

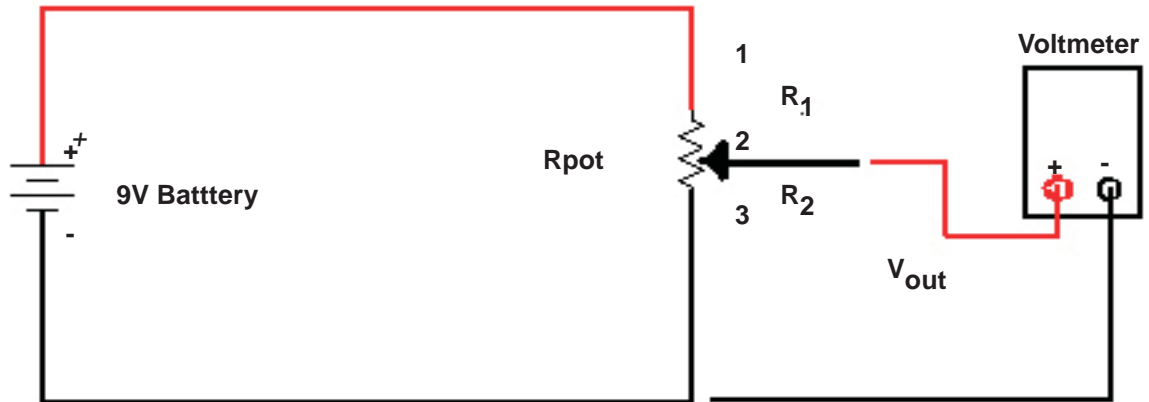
## QUIZ 3

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Questions 1-10 relate to the circuit shown.



$R_{\text{pot}}$  is a 10 kW potentiometer

$V_{\text{out}}$  is the voltage measured between the wiper (terminal 3) and the negative side of the battery (terminal 2.)

$R_2$  is the resistance between terminals 3 and 2

$R_1$  is the resistance between terminals 1 and 3

$R_T = R_1 + R_2 = 10 \text{ kW}$

1. What value is measured for  $V_{\text{out}}$  if the wiper arm is turned so that terminal 3 is at terminal 2?

**0 Volts**

2. What is the value of  $R_2$  in question 1?

**0  $\Omega$**

3. If  $R_2$  is set to 4 kW, what value is measured for  $V_{\text{out}}$ ?

$$VT = I * RT$$

$$I = VT / RT$$

$$I = 9 / 10000 = .0009 \text{ A}$$

$$V_{\text{out}} = I * R_2$$

$$V_{\text{out}} = .0009 * 4000$$

**3.6 Volts**

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4. If  $R_1$  is set to 8 kW, what value is measured for  $V_{out}$ ?

$$V1 = I * R1$$

$$V1 = .0009 * 8000$$

$$V1 = 7.2 \text{ Volts}$$

$$VT = V1 + Vout = 9$$

$$= 7.2 + Vout = 9$$

$$Vout = 1.8 \text{ Volts}$$

5. Suppose the voltmeter reads a value of 6.4 V. Calculate the values of  $R_1$  and  $R_2$ .

$$VT = I * RT$$

$$I = VT / RT$$

$$I = 9 / 10000 = .0009 \Omega$$

$$Vout = I * R2$$

$$R2 = Vout / I$$

$$R2 = 6.4 / .0009$$

$$R2 = 7111 \Omega$$

$$RT = R1 + R2$$

$$R1 = RT - R2 = 10000 - 7111$$

$$R1 = 2999 \Omega$$

6. Calculate the value of the circuit current,  $I$ , if  $V_{out} = 6 \text{ V}$ .

$$VT = I * RT$$

$$I = VT / RT$$

$$I = 9 / 10000 = .0009 \Omega$$

7. Calculate the value of the circuit current,  $I$ , if  $V_{out} = 12 \text{ V}$ .

$$VT = I * RT$$

$$I = VT / RT$$

$$I = 12 / 10000 = .0012 \Omega$$

8. What should be the ratio of  $R_2$  to  $R_T$  if  $V_{out} = 1/3 E$ ?

$$E = I * RT$$

$$Vout = 1/3 E = I * R2$$

$$\text{After making substitution: } 1/3 * I * RT = I * R2$$

$$1/3 * RT = R2$$

$$\text{therefore, } R2:RT = 1:3$$

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9. If the wiper arm is turned so that  $V_{out} = 3V$  with  $E = 12V$ , what do you expect  $V_{out}$  to be if  $E$  is changed to  $18V$ ?

$$3 \text{ Volts} / 12 \text{ Volts} = V_{out} / 18 \text{ Volts}$$

$$.25 = V_{out} / 18$$

$$V_{out} = 4.5 \text{ Volts}$$

10. With  $E = 12V$ , what is the possible range of  $V_{out}$ ?

$$\text{Minimum } V_{out} = 0 \text{ Volts}$$

$$\text{Maximum } V_{out} = 12 \text{ Volts}$$