Section 9.1
Series and Parallel Circuits
Check Your Understanding

Checking Concepts

1. How is a parallel circuit different from a series circuit?

   more than one pathway for e⁻ to travel

   only one pathway for e⁻ to travel

2. In a series circuit, how does the voltage supplied by the battery compare to the voltages on each load?

   sum of voltages lost on each load = voltage supplied by battery

   $$V_T = V_1 + V_2$$

3. What happens to the total resistance of a series circuit when another resistor is added?

   increases $R_T = R_1 + R_2$

4. What happens to the total resistance of a parallel circuit when another resistor is added?
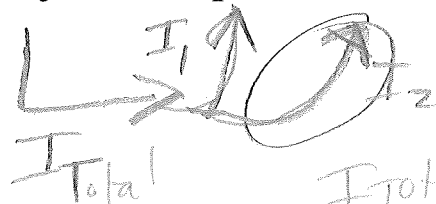
   decreases

5. Two resistors are connected in parallel to a battery. What must be the voltage across these two resistors?

   of source
   $$V_S = V_1 = V_2$$

   10v *10Ω* *10v* *the same as the battery voltage*

6. Is the current in one branch of a parallel circuit more than, less than, or equal to the total current entering the junction point of the circuit?

   I_1 I_2

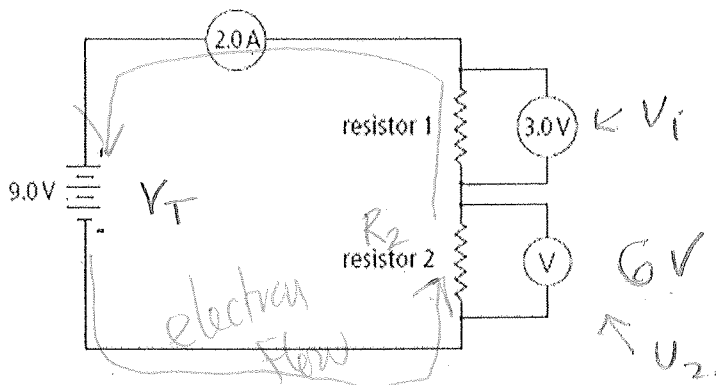 I_{Total} $I_{Total} = I_1 + I_2$

7. For the following circuit, find:

(a) the current through resistor 2 $-2.0\ A$

(b) the voltage across resistor 2 $6V$

$$I_T = I_1 = I_3$$

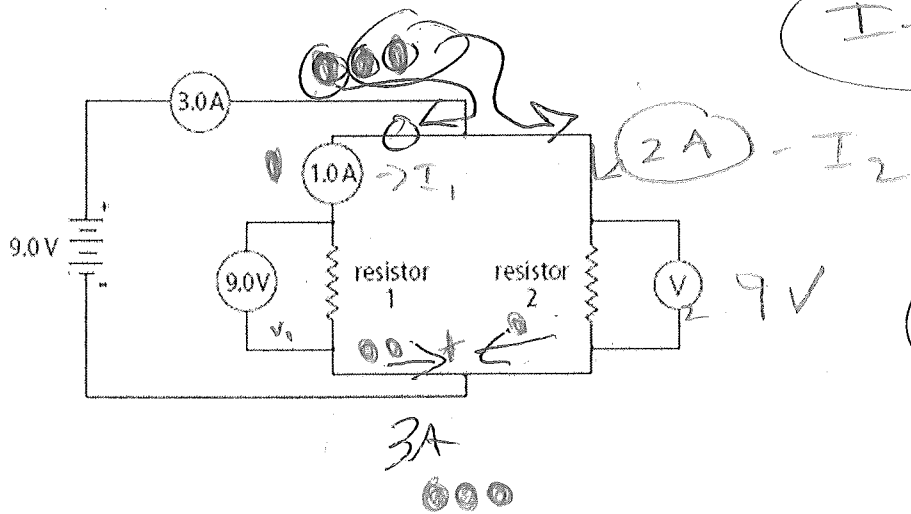in series

$$V_T = V_1 + V_2$$

$$9 = 3V + \boxed{6V}$$

resistor 1 $3.0V$ ← V_1

Y_T

9.0V

R_2

resistor 2 V $6V$

electron flow

↖ U_2

2.0 A

8. For the following circuit, find:

(a) the current through resistor 2 $2\ A$

(b) the voltage across resistor 2 $9V$

$$I_T = I_1 + I_2$$

