Name: _____ Class: _____ Date: _____

Electrical circuits

PAGES 156 TO 163

CONCEPT REVIEW 22
Complete this concept review handout and keep it as a record of what you have learned..

Definitions

- An electrical circuit is *a network in which electrical charges can flow continuously in a loop.*
- A series circuit is *a circuit in which the elements are connected end to end.*
- A parallel circuit is *a circuit that contains at least one branch.*
- Kirchhoff's first law states *that the intensity of a current that flows into an element or a node of an electrical circuit is always equal to the intensity of the current that flows out of the element or node.*
- Kirchhoff's second law states *that in an electrical circuit, the total energy acquired by the charges from the power supply is always equal to the total energy transferred by these charges, whatever pathway they may take in the circuit.*

Minimal components of an electrical circuit

Component	Function
Power supply	*Creates a potential difference or transfers energy to charges.*
Electrical resistance	*Uses electrical energy.*
Wires	*Carry the charges from the power supply to the elements and then from the elements back to the source.*

Applying Ohm's law and Kirchhoff's laws to series and parallel circuits

	Series circuit	Parallel circuit
Current intensity	$I_{total} = I_1 = I_2 = I_3 = \ldots$	$I_{total} = I_1 + I_2 + I_3 + \ldots$
Potential difference	$U_{total} = U_1 + U_2 + U_3 + \ldots$	$U_{total} = U_1 = U_2 = U_3 = \ldots$
Equivalent resistance	$R_{eq} = R_1 + R_2 + R_3 + \ldots$	$R_{eq} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \ldots}$

© ERPI Reproduction prohibited

Name: _____ Class: _____ Date: _____

INTEGRATION QUESTIONS

Electrical circuits

1. Do the following situations apply to a series circuit (S) or to a parallel circuit (P)?

a) When a bulb on the circuit burns out, the current stops circulating. S

b) The effect of each resistor is shared among the circuit's various pathways. P

c) The current drops every time a new resistor is added to the circuit. S

d) A defect in one of the circuit's elements does not prevent the current from circulating. P

2. To which component of an electrical circuit does each of the following elements correspond?

a) I transport electric current. *Wires.*

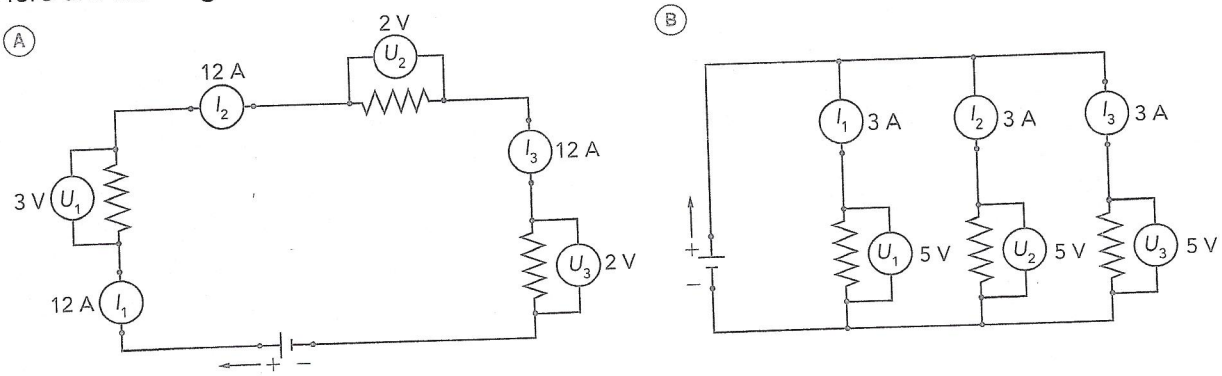
b) A bulb. *Electrical resistance.*

c) A battery. *Source of electrical energy.*

d) A generator. *Source of electrical energy.*

e) A heating element. *Electrical resistance.*

3. Here are the diagrams of two electrical circuits.



a) What is the total current intensity in Circuit A?

