

## Electrical Power & Energy – IGCSE Physics Worksheet

### Reading Comprehension: Electrical Power & Energy

Electrical devices transfer energy from one form to another. To understand how quickly this happens, we use the concept of power. Electrical power is the rate at which electrical energy is transferred or used. It tells us how fast a device converts electrical energy into other forms such as light, heat, or sound.

Power is measured in watts (W). One watt means that 1 joule of energy is transferred every 1 second. The equation for electrical power is:

$$P = IV$$

where

P = power (W),

I = current (A),

V = potential difference (V).

Another useful equation links power to resistance:

$$P = I^2R$$

Electrical energy is the total amount of work done or transferred by an electrical device. It is measured in joules (J). The equation is:

$$E = Pt$$

where

E = energy (J),

P = power (W),

t = time (s).

In everyday life, energy is often measured in kilowatt-hours (kWh), especially on electricity bills. One kilowatt-hour is the energy transferred by a 1 kW appliance running for 1 hour.

Understanding electrical power and energy helps us compare appliances, calculate running costs, and design efficient electrical systems.

### Section A: Multiple-Choice Questions

1. Electrical power is defined as: [1 mark]

A. Energy  $\times$  time

B. Energy  $\div$  time

- C. Current  $\times$  resistance
- D. Charge  $\div$  time

2. The unit of electrical energy is: [1 mark]

- A. Watt
- B. Coulomb
- C. Joule
- D. Ampere

3. Which equation correctly links power, current, and voltage? [1 mark]

- A.  $P = IV$
- B.  $P = V^2$
- C.  $P = IR$
- D.  $P = I/V$

### Section B: Short-Answer Questions

4. A device uses 40 J of energy in 5 seconds.

Calculate its power. [2 marks]

5. Explain why a 2000 W kettle uses more energy than a 1000 W kettle when used for the same amount of time. [2 marks]

6. A lamp is connected to a 12 V supply and draws a current of 0.5 A.

Calculate its power. [2 marks]

### Section C: Application Questions

7. A heater has a power rating of 1500 W and is used for 10 minutes.

Calculate the energy transferred in joules. [3 marks]

8. An appliance uses 3 kW of power for 2 hours.

Calculate the energy used in kWh. [2 marks]

### Section D: Longer-Answer Question

9. Describe the difference between power and energy.

Explain why high-power appliances cost more to run. [4 marks]

## Answer Key

### Section A

- 1. B
- 2. C
- 3. A

### Section B

4.

$$P = E / t = 40 / 5 = 8 \text{ W}$$

5.

A 2000 W kettle transfers energy faster.

For the same time, it uses more energy because:

$$E = Pt$$

6.

$$P = IV = 12 \times 0.5 = 6 \text{ W}$$

### Section C

7.

Convert time: 10 minutes = 600 s

$$E = Pt = 1500 \times 600 = 900000 \text{ J}$$

8.

$$E = 3 \text{ kW} \times 2 \text{ h} = 6 \text{ kWh}$$

### Section D

9. (Model answer)

Power is the rate at which energy is transferred, while energy is the total amount transferred.

High-power appliances transfer energy more quickly, so they use more energy in a given time.

Since electricity bills charge for energy used, high-power devices cost more to run.