

Calculating Current

Answer the following questions by:

- Identifying the variables you have
- Identify the variable you are missing
- Use the formula to find your missing variable.

$$I = \frac{q}{t(s)}$$

1. Find the charge that flows through an electric iron in 10 seconds if the iron has a current rating of 6A.

$$\begin{aligned} q &= I \times t \\ &= 6A \times 10s \\ &= 60C \end{aligned}$$

2. A 110 V heating element in an electrical water heater is rated at 20 amperes. Find the charge that passes through the element in 10 seconds.

$$\begin{aligned} I &= 20A & Q &= I \times t \\ Q &=? & &= 20A \cdot 10s \\ t &= 10s & Q &= 200C \end{aligned}$$

3. A calculator display has 3×10^{-2} coulombs of charge pass through it in 10 seconds. Find the current in milliamperes.

$$\begin{aligned} Q &= 3 \times 10^{-2} C & I &= \frac{3 \times 10^{-2} C}{10s} & 1A & \text{---} 1000mA \\ t &= 10s & & & & \times 1000 \\ I &=? & I &= 0.003A \times 1000 = \underline{\underline{3mA}} \end{aligned}$$

4. In an electric motor operating at a constant speed, 30 000 coulombs of charge have moved through the motor. The motor is drawing a steady current of 50 amperes. Find the length of time the motor operated at constant speed.

$$\begin{aligned} Q &= 30000C & t &= \frac{q}{I} = \frac{30000C}{50A} \\ I &= 50A & & & & = 600s \\ t &=? & & & & \end{aligned}$$

5. If 15 C of charge flows through a conductor in two minutes, what is the current?

$$\begin{aligned} Q &= 15C & I &= \frac{15C}{120s} = 0.125A \\ t &= 2 \text{ min} = 120s & & & & \\ I &=? & & & & \end{aligned}$$

$$V = \frac{E}{Q}$$

Calculating Potential Difference

Answer the following questions by:

- Identifying the variables you have
- Identify the variable you are missing
- Use the formula to find your missing variable

1. $V = ?$
 $E = 45 \text{ J}$
 $Q = 15 \text{ C}$

$$V = \frac{E}{Q} = \frac{45 \text{ J}}{15 \text{ C}} = \boxed{3 \text{ V}}$$

2. $V = 9 \text{ V}$
 $E = ?$
 $Q = 145 \text{ C}$

$$E = V \times Q = 9 \text{ V} \times 145 \text{ C}$$
$$E = 1305 \text{ J}$$

3. $V = 1.5 \text{ V}$
 $E = 225 \text{ J}$
 $Q = ?$

$$Q = \frac{E}{V} = \frac{225 \text{ J}}{1.5 \text{ V}} = 150 \text{ C}$$

4. The potential difference between the two terminals on a battery is 9 volts. How much work (energy) is required to transfer 10 coulombs of charge across the terminals?

$$V = 9 \text{ V}$$
$$E = ?$$
$$Q = 10 \text{ C}$$
$$E = V \times Q$$
$$= 9 \text{ V} \times 10 \text{ C}$$
$$E = 90 \text{ J}$$

5. Ten joules of work (energy) are required to transfer 2 coulombs of charge from X to Y. What is the difference in potential between these two points?

$$Q = 2 \text{ C}$$
$$E = 10 \text{ J}$$
$$V = \frac{E}{Q} = \frac{10 \text{ J}}{2 \text{ C}} = 2 \text{ V}$$

6. It requires 600 joules of energy to transfer a quantity of charge between points C and D of a circuit, which have a potential difference of 30 volts. How much charge is transferred?

$$E = 600 \text{ J}$$
$$V = 30 \text{ V}$$
$$Q = \frac{E}{V} = \frac{600 \text{ J}}{30 \text{ V}} = 20 \text{ C}$$
$$Q =$$