

Combined Science - Physics - Key Stage 4 - Electricity

# **Series and Parallel Circuits Worksheet**

Miss Walrond



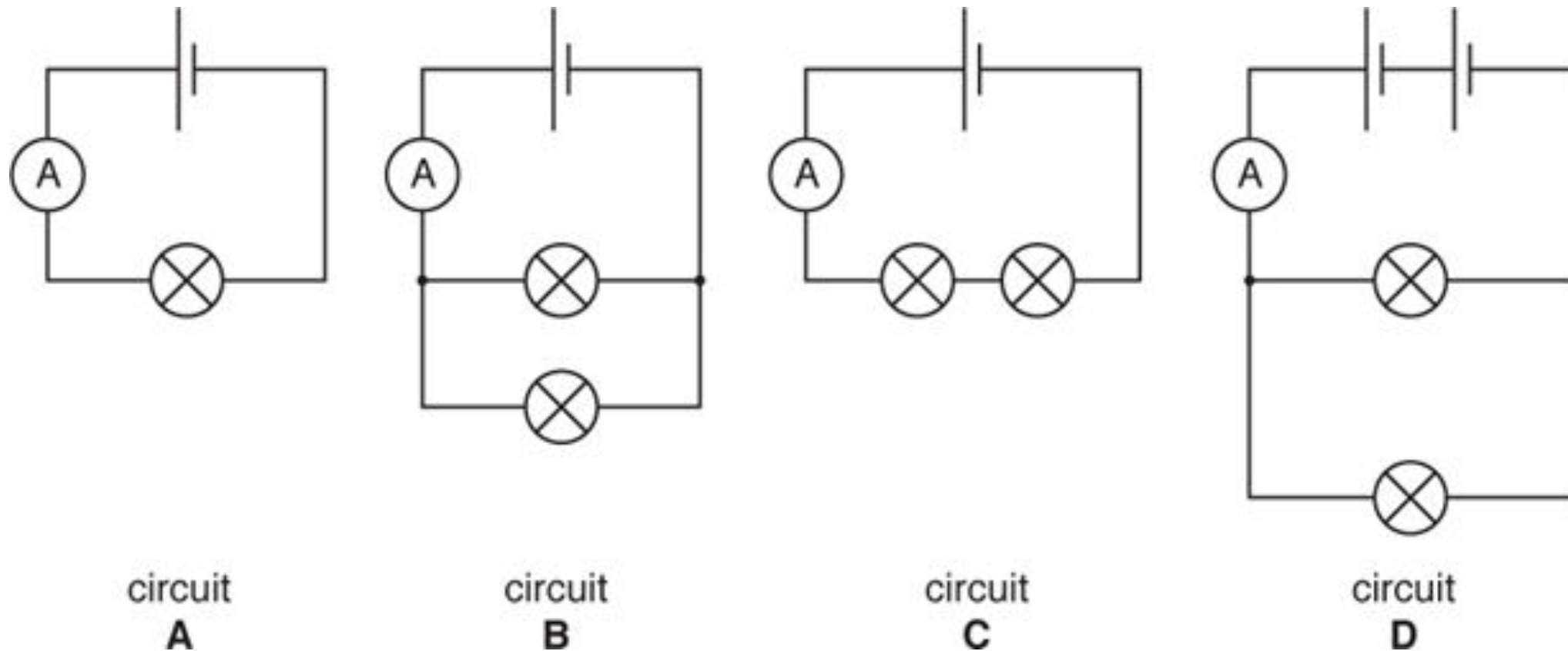
**Q1.**

Alyssia is doing electricity experiments.

Alyssia investigates the current in circuits made from cells and lamps.

All the cells are alike and all the lamps are alike.

Here are four circuits she connects up. Each circuit contains an ammeter.



For each statement choose the correct circuit.

Put a letter **A, B, C** or **D** in each box to show your choice.

You can use each letter once, twice or not at all.

