Review 1

1. List the three basic elements of an atom and state the charge of each (positive, negative, or neutral).

Element	Charge
Electron	**negative**
Proton	**positive**
Neutron	**neutral**

2. An electron forced out of orbit by an external force is called a **Free electron** .

3. Conductors allow **many** free electrons to flow when an external electric force is applied.

4. Which of the following materials are good conductors?

a. **copper**	e. **aluminum**
b. plastic	f. glass
c. **silver**	g. **iron**
d. rubber	h. mica

5. Semiconductor devices can be manufactured to allow **many** electrons to flow in one direction and **few** electrons to flow in the opposite direction

Review 2

1. Elements are identified by the number of **electrons** in orbit around the nucleus.

2. A material that has an excess of electrons is said to have a **negative** charge.

3. A material that has a deficiency of electrons is said to have a **positive** charge.

4. Like charges **repel** and unlike charges **attract** .

5. The force that is applied to a conductor to cause current flow is **voltage** .

6. Electrons move from **a or b** .

   a. positive to negative
   b. negative to positive

7. With an increase of length or a decrease of cross-section of a conductor, resistance will **increase** .

   a. increase
   b. decrease

Review 3

1. The basic Ohm's Law formula is **V=I*R** .

2. When solving circuit problems;
   current must always be expressed in **ampere** ,
   voltage must always be expressed in **volt** ,
   and resistance must always be expressed in **ohm (Ω)** .

3. The total current of a simple circuit with a voltage supply of **12 volts** and a resistance of **24 Ω** is **0.5 amps**.

   From Ohm's law
   ↓
   I = V / R = 12 / 24 = 0.5 A

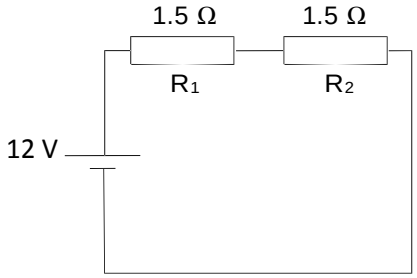
4. What is the total resistance of a series circuit with following values: R_1=10 **Ω** , R_2=15 **Ω** , and R_3=20 **Ω** ? =**45 Ω** .

   $R_t = R_1+R_2+R_3 = 10+15+20 = 45\ \Omega$

5. What is total current of a series circuit that has a 120 volt supply and 60 **Ω** resistance? **2 amps**

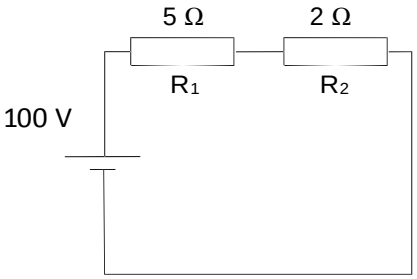
   From Ohm's law
   ↓
   I = V / R = 120 / 60 = 2 A

6. In the following circuit, the voltage dropped across **R_1** is **6 volts** and **R_2** is **6 volts**.



R_1 & R_2 are connected In series
↓
$R_t = R_1+R_2 = 1.5+1.5= 3\ \Omega$
$I_t = I_1=I_2=V_t / R_t = 12 / 3 = 4$ A
$V_1= I_1*R_1 = 4 * 1.5 = 6$ V
$V_2= I_2*R_2 = 4 * 1.5 = 6$V

7. In the following circuit, voltage dropped across **R_1** is **71.4 volts** and across **R_2** is **28.6 volts**.

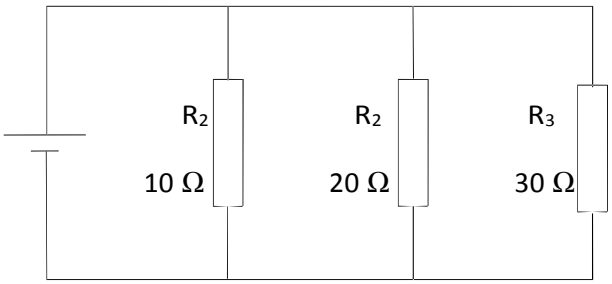


R_1 & R_2 are connected In series
↓
$R_t = R_1+R_2 = 5+2= 7\ \Omega$
$I_t = I_1=I_2=V_t / R_t = 100 / 7 = 14.3$ A
$V_1= I_1*R_1 = 14.3 * 5 = 71.4$ V
$V_2= I_2*R_2 = 14.3 * 2 = 28.6$ V

Review 4

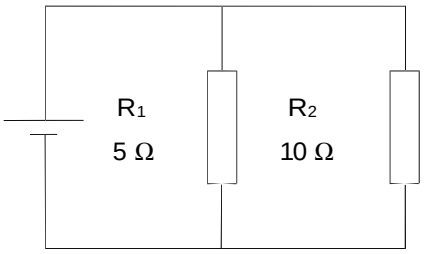
1. The total resistance of a parallel circuit that has four 20 Ω resistors is **5Ω**.
   R_t = the value of one resister ÷ the number of resisters
   R_t = 20/4 = 5 Ω

