Sc!ence

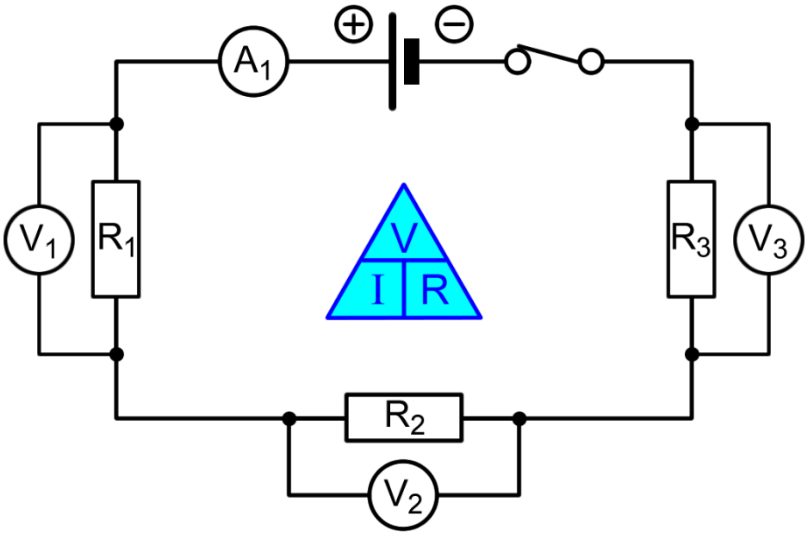
Name: …… **( )**

Class: ……

Date: …… **/** …… **/** ……

Resistors in Series and Parallel – Introduction

Question 1 – Resistors in Series:



• Battery = 12 V • R_1 = 20 Ω • R_2 = 50 Ω • R_3 = 80 Ω

Ohm's Law: $V = I \times R$

Effective resistance of circuit = sum of resistors in series: $R_e = R_1 + R_2 + R_3$

All resistors (components) in a series circuit have the same current (I) flowing through them

The potential difference (V) splits between the resistors (components) in a series circuit

So, for the above parallel circuit, e.m.f. of battery = $V_1 + V_2 + V_3$

(a) Calculate the effective resistance, R_e, of the circuit.

(b) Calculate the current flowing through the circuit, *i.e.* the reading on A_1.

(c) Calculate the potential difference across R_1, R_2 and R_3, *i.e.* the readings on V_1, V_2 and V_3.

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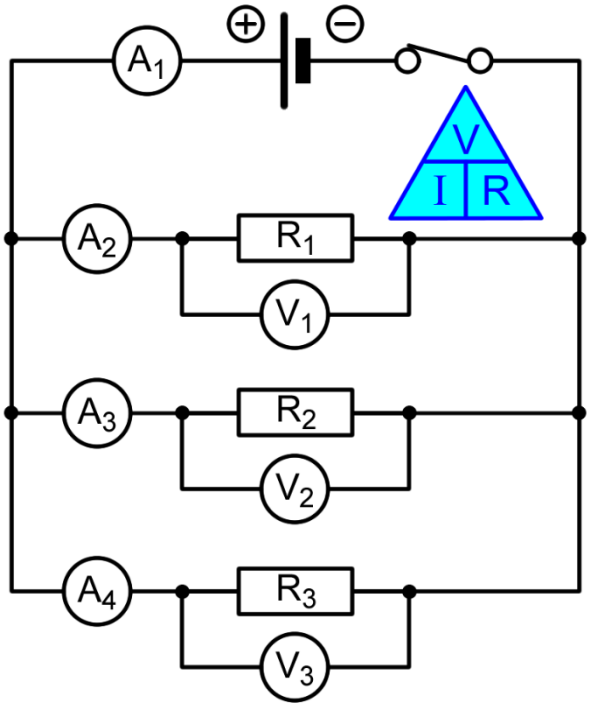
Question Two – Resistors in Parallel



• Battery = 12 V • R_1 = 20 Ω • R_2 = 50 Ω • R_3 = 80 Ω

Ohm's Law: $V = I \times R$

Effective resistance of a parallel circuit: $^1/_{Re} = {}^1/_{R1} + {}^1/_{R2} + {}^1/_{R3}$

The current (I) splits between the resistors (components) in a parallel circuit

So, for the above parallel circuit, reading on $A_1 = A_2 + A_3 + A_4$

All resistors (components) in a parallel circuit have the same potential difference (V) across them

(a) Calculate the effective resistance, R_e, of the circuit.