$$V_S = V_1 = V_2$$

3.0A

1.0A → I_1

9.0V

9.0V

resistor 1

resistor 2

V_1

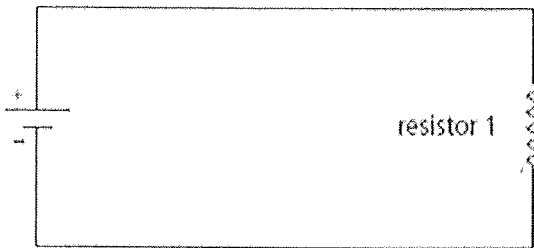$2\ A$ $-I_2$

V_2 $9V$
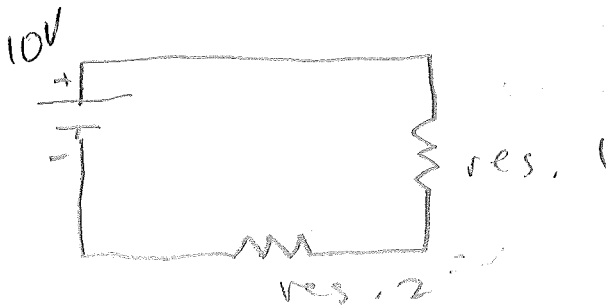
3A

.   You are given the following circuit.

A second resistor is now added in series with resistor 1.
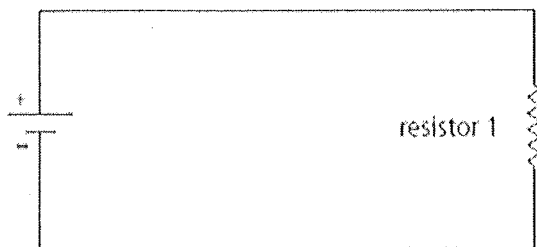
(a) Draw the new circuit diagram.

(b) Comparing your new circuit to the original, describe the changes in:

(i) total resistance   increases.
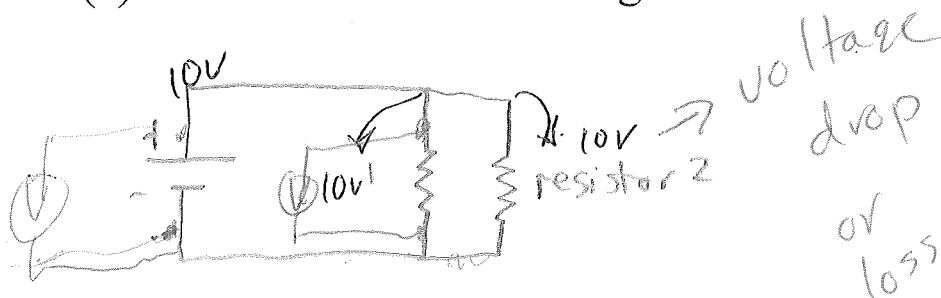
(ii) current leaving the cell   decreased

(iii) voltage across resistor 1   decreased.

10. You are given the following circuit.

A second resistor is now added in parallel with resistor 1.

(a) Draw the new circuit diagram.

[handwritten: 10v ... 10v ... resistor 2 ... voltage drop or loss]

(b) Comparing your new circuit to the original, describe the changes in:

(i) total resistance *has decreased*

(ii) current leaving the cell *increased*

(iii) voltage across resistor 1 *is the same.*

[handwritten: if R↑ I↓   if R↓ I↑ (ohm's law)]

Pause and Reflect

Are the lights in your school connected in series or in parallel? Justify your answer using facts about series and parallel circuits.
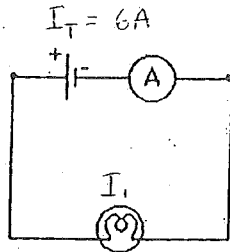
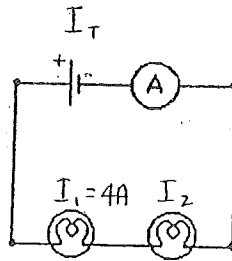*[handwritten: parallel → if lights out → rest of school not if some burn out others do not]*

SCIENCE 10: CIRCUIT DIAGRAMS - CURRENT WORKSHEET

1. Calculate the amount of current going through each of the light bulbs.

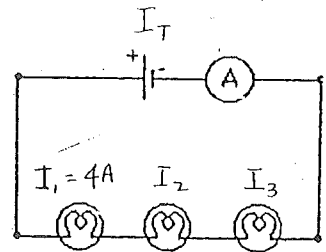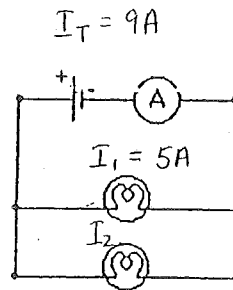a. $I_1 = $ __6 A__