- (i) The ammeter in this circuit has the **smallest** reading.
- (ii) The ammeter in this circuit has the **greatest** reading.
- (iii) In these **TWO** circuits the lamps are connected in **parallel**.

and

[1]

[1]

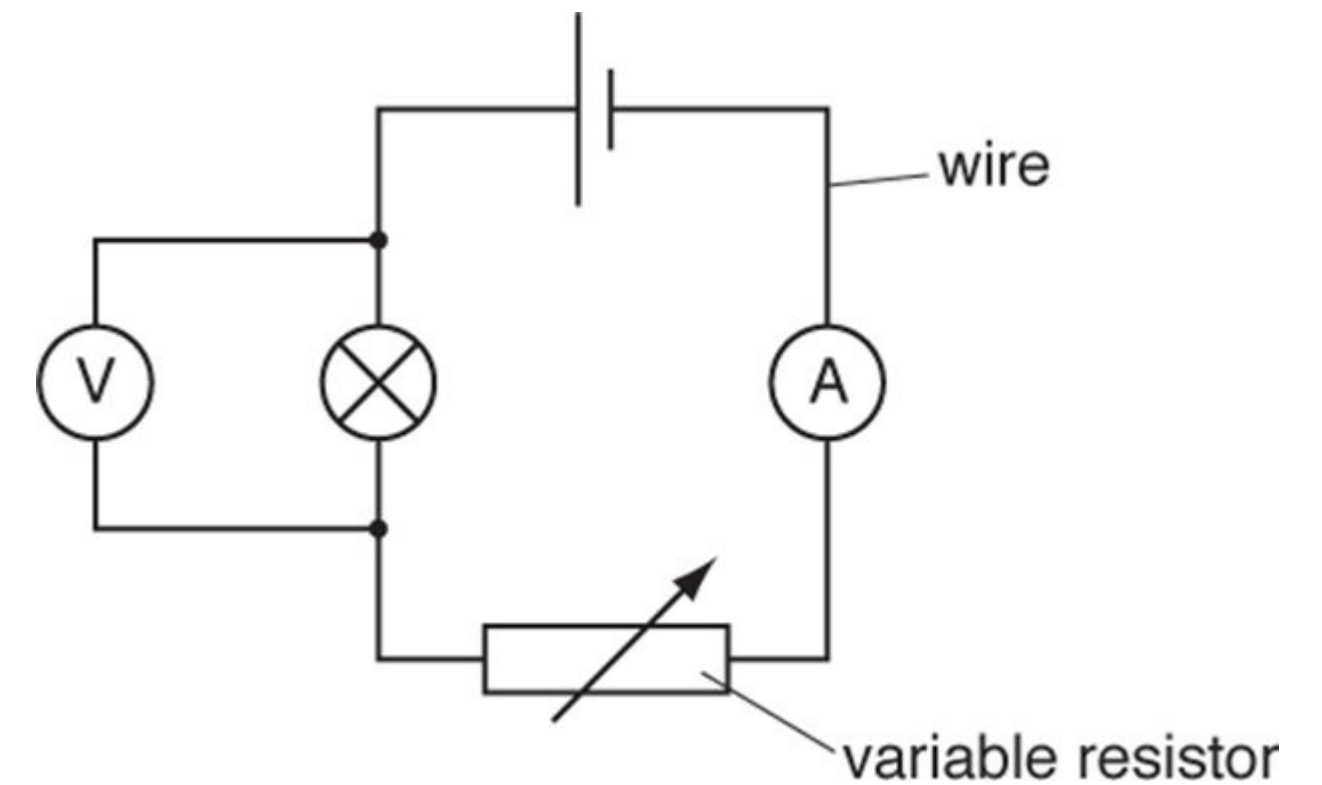
[1]



## Q2.

Riya connects an electrical circuit.  
The voltmeter reading is 3.0 V.

The ammeter reading is 1.5A.



- i. Calculate the resistance of the lamp.

answer ..... ohms **[2]**

- ii.. Riya wants to decrease the total resistance of the circuit.

She **cannot** change the voltage.

Describe **two** changes she could make to this electrical circuit to decrease the total resistance.

**[2]**



# Answers



# Q1

- |  |                         |
|--|-------------------------|
| 1. i. C  | <b>1</b>                |
| ii. D  | <b>1</b>                |
| iii. B <b>and</b> D                                | <b>1</b> (both needed). |
|  |                         |
| 2. i. 2  | <b>2</b>                |
| 3 / 1.5     (if answer is incorrect or incomplete) | <b>1</b>                |
|  |                         |
| ii. <b>Any two from:</b>                           |                         |
| Reduce the setting on the variable resistor        | <b>1</b>                |
| Remove the lamp or variable resistor               | <b>1</b>                |
| Make the wires shorter                             | <b>1</b>                |
| Use thicker wire                                   | <b>1</b>                |
| Place resistor and lamp in parallel                | <b>1</b>                |



# In lesson questions



# Independent Task - Series and Parallel

Copy and complete the table using the text below.  
(Hint: you will need to sort the statements)

	Series	Parallel
Current		
Potential difference		

The current is the same through each component.	The potential difference splits between components.
The potential difference across each branch is the same.	The current splits between branches.



