

## Multi-Step Questions using the equations $P = IV$ and $E = VQ$

These questions require you to use more than one equation to find the final answer. The questions become progressively more difficult and may involve rearranging equations and converting units before calculating your answer.

1. A torch bulb operates at 3.0 V and has a current of 0.20 A.
  - a) Calculate the power of the bulb.
  - b) Calculate the energy transferred in 50 s.
2. A bicycle light operates at 6.0 V and draws a current of 0.50 A.
  - a) Calculate the power of the light.
  - b) Calculate the energy transferred in 2 minutes.
3. A phone charger has a potential difference of 5.0 V and a current of 2.0 A.
  - a) Calculate the power.
  - b) Calculate the charge transferred in 5 minutes.
  - c) Calculate the energy transferred using  $E = VQ$ .
4. A laptop charger operates at 20 V and draws a current of 3.0 A.
  - a) Calculate the power.
  - b) Calculate the charge transferred in 10 minutes.
  - c) Calculate the energy transferred.
5. An electric fan operates at 12 V and draws a current of 1.5 A.
  - a) Calculate the power.
  - b) The fan runs for 15 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred.
6. A kettle draws a current of 10 A from a 230 V supply.
  - a) Calculate the power.
  - b) The kettle is used for 3 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred.
7. An electric scooter motor operates at 48 V and draws a current of 15 A.
  - a) Calculate the power.

- b) The motor runs for 5 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred in kJ.
8. An electric vehicle battery provides 400 V and a current of 50 A.
- a) Calculate the power output.
  - b) The car operates at this power for 20 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred in MJ.
9. A battery storage system supplies 600 V and a current of 80 A.
- a) Calculate the power output.
  - b) The system operates for 30 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred in MJ.
10. A train motor operates at 750 V and draws a current of 200 A.
- a) Calculate the power of the motor.
  - b) The motor operates for 4 minutes. Calculate the charge transferred.
  - c) Calculate the energy transferred in MJ.
  - d) Explain why the energy calculated using  $E = VQ$  should match the energy obtained using power  $\times$  time.