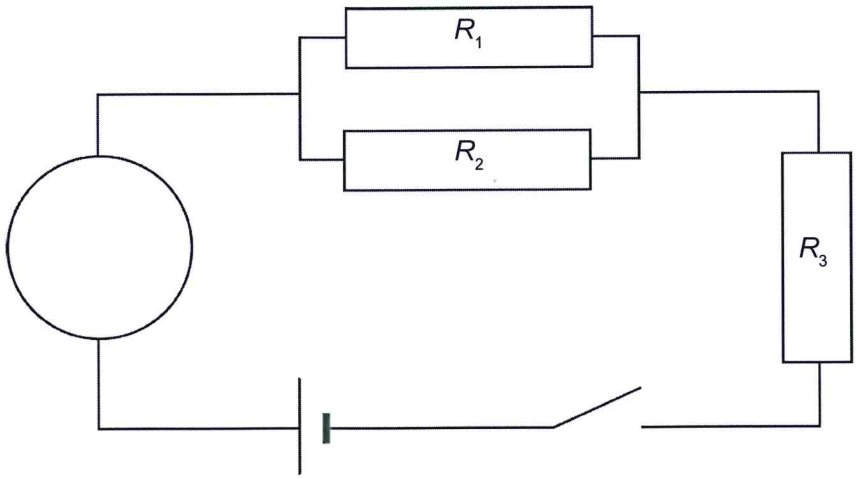
Question 10

**(14 marks)**

An electrical circuit was constructed as shown below. It has a meter, a 1.50 V cell and a switch. The total resistance $R_T$ of the circuit is 9.24 Ω.




(a) The circle in the circuit indicates where a voltmeter or an ammeter should be placed.

In the circle on the diagram above, clearly write the letter 'A' for ammeter or 'V' for voltmeter, indicating which meter should be correctly placed here. Explain why you have made this choice of meter. (3 marks)

(b) $R_2$ has a resistance of 12.0 Ω. Given the total resistance of resistors $R_1$ and $R_2$ is 3.00 Ω, calculate the resistance of $R_1$. (3 marks)

(c) The cell provides 1.50 V of potential difference to the circuit, which has a total resistance, $R_T$ of 9.24 Ω.

(i) On the diagram on page 22, use an arrow to indicate the direction of conventional current in this circuit.
Show through calculation that the current flowing through $R_3$ is 0.162 A. (3 marks)

(ii) Calculate the current flowing through $R_2$. (5 marks)