# Independent Task 1 - application of series and parallel

**Copy and complete the sentences using the words below. You can use words, once, more than once or not at all.**

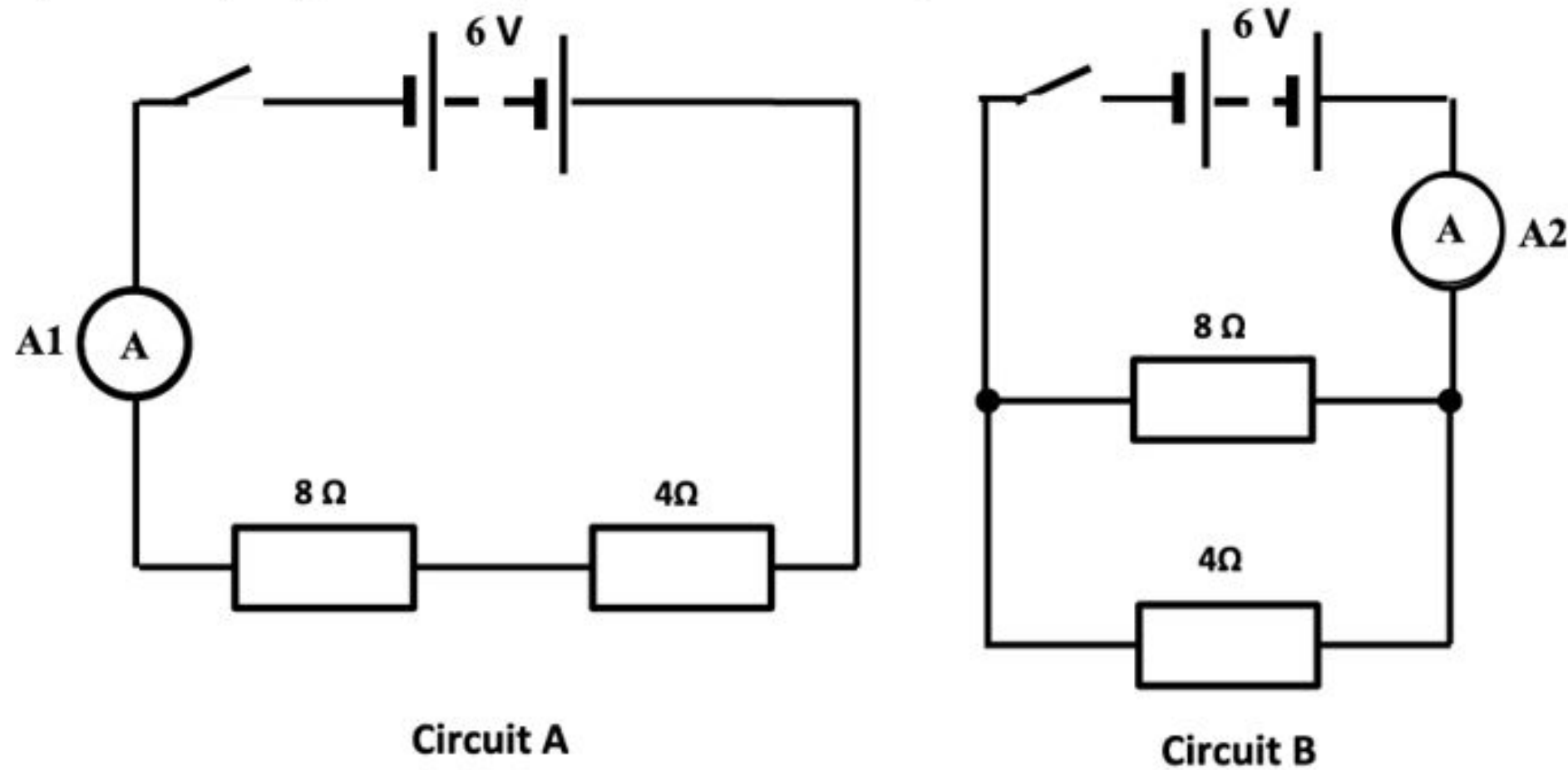
- 1) When we add another lamp into a series circuit, the total resistance \_\_\_\_\_, this means that the total current \_\_\_\_\_. Also, the potential difference across each of the lamps \_\_\_\_\_. This means that the lamps all become \_\_\_\_\_.
- 2) When we add another lamp into a parallel circuit in a new branch, the total resistance \_\_\_\_\_, the current through each lamp \_\_\_\_\_. Also, the potential difference across each of the lamps \_\_\_\_\_. This means that the lamps have the same brightness.