(b) Calculate the current flowing through the circuit, *i.e.* the reading on A_1.

(c) State the potential difference across R_1, R_2 and R_3, *i.e.* the readings on V_1, V_2 and V_3.

(d) Calculate the current across R_1, R_2 and R_3, *i.e.* the readings on A_1, A_2 and A_3.

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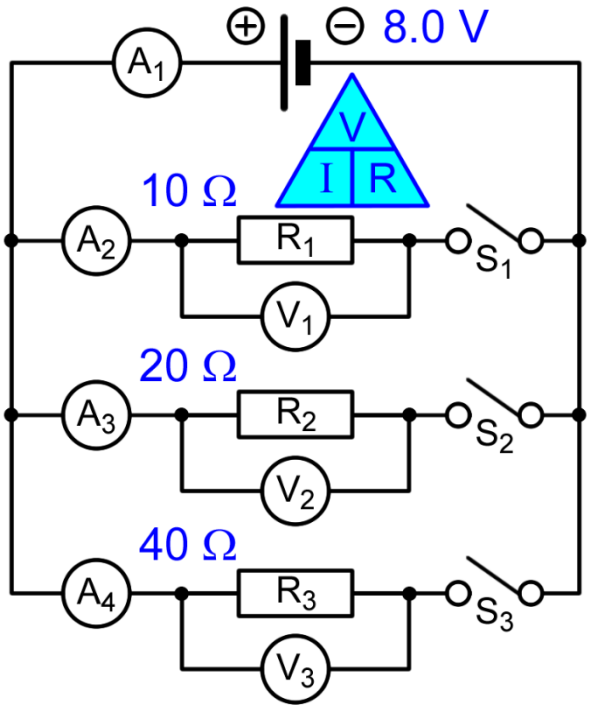
Question Three – Resistors in Parallel



• Battery = 8.0 V • R_1 = 10 Ω • R_2 = 20 Ω • R_3 = 40 Ω

Ohm's Law: $V = I \times R$

Effective resistance of a parallel circuit: $^1/_{Re} = {}^1/_{R1} + {}^1/_{R2} + {}^1/_{R3}$

The current (I) splits between the resistors (components) in a parallel circuit

So, for the above parallel circuit, reading on $A_1 = A_2 + A_3 + A_4$

All resistors (components) in a parallel circuit have the same potential difference (V) across them

(a) Calculate the current through the main circuit (reading on A_1) when only switch S_1 is closed.

(b) **(i)** Calculate the effective resistance through the circuit when only switch S_1 and switch S_2 are closed.

(ii) Calculate the current through the main circuit (reading on A_1) when only switch S_1 and switch S_2 are closed.

(c) **(i)** Calculate the effective resistance through the circuit when switch S_1, switch S_2 and switch S_3 are all closed.

(ii) Calculate the current through the main circuit (reading on A_1) when switch S_1, switch S_2 and switch S_3 are all closed.

(d) Calculate the readings on A_2, A_3, A_4 when switch S_1, switch S_2 and switch S_3 are all closed.

(e) How does the effective resistance of the circuit, R_e, change as the switches are closed and the number of resistors in parallel increases?

(f) How does the current through the main circuit (reading on A_1) change as the switches are closed and the number of resistors in parallel increases?

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- Scan the QR code below for the answers to this assignment.

http://www.nygh.sg/lower_secondary_science/sec_two_science/sec_two_physics/resistors_introduction_answers.pdf