$I_{tot} = I_1 = I_2 = I_3 = 12\ A$

The total current intensity in Circuit A is 12 A.

b) What is the total current intensity in Circuit B?

$I_{tot} = I_1 + I_2 + I_3 = 3\ A + 3\ A + 3\ A = 9\ A$

The total current intensity in Circuit B is 9 A.

Name: _____ Class: _____ Date: _____

c) What is the total potential difference of Circuit A?

$U_{tot} = U_1 + U_2 + U_3 = 3\ V + 2\ V + 2\ V = 7\ V$

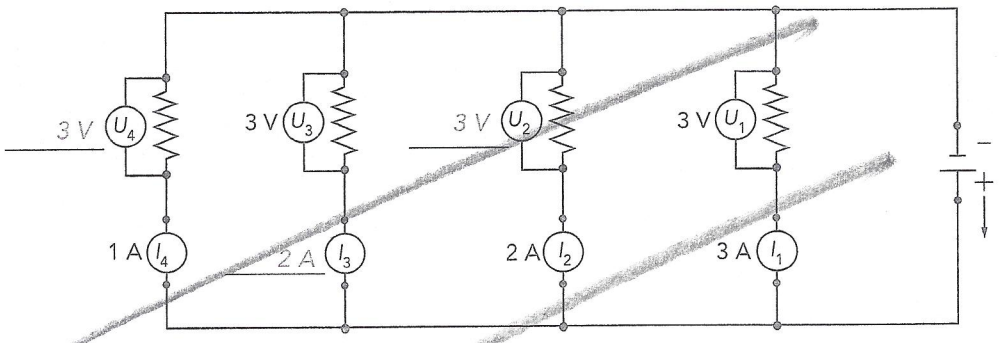
The total potential difference of Circuit A is 7 V.

d) What is the total potential difference of Circuit B?

$U_{tot} = U_1 = U_2 = U_3 = 5\ V$

The total potential difference of Circuit B is 5 V.

4. Complete the data in the following diagram.

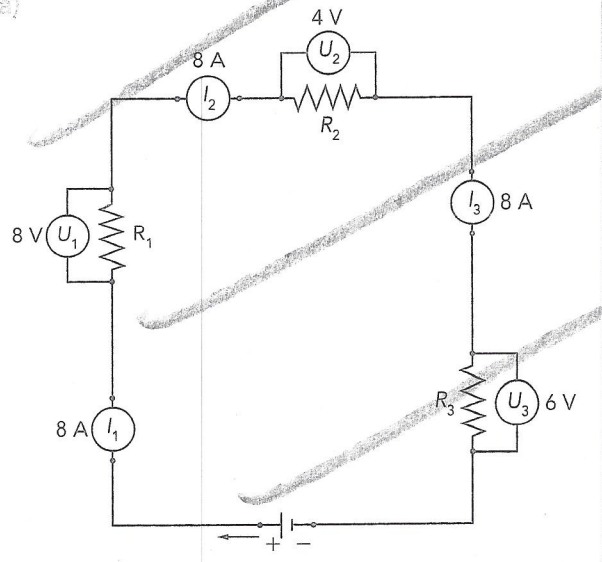


$I_{tot} = 8\ A$

$U_{tot} = 3\ V$

5. In each of the following circuits, calculate the equivalent resistance.

a)



$R_1 = \frac{U_1}{I_1} = \frac{8\ V}{8\ A} = 1\ \Omega$

$R_2 = \frac{U_2}{I_2} = \frac{4\ V}{8\ A} = 0.5\ \Omega$

$R_3 = \frac{U_3}{I_3} = \frac{6\ V}{8\ A} = 0.75\ \Omega$

$R_{eq} = R_1 + R_2 + R_3$

$= 1\ \Omega + 0.5\ \Omega + 0.75\ \Omega$

$= 2.25\ \Omega$

The equivalent resistance of the circuit is 2.25 Ω.