**increases   decreases   is the same   brighter   dimmer**





# Independent Task 2 - application of series and parallel



Answers as discussed in the next 3 slides have not been seen or verified by OCR.

OCR, Twenty First Century Physics, Paper j259, Specimen.

Lydia is comparing series and parallel circuits in a class practical.

Put a tick (✓) in the box next to the correct answer.

- ☐ The reading on **A<sub>1</sub>** is less than the reading on **A<sub>2</sub>**.
- ☐ The total resistance in circuit B is  $6\ \Omega$ .
- ☐ The p.d. across the  $8\ \Omega$  is the same in both circuits.
- ☐ The p.d. across **A2** is very large

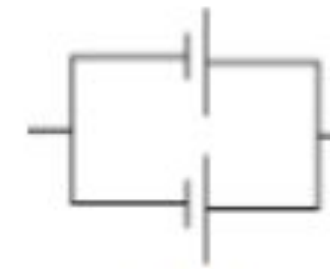
[1]



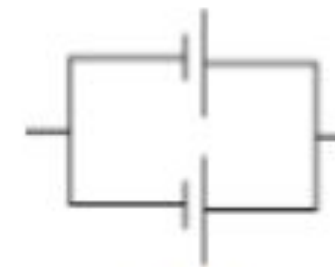
# Independent Task - Combining Cells

Answer the questions below.

- 1) Assume that the cells all have a voltage of 2 V. Write down the battery voltage.



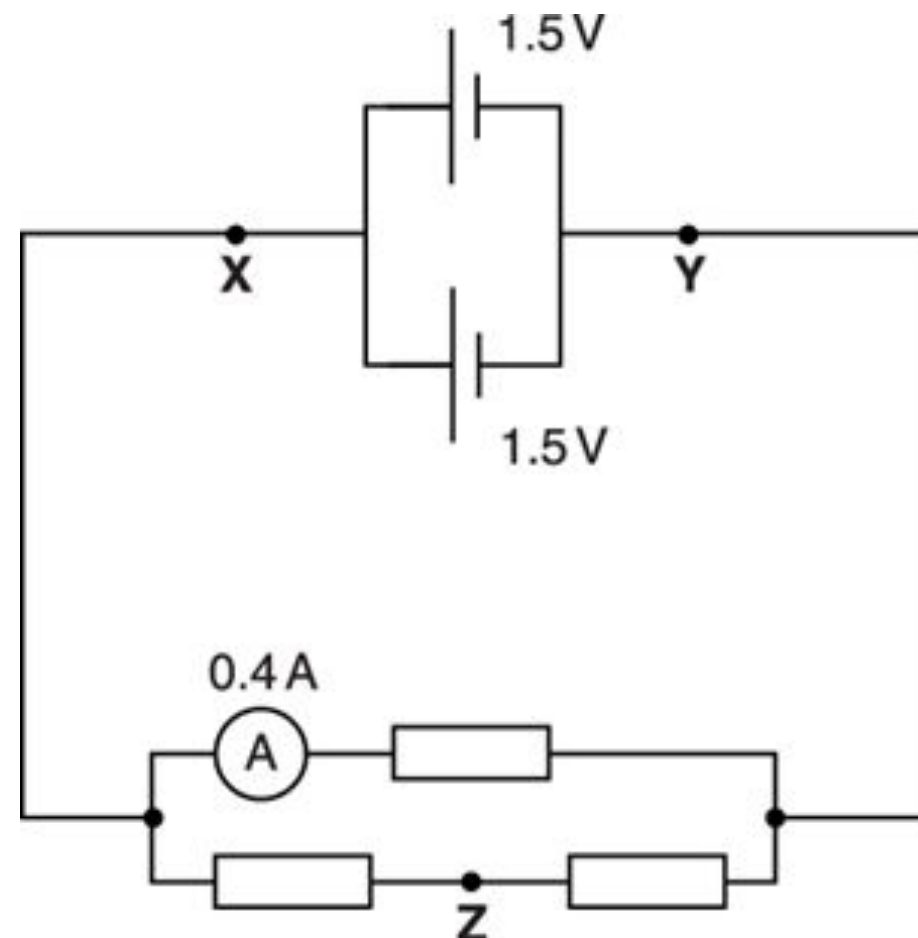
- 2) Assume that the cells have a voltage of 9 V. Write down the battery voltage.



