3.4 Energy can be transformed

Student worksheet answers (pages 48–49)

Energy transformations

1 Name a device that will convert:

Answers will vary.

a chemical to electrical energy: battery

b chemical into heat energy: chemical heat pack; an explosion

c electricity to light: light bulb

d chemical energy into sound: an explosion; fireworks; iPod; phone

e electricity to heat: heater; kettle

f potential to kinetic energy: falling; slide

g chemical energy to light: lighting a match

h kinetic energy to sound: striking a bell

2 Draw a flow diagram that shows all of the energy changes when:

a a light turns on

chemical potential energy (coal) → electrical → light

b a toaster cooks your toast

chemical potential energy (coal)→electrical → heat

c a church bell is struck by a bell-ringer

chemical potential energy (food) → kinetic energy → sound

d a firework explodes

chemical potential energy (explosives) → kinetic energy (through air) → heat/light/sound

e an iPhone is charged using energy from a coal power station

chemical potential energy (coal) → electrical → chemical potential energy (battery) → heat/light/sound

3 Why does a mug of hot chocolate eventually cool down? Where does the heat energy go?

Heat is lost to the surroundings (atmosphere/air)

4 What will happen to a glass of ice-cold water if left at room temperature?

The heat in the atmosphere will transfer to the water in the glass, heating it up

5 Why does the ice-cold water form condensation on the side of the glass?

The ice-cold water cools the glass and air around the glass, condensing water vapour into liquid water

6 Does hot chocolate or cool lemonade have more thermal energy? Explain your answer

The hot chocolate as the more thermal energy an object has, the hotter it is

7 Which of the drinks in question 6 will have more thermal energy if they are left on the same bench overnight? Explain your answer.

They will both reach room temperature overnight and have the same amount of thermal energy

Extend your understanding

In exothermic chemical reactions, reactants have more energy than products. Therefore, when the products form, the extra energy is released to the surroundings as heat.

In endothermic reactions, products have more energy than reactants. Therefore, heat must be absorbed from the surroundings for the reaction to occur.

8 If an exothermic reaction occurred in a beaker, what would the beaker feel like if you picked it up?

Hot/warm

9 If an endothermic reaction occurred in a beaker, what would the beaker feel like if you picked it up?

Cool/cold

10 Show the energy conversion of these two processes by drawing energy chain flow charts:

a Exothermic

chemical potential energy → heat

b Endothermic

heat → chemical potential energy

11 Is the burning of coal an exothermic or an endothermic reaction? Explain your answer.

Exothermic reaction; large quantities of heat energy is produced