3055 BA SANGAM COLLEGE

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WORKSHEET 16

SCHOOL:BA SANGAM COLLEGE YEAR 12

SUBJECT: PHYSICS NAME OF STUDENT: _____

STRAND	*ELECTRICITY*
SUB-STRAND	*ELECTROSTATICS*
Content Learning Outcome	Explore electric forces by using Coulomb's law **and** effects on charged objects

SERIES AND PARALLEL CIRCUITS

Resistors in Series

When connected in series, the **total resistance, R_T,** is equal to

$$R_T = R_1 + R_2 + R_3 + ...$$

Current in series resistors: In series circuits, charge has only one path through which to flow. Therefore, the current passing through each resistor in series is the same.

$$I_{TOTAL} = I_1 + I_2 + I_3$$

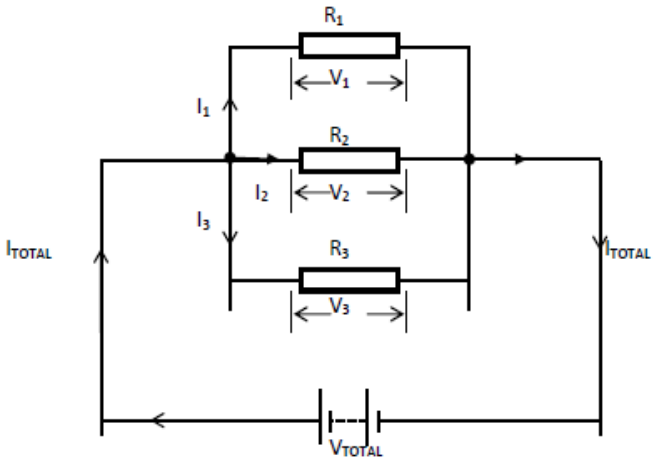
The **sum of all the Voltages** equals the Voltage across the battery, assuming negligible resistance in the connecting wires.

$$V_{TOTAL} = V_1 + V_2 + V_3$$

Resistors in Parallel

When connected in parallel, the total resistance, R_T, is equal to

$$\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + ...$$



Current in parallel resistors:

The sum of the currents in each parallel resistor equals the original current entering the branches.

$$I_{TOTAL} = I_1 + I_2 + I_3$$

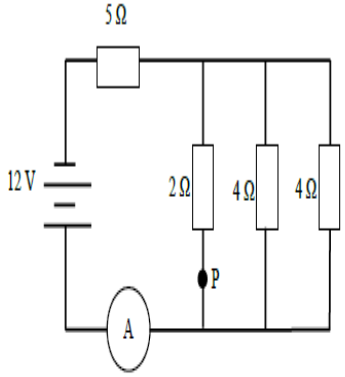
Voltage in parallel resistors:

The potential difference across each of the resistors in a parallel combination is the same

$$V_{TOTAL} = V_1 = V_2 = V_3$$

Example

Use the circuit below to answer the questions that follow.

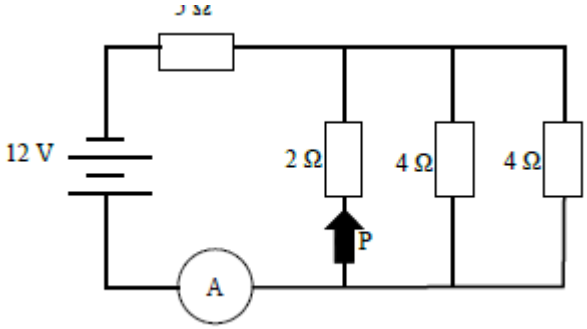


(i) On the diagram given in the **Answer Booklet**, draw an arrow to show the direction of the conventional current at point P. **(1 mark)**

(ii) Calculate the total resistance of the circuit. **(2 marks)**

(iii) Calculate the current flowing through the ammeter. **(1 mark)**

(iv) Calculate the voltage across 5 Ω resistor. **(1 mark)**



$$\frac{1}{R_p} = \frac{1}{2} + \left(\frac{1}{4} + \frac{1}{4}\right)$$

$$\frac{1}{R_p} = \frac{1}{1}$$

$$R_p = 1\ \Omega$$

Therefore $R_T = 1 + 5$

$= 6\ \Omega$

$$I = \frac{V}{R}$$

$$I = \frac{12}{6}$$

$$I = 2\ A$$

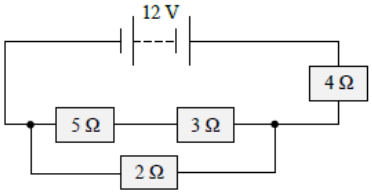
$V = IR$

$V = 2 \times 5$

$= 10\ V$

Activity

Four resistors are connected to a 12 V battery, as shown in the diagram below.



(i) Determine the total resistance of the circuit. **(2 marks)**

(ii) Calculate the total current through the battery. **(1 mark)**

(iii) Calculate the voltage across the 5 Ω resistor. **(2 marks)**