- 3) Describe what happens to the current when two cells are combined  
a) in series.                      b) in parallel.



# Worked Example 3



Tim sets up this parallel circuit.

- i. What is the voltage between points **X** and **Y**?  
voltage = ..... V **[1]**
- ii. All the resistors have the same resistance.

What is the current through point **Z**?

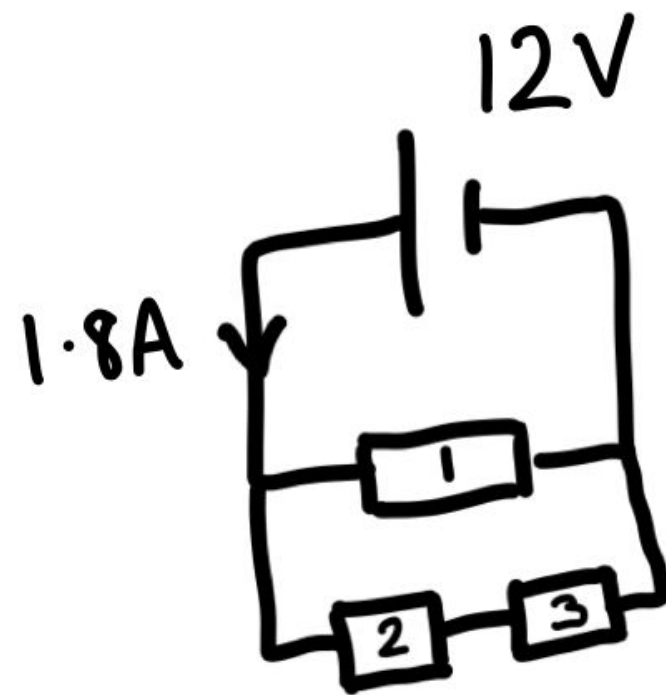
current = ..... A **[1]**

OCR, Twenty First Century Physics, Paper A182, June 2016.



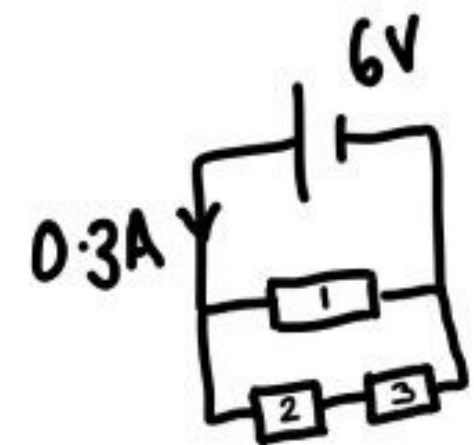
# Independent Task: Series and Parallel

Each resistor is identical and has a resistance of  $10\ \Omega$ . Calculate the current through each resistor, and the potential difference across each resistor.



The resistors in this circuit are identical and have a resistance of  $30\ \Omega$ .

- 1) Calculate the current through resistor 1.
- 2) Calculate the current through the second branch.
- 3) Explain your answer to question 2.
- 4) Calculate the potential difference across resistors 2 and 3



Images, Miss Walrond



# Answers



# Independent Task

	<b>Series</b>	<b>Parallel</b>
<b>Current</b>	The current is the same through each component.	The current splits between branches.
<b>Potential difference</b>	The potential difference splits between components.	The potential difference across each branch is the same.



