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## Charge, Current, Voltage, Energy and Power Worksheet

**Q1.**

A charge of 30 C flows through an electrical circuit in 20 seconds. What is the current flowing in the circuit?

**Q2.**

$2.25 \times 10^{20}$  electrons flows through a bulb in 2 minutes. Calculate the electric current that flows through the bulb. (Charge on one electron is  $1.6 \times 10^{-19} \text{ C}$ )

**Q3.**

Calculate the number of electrons that flow through a wire if a steady current of 1.5 A flows through the wire for 2 minutes. (Charge on an electron is  $1.6 \times 10^{-19}$ )

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**Q4.**

How many electrons are there in 0.8 C of charge? (Charge on one electron is  $1.6 \times 10^{-19}$  C)

**Q5.**

When lightning strikes, 500 C of charge is transferred and  $1.6 \times 10^9$  J of energy is dissipated. What is the potential difference between the cloud and the earth?

**Q6.**

The potential difference across two metal plates is 400 V. How much energy is required to transfer 50 C of charge across the two plates?

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**Q7.**

What is the number of electrons transferred across two metal plates of potential difference 420 V if  $1.26 \times 10^4$  J of energy is dissipated during the process? (Charge of an electron =  $1.6 \times 10^{-19}$  C)

**Q8.**

A current of 0.2 A flows in a conductor when a potential difference of 3 V is applied across it. Calculate the resistance of the conductor.

**Q9.**

Calculate the current flowing across a conductor with resistance of  $50 \Omega$  when a potential difference of 12 V is applied across the conductor.

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**Q10.**

A constantan wire of length  $3x$  and diameter  $2d$  has the resistance  $R$ . What is the resistance, in terms of  $R$ , for another constantan wire of length  $x$  and diameter  $d$ ?

**Q11.**

State four factors that affect the resistance of a conductor.

**Q12.**

When a resistor is connected to a 6 V supply,  $6.25 \times 10^{19}$  electrons flow across the resistor in every 2 seconds. Calculate the energy dissipated and electrical power. (Charge of electron =  $1.6 \times 10^{-19}$  C)

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**Q13.**

A  $48\ \Omega$  resistor was connected to a 240 V power supply. Calculate the amount of energy dissipated in the resistor after 2 minutes.

**Q14.**

A  $48\ \Omega$  resistor was connected to a 240 V power supply. Calculate the amount of energy dissipated in the resistor after 2 minutes.

**Q15.**

When a bulb is connected to a power supply of 12 V for 3 minutes, 1080 J of energy is dissipated. Calculate

- a) the resistance of the bulb
- b) the amount of energy dissipated when the same bulb is connected to a power supply of 20 V for 5 minutes.

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**Q16.**

A water heater is rated 240 V, 1500 W. Calculate the resistance of the heating element and the current when the water heater is connected to a 240 V power supply.

**Q17.**

When an electrical kettle is connected to a 240 V power supply, 216 KJ of energy is dissipated in 5 minutes. Calculate

a) the power of the electrical kettle

b) the resistance of the heating element

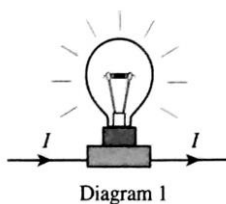
c) the current that flows when the 240 V supply is connected.

Signature: Name: Marks: **Q18.**

A water heater is rated 240 V, 400 W heats up 120 g of water from 25 °C to 38 °C in 8 seconds. Calculate the efficiency of the water heater. (Specific heat capacity of water = 4200 J kg<sup>-1</sup> °C<sup>-1</sup>)

**Q19.**

The diagram shows a light bulb which glows brightly when electrical current flows through it.



- What is the meaning of current?
- Name one instrument that can be used to measure the magnitude of current flow.
- A constant current of 3.0 A flows through the light bulb for 0.5 minute. Calculate the amount of charge that flows through the bulb.

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Diagram 2 shows an electric iron with power rating 240 V, 1800 W,

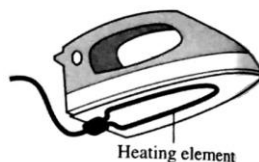


Diagram 2

- a) State one suitable material that can be used as the heating element in the electric iron.
- b) The electric iron in Diagram 2 is connected to a 240 V power supply. Calculate
- The current that flows through the heating element
  - The resistance of the heating element
- c) A student carried out an investigation to compare the heating effect of the heating elements P, Q and R. The electric iron is switched on until it reaches a certain fixed temperature. The table below shows the results of the investigation.

Heating element	Potential Difference /V	Current /A	Time required to reach a fixed temperature / minutes
P	240	8.0	2.0
Q	240	5.0	5.0
R	240	3.0	3.0

- State the energy change that occurs when the electric iron is switched on.
- Calculate the energy supplied by each of the heating elements P, Q and R to reach the temperature required.
- Based on your answers in (c)II., suggest the most suitable heating element to be used in the electric iron. Give one reason for your answer.