

## Section 4: Energy resources and energy transfer

- a) Units
- b) Energy transfer
- c) Work and power
- d) Energy resources and electricity generation

### a) Units

*Students will be assessed on their ability to:*

- 4.1 use the following units: kilogram (kg), joule (J), metre (m), metre/second (m/s), metre/second<sup>2</sup> (m/s<sup>2</sup>), newton (N), second (s), watt (W).

### b) Energy transfer

*Students will be assessed on their ability to:*

- 4.2 describe energy transfers involving the following forms of energy: thermal (heat), light, electrical, sound, kinetic, chemical, nuclear and potential (elastic and gravitational)
- 4.3 understand that energy is conserved
- 4.4 know and use the relationship:  
$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$
- 4.5 describe a variety of everyday and scientific devices and situations, explaining the fate of the input energy in terms of the above relationship, including their representation by Sankey diagrams
- 4.6 describe how energy transfer may take place by conduction, convection and radiation
- 4.7 explain the role of convection in everyday phenomena
- 4.8 explain how insulation is used to reduce energy transfers from buildings and the human body.

### c) Work and power

*Students will be assessed on their ability to:*

4.9 know and use the relationship between work, force and distance moved in the direction of the force:

work done = force  $\times$  distance moved

$$W = F \times d$$

4.10 understand that work done is equal to energy transferred

4.11 know and use the relationship:

gravitational potential energy = mass  $\times$   $g$   $\times$  height

$$\text{GPE} = m \times g \times h$$

4.12 know and use the relationship:

kinetic energy =  $\frac{1}{2}$   $\times$  mass  $\times$  speed<sup>2</sup>

$$\text{KE} = \frac{1}{2} \times m \times v^2$$

4.13 understand how conservation of energy produces a link between gravitational potential energy, kinetic energy and work

4.14 describe power as the rate of transfer of energy or the rate of doing work

4.15 use the relationship between power, work done (energy transferred) and time taken:

$$\text{power} = \frac{\text{work done}}{\text{time taken}}$$

$$P = \frac{W}{t}$$

### d) Energy resources and electricity generation

*Students will be assessed on their ability to:*

4.16 describe the energy transfers involved in generating electricity using:

- wind
- water
- geothermal resources
- solar heating systems
- solar cells
- fossil fuels
- nuclear power

**4.17 describe the advantages and disadvantages of methods of large-scale electricity production from various renewable and non-renewable resources.**