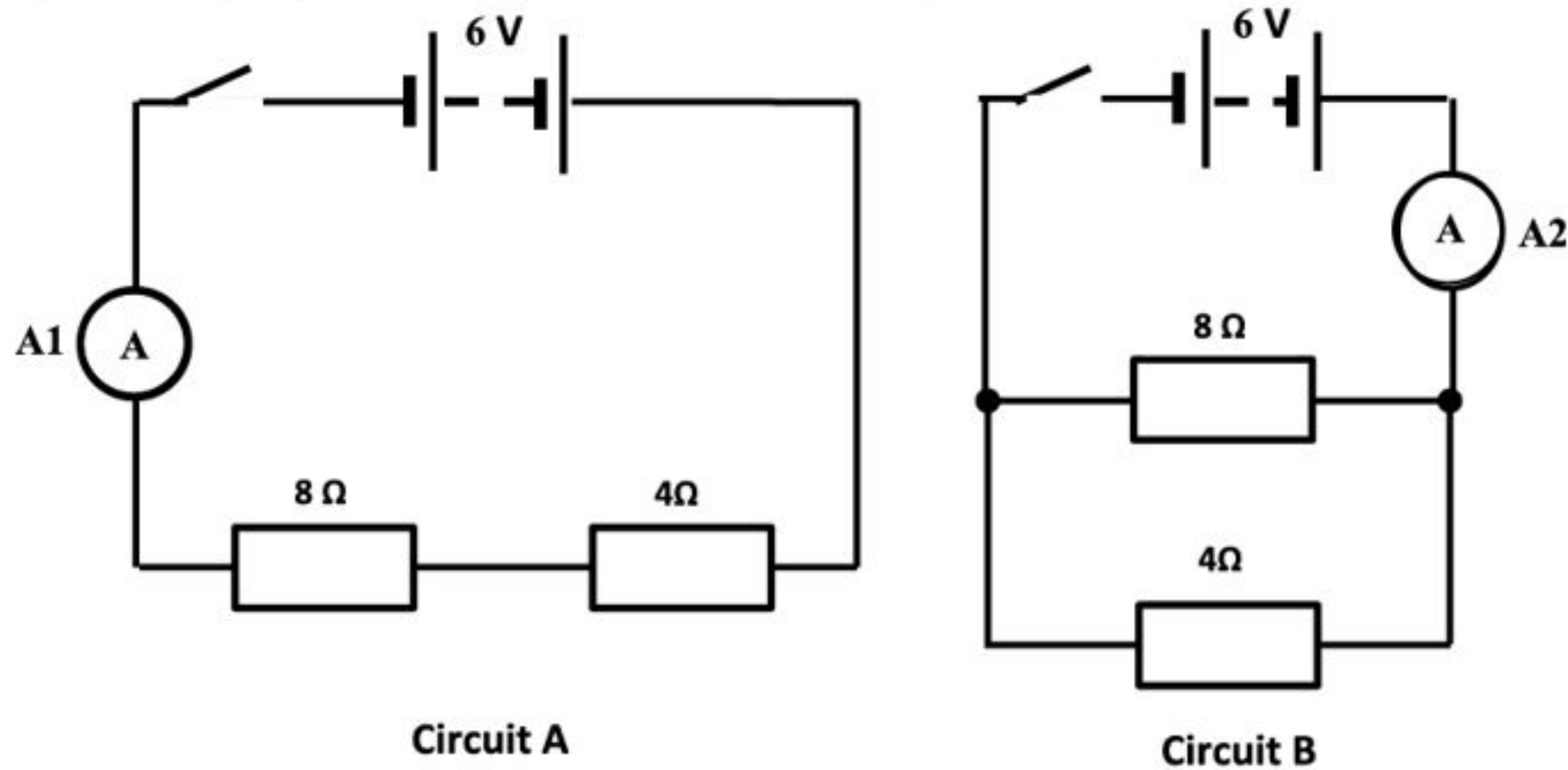
# Independent Task

Copy and complete the sentences using the words below. You can use words, once, more than once or not at all.

- 1) When we add another lamp into a series circuit, the total resistance increases, this means that the total current decreases. Also, the potential difference across each of the lamps decreases. This means that the lamps all become dimmer.
- 2) When we add another lamp into a parallel circuit in a new branch, the total resistance decreases, the current through each lamp is the same. Also, the potential difference across each of the lamps is the same. This means that the lamps have the same brightness.



# Independent Task 2 - application of series and parallel



Lydia is comparing series and parallel circuits in a class practical.

Put a tick (✓) in the box next to the correct answer.

- ☐ The reading on **A<sub>1</sub>** is less than the reading on **A<sub>2</sub>**.
- ☐ The total resistance in circuit B is  $6\Omega$ .
- ☐ The p.d. across the  $8\Omega$  is the same in both circuits.
- ☐ The p.d. across **A2** is very large

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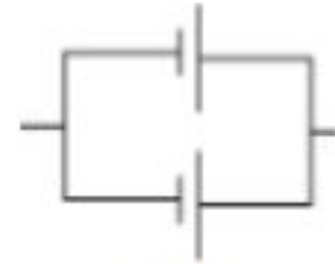


# Review: Independent Task - Combining Cells

- 1) Assume that the cells all have a voltage of 2 V. Write down the battery voltage.