2. R_t for the following circuit is **5.45 Ω**.



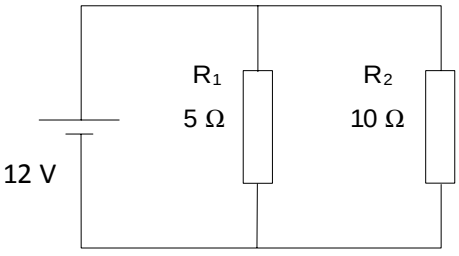
$1/R_t = 1/R_1 + 1/R_2 + 1/R_3$
$1/R_t = 1/10 + 1/20 + 1/30$
$1/R_t = 3/30 + 1.5/30 + 1/30$
$1/R_t = 5.5/30$
$R_t = 30/5.5 = 5.45$ Ω

3. R_t for the following circuit is **3.33Ω**.



$R_t = (R_1 * R_2) ÷ (R_1 + R_2)$
$R_t = (5*10)/(5+10) = 50/15 = 3.33$ Ω

4. Voltage available at R_2 in the following circuit is **12 volts**.



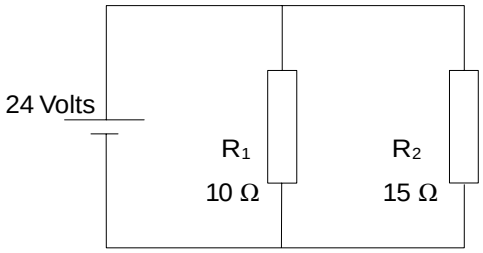
V_t = 12 v
In parallel circuits the voltage is constant
$V_t = V_1 = V_2$
V_2 = 12v

5. In a parallel circuit with two resistors of equal value and a total current flow of 12 amps, the value of current through each resistor is **6 amps**.

$R_1 = R_2$
In parallel circuits the voltage is constant
$V_t = V_1 = V_2$
$I_t = I_1 + I_2$

V1/R1 = V2/R2
$I_1 = V_1 / R_1$
$I_2 = V_2 / R_2$
$\rightarrow I_1 = I_2$
$\longrightarrow I_t = I_1 + I_2 \longrightarrow 12 = I_1 + I_2$
$\longrightarrow I_1 = 6$
$\longrightarrow I_2 = 6$

6. In the following circuit, current flow through **R_1** is _____ **2.4 amps**, and through **R_2** is **1.6 amps**.

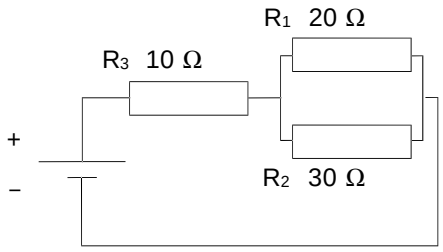


In parallel circuits the voltage is constant
$V_t = V_1 = V_2 = 12v$

From Ohm's law
↓
I1 = V1/R1 = 24/10 = 2.4 amps
I2 = V2/R2 = 24/15 = 1.6 amps

Review 5

1. Calculate equivalent resistance for R_1 and R_2 and totalresistance for the entire circuit.



R_1 & R_2 are connected In parallel

↓

$R_{1\&2} = (R_1 * R_2) \div (R_1 + R_2)$

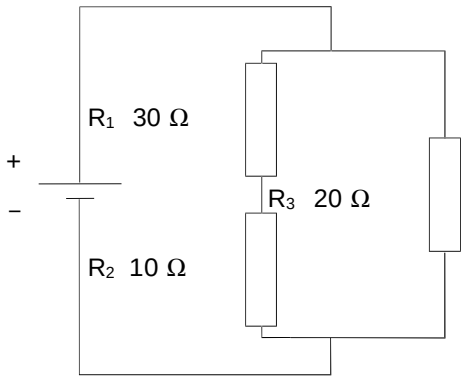
$R_{1\&2} = (20 * 30)/(20+30) = 600/50 = 12\Omega$

R_3 & $R_{1\&2}$ are connected In series

↓

$R_{1\&2\&3} = R_3 + R_{1\&2} = 10 + 12 = 22\ \Omega$

2. Calculate equivalent resistance for R_1 and R_2 and total resistance for the entire circuit.



R_1 & R_2 are connected In series

↓

$R_{1\&2} = R_1 + R_2 = 30 + 10 = 40\ \Omega$

R_3 & $R_{1\&2}$ are connected In parallel

↓

$R_{1\&2\&3} = (R_{1\&2} \times R_3) \div (R_{1\&2} + R_3)$

$R_{1\&2\&3} = (40 \times 20) \div (40 + 20) = 800/60 = 13.33\Omega$

Review 6

1. The rate at which work is done is called **power**.

2. The basic formulas for power in a DC circuit are:

$P = I \times V$

$P = I^2 \times R$

$P = V^2/R$

3. In a circuit with a **12 volt** supply and **4 Ω** resistance, the power consumed is

36 watts.

$P = V^2/R$

$P = 12^2 / 4 = 144/4 = 36w$

General questions:

1. The force that moves electrons is **Voltage or EMF**.

2. Movement of electrons is **Current**.

3. The force that stop electrons is **Resistance**.

4. What is the unit for Voltage, Current, Resistance and Power?

    - Voltage – **Volt**.
    - Current – **Ampere**.
    - Resistance – **Ohm**.
    - Power – **Watt**.

5. What is the device that measure Voltage, Current, Resistance and Power?

    - Voltage – **Voltmeter**.
    - Current – **Ammeter**.
    - Resistance – **Ohmmeter**.
    - Power – **Wattmeter**.