$I_T = 6A$

+ A

I_1

b. $I_1 = $ __4A__ $I_2 = $ __4A__

I_T

+ A

$I_1 = 4A$ I_2

c. $I_1 = $ __4A__ $I_2 = $ __4A__ $I_3 = $ __4A__

I_T

+ A

$I_1 = 4A$ I_2 I_3

d. $I_1 = $ __5A__ $I_2 = $ __4A__

$I_T = 9A$

+ A

$I_1 = 5A$

I_2

$I_T = I_1 + I_2$
$9 = 5A + \underline{}$
$I_2 = 4A$

e. $I_1 = $ __4A__ $I_2 = $ __2A__ $I_3 = $ __7A__

$I_T = 13 A$

+ A

$I_1 = 4A$

I_2

$I_3 = 7A$
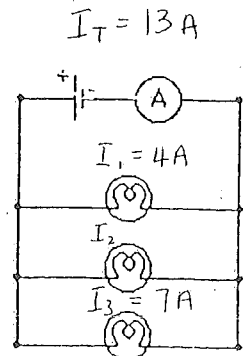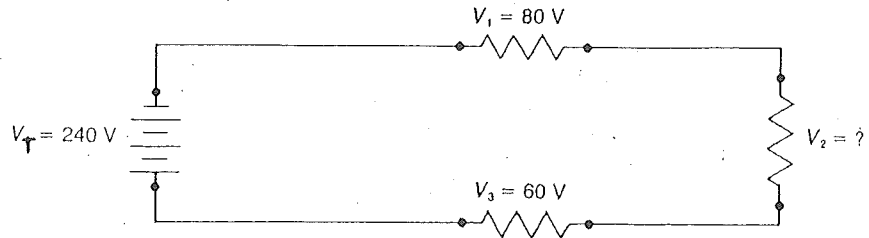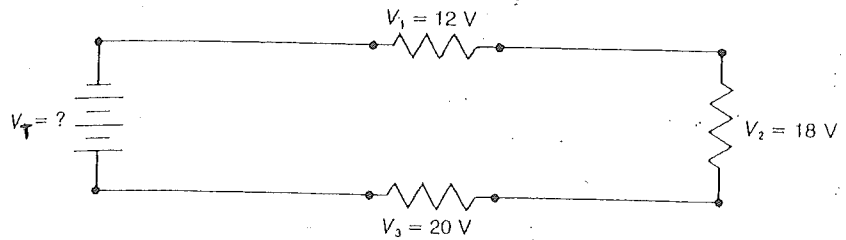
SCIENCE 10: CIRCUIT DIAGRAMS - CURRENT AND VOLTAGE WORKSHEET (I)

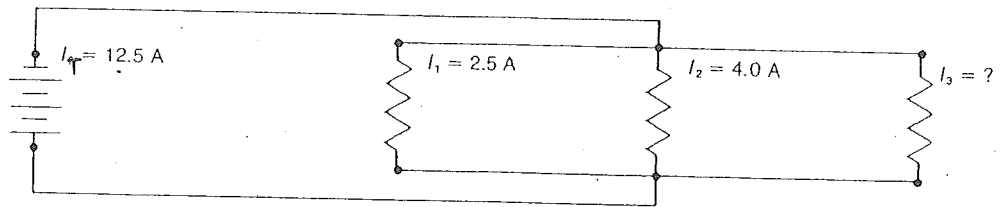1. Calculate the voltage in each of the following circuits:
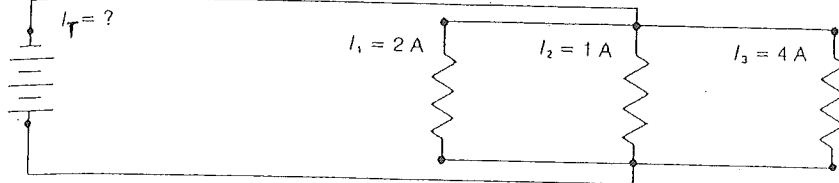
a. V_2 = __100 V__

$V_1 = 80$ V

$V_T = 240$ V

$V_2 = ?$

$V_3 = 60$ V

b. V_T = __50 V__

$V_1 = 12$ V

$V_T = ?$

$V_2 = 18$ V

$V_3 = 20$ V

2. Calculate the electric current in each of the following circuits:

a. I_3 = __6 A__

$I_T = 12.5$ A

$I_1 = 2.5$ A

$I_2 = 4.0$ A

$I_3 = ?$

b. I_T = __7A__

$I_T = ?$

$I_1 = 2$ A

$I_2 = 1$ A

$I_3 = 4$ A

3. Calculate the voltage and electric current in the following circuit:

a. V_2 = __3 V__

b. V_4 = __9 V__

c. I_3 = __1 A__

d. I_4 = __4 A__

$V_1 = 6$ V $I_1 = 4$ A

$I_2 = 3$ A $I_3 = ?$

$V_T = 18$ V

$V_2 = ?$ $V_3 = 3$ V

$V_4 = ?$ $I_4 = ?$