**4 V**

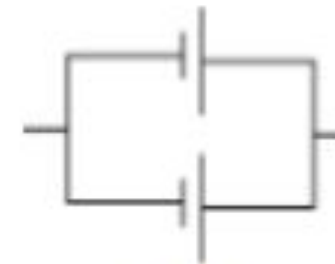


**2 V**

- 2) Assume that the cells have a voltage of 9 V. Write down the battery voltage.



**18 V**



**9 V**

- 3) Describe what happens to the current when two cells are combined
- a) in series. **The current will increase.**
  - b) in parallel. **The current will increase.**

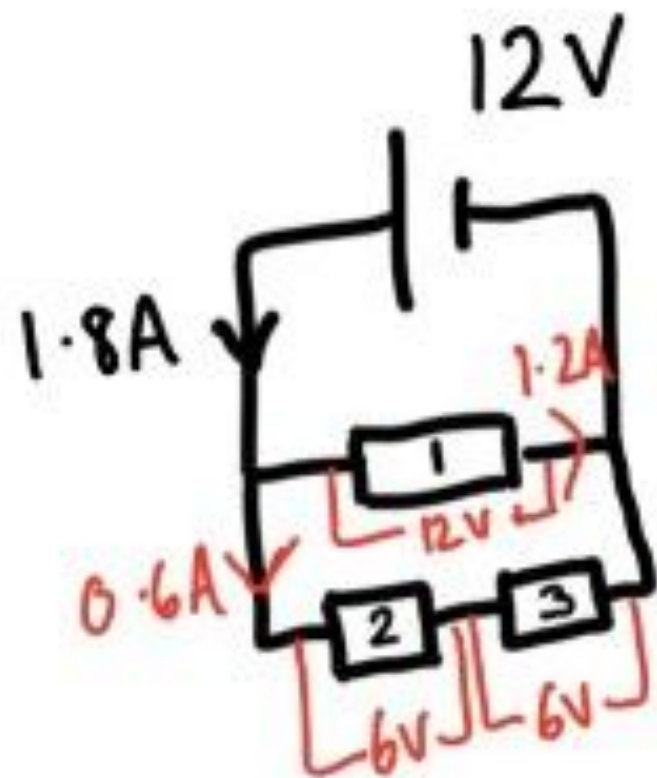


# Review: Independent

## Task: Series and Parallel

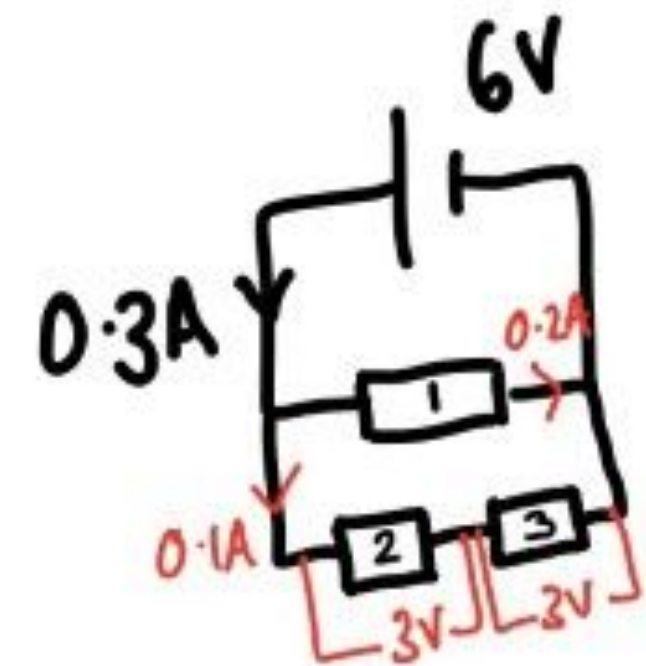
Each resistor is identical and has a resistance of  $10\ \Omega$ . Calculate

- the current through each resistor
- potential difference across each resistor.



The resistors in this circuit are identical and have a resistance of  $30\ \Omega$ .

- 1) Calculate the current through resistor 1.
- 2) Calculate the current through the second branch.
- 3) Calculate the potential difference across resistors 2 and 3



Images, Miss Walrond

