Worksheet 2.3: Electrical Power (P = V I)

PhysicsSheets

Specification: GCSE Physics (AQA 4.2.4.1 / Edexcel SP10)

Core Equation: $P = V \times I$

Rearranged Forms: $V = \frac{P}{I}$ | $I = \frac{P}{V}$

Units:

- Power (P): Watts (W)
- Potential difference (V): Volts (V)
- Current (I): Amperes (A)

Section A: Formula Recall & Unit Conversions

1. Complete the table below by stating the correct SI unit and its symbol for each variable in the equation $P = V \times I$.

Variable	SI Unit	Symbol
Power (P)	_____	_____
Potential difference (V)	_____	_____
Current (I)	_____	_____

2. Rearrange the equation $P = V \times I$ to make V and I the subject:

a) $V =$ _____

b) $I =$ _____

3. Convert the following values into their standard SI units:

a) 250 mA = _____ A

b) 1.5 kV = _____ V

c) 0.005 kW = _____ W

d) 30 minutes = _____ seconds

e) 2.5 kJ = _____ J

Section B: Practice Calculations

1. Answer the following questions, showing your working clearly and stating the correct units.

a) A lamp is connected to a 12 V power supply and has a current of 0.5 A flowing through it. Calculate the power dissipated by the lamp.

b) A domestic electric heater has a power rating of 2000 W and is connected to the 230 V mains supply. Calculate the current flowing through the heater. Give your answer to 3 significant figures.

c) An electric motor has a power output of 60 W. If it draws a current of 500 mA, calculate the potential difference across the motor.

d) An industrial appliance has a power rating of 2.5 kW and operates at a potential difference of 250 V. Calculate the current drawn by the appliance. Give your answer to 2 significant figures.

Section C: Challenge Context

2. Figure 1 shows a kettle connected to a mains power supply.

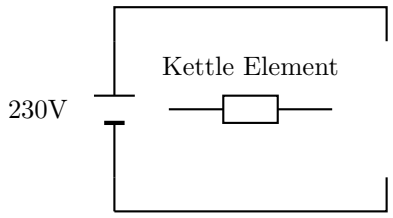

Figure 1: Kettle Circuit

a) A kettle has a power rating of 2.2 kW and is connected to a 230 V mains supply.

- Calculate the current flowing through the kettle.
- Calculate the energy transferred by the kettle in 5.0 minutes. Give your answer in kilojoules (kJ) to 3 significant figures.

b) Explain why using a kettle with a higher power rating (e.g., 3.0 kW instead of 2.2 kW) connected to the same 230 V supply would cause the mains circuit breaker to trip more easily. In your answer, refer to the current drawn and the function of a circuit breaker.