Checkpoint support and extension

energy between stores.

Revision activity answers

Task 1

Students should calculate the amount of energy associated with each food and activity. They should then circle the food/activity that has the higher amount of energy associated with it for each question.

**1** energy in 100 g of **apple** = 200 kJ; energy needed for 30 minutes of sitting = 180 kJ

**2** energy in 200 g of **chips** = 2000 kJ; energy needed for 180 minutes of standing = 1260 kJ

**3** energy in 50 g of chocolate = 750 kJ; energy needed for 1 hour of **walking slowly** = 780 kJ

**4** energy in 250 g of banana = 850 kJ; energy needed for 15 minutes of **swimming** = 1095 kJ

**5** energy in 75 g of **cooked beef** = 750 kJ; energy needed for 5 minutes of running = 300 kJ

Task 2

1

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Advantage** | **Energy resource** | | | **Disadvantage** |
| no fuel costs and no polluting gases are released |  | wind turbines |  | if there is an accident, radioactive material may be emitted into the environment |
|  |  |  |  |  |
| no fuel costs and very reliable |  | coal power stations |  | noisy and may spoil the view |
|  |  |  |  |  |
| very reliable and can produce electricity at any time |  | solar panels |  | release carbon dioxide which contributes to global warming |
|  |  |  |  |  |
| no polluting gases are released and lots of energy is produced |  | tidal power stations |  | can destroy the habitats of wading birds |
|  |  |  |  |  |
| provides electricity in remote areas where there is no access to mains electricity |  | nuclear power stations |  | only works during the day and doesn’t work well when it is cloudy |

**2** chemical, steam, kinetic, generator, current, thermal

Task 3

**1** How much energy is transferred by a device per second.

**2** The power shower, because it has the greatest power rating.

**3** **a** 57.6p. This is provided as a worked example – you may wish to remove the instructions before students attempt the task.

**b** 26.4p

**c** 135p

**d** 12.6p

**e** 7.5p

**f** 7.2p

**4** Kettle 1: 6.72p and Kettle 2: 7.92p. The quicker, more powerful kettle costs less money each time it boils the kettle and therefore would be cheaper to use.

Task 4

**1** created, transferred

**2** elastic energy store, gravitational potential energy store, chemical energy store, kinetic energy store, and thermal energy store

**3**

|  |  |  |
| --- | --- | --- |
| **Activity** | **Energy store(s) before** | **Energy store(s) after** |
| ball rolling down a hill, starting from rest | gravitational potential energy store | kinetic energy store (gravitational potential energy store, if it hasn’t reached the lowest point)  thermal energy store of the surroundings |
| hand-held fan | chemical energy store  of battery | kinetic energy store and thermal energy store of motor and surroundings |
| cooking soup | chemical energy store | thermal energy store (of soup and surroundings) |
| a pull back and release toy | elastic energy store | kinetic energy store (and thermal energy store of surroundings) |

Task 5

**1** The energy is transferred to a store that you do not want it to go to.

**and**

The energy becomes spread out wastefully.

**2** energy dissipated = energy input – useful energy output

**3** **a** energy is transferred to the thermal energy store of the surroundings because of air resistance and the deformation of the ball

**b** when current flows the wire gets hot and transfers energy to the thermal energy store of the surroundings

**c** the friction between the air and the rocket causes energy to be lost to the thermal energy store of the air

**d** contact forces between the moving parts of the bicycle and friction between the tyres and the road transfers energy to the thermal energy store of the surroundings

**4**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Device** | **Energy input (kJ)** | **Useful energy output (kJ)** | **Energy dissipated (kJ)** | **Efficiency (%)** |
| car | 36 000 | 7200 | 28 800 | 20 |
| fridge | 180 | 171 | 9 | 95 |
| solar cell | 50 | 7 | 43 | 14 |
| mobile phone charger | 36 | 27 | 9 | 75 |

Extension activity overview

Students have been asked to choose appropriate energy resources for the use of a coastal town. The town is planning to expand its population and therefore must increase its energy supply. It also has an old coal-burning power station that is causing too much pollution – students must chose if it is appropriate to replace it too.

Extension activity answers or marking guidance

The report should be clearly structured and include key values from the information provided.

Students should choose power stations that would help increase the daily energy output of the power stations in the town by at least 430 000 kWh.

Students should explain the choices they have made with reference to the advantages and disadvantages of each type of power station and the amount of power needed. They should realise that some of the electricity that is generated will need to be generated by reliable sources.

Students may realise that the power station needs to provide more than the average daily energy use because during the summer the people will use less power as it is warmer and lighter but during the winter they may use more.

Students may choose to replace the coal power station. Even in this case, nuclear and gas power stations will provide more energy than is needed. Students could suggest the town could sell excess electricity to make some money.