a

Describe what a system is.

b

Describe energy store changes for the following objects:

A football that has been kicked upwards.

A squash ball hitting a wall.

A car accelerating.

A car decelerating.

Bringing water to the boil.

c

What is the equation linking kinetic energy, mass and speed?

Write the units for the following:

kinetic energy: _____

mass: _____

speed: _____

List some examples of objects with kinetic energy stores.

d

What is the equation linking elastic potential energy, spring constant and extension?

Write the units for the following:

elastic potential energy: _____

spring constant: _____

extension: _____

List some examples of objects with elastic potential energy stores.

e

What is the equation linking gravitational potential energy, mass, gravitational field strength and height?

Write the units for the following:

gravitational potential energy: _____

mass: _____

gravitational field strength: _____

height: _____

List some examples of objects that have gravitational potential energy stores.

f

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

Write the units for the following:

change in thermal energy: _____

specific heat capacity: _____

Write a definition for specific heat capacity.

g

Define Power.

Write a definition for specific heat capacity.

Write the units for the following:

power: _____

energy transferred: _____

time: _____

work done: _____

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

The power output of a hairdryer is 2000W. How much energy is transferred per second?

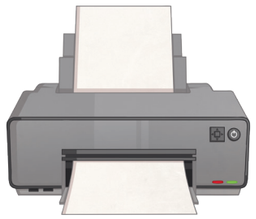
a

What is the law of conservation of energy?

Define dissipation.

b

The following questions are about energy stores and transfers in a printer.



The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? _____

What is the final energy store? _____

Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? _____

What is the final energy store? _____

c

For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.
Hot water stored in a tank.

Moving parts in a car.

d

Describe how thermal conductivity of a material affects how it transfers energy by conduction.

e

How is energy lost from a building? What factors affect this?

f

What is the equation linking efficiency, useful output energy transfer and total input energy transfer?

What is the equation linking efficiency, useful power output and total power input?

When energy is transferred in a closed system, what happens to the total amount of energy?

How can the efficiency of an energy transfer be increased?

g

Which lorry is more energy efficient and why?

h

List the main energy resources.

i

Define renewable and non-renewable energy resources.

j

For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.

Except for oil, all energy resources are used for electricity generation. Which are used for heating?

k

My main areas for improvement are:

l

Energy Resource	Enviromental Impact	Reliability of Output
Coal		
Oil		
Gas		
Nuclear		
Biofuel		
Wind		
Hydroelectricity		
Geothermal		
Tidal		
Waves		
Solar		

a

Describe what a system is.

It is an object or group of objects.

b

Describe energy store changes for the following objects:

A football that has been kicked upwards.
As the ball moves upwards, the kinetic energy store of the ball decreases and the gravitational potential energy store of the ball increases.

A squash ball hitting a wall.
When the ball hits the wall, the kinetic energy store of the ball decreases and the elastic potential energy store increases. Some of the energy is also transferred to the surroundings. The thermal energy store of the surroundings increases and some of the energy is transferred by sound waves.

A car accelerating.
As the car moves, the chemical energy store of the petrol decreases and the kinetic energy store of the car increases. Some of the energy is also transferred by sound waves to the surroundings and the thermal energy store of the surroundings also increases.

A car decelerating.
As the car slows down, the kinetic energy store decreases and the thermal energy store of the surroundings and brakes increases. Some of the energy is also transferred by sound waves to the surroundings.

Bringing water to the boil.
Energy is transferred electrically from the chemical energy store in the power station to the heating element in the kettle and the thermal energy store of the water increases, which increases the kinetic energy stores of the particles that make up the water.

c

What is the equation linking kinetic energy, mass and speed?

kinetic energy = $\frac{1}{2}$ × mass × (speed)^2

Write the units for the following:

kinetic energy: **(E_k), joules, J**

mass: **(m), kilograms, kg, grams, g**

speed: **(v), metres per second, m/s**

List some examples of objects with kinetic energy stores.
(These are just a few examples. There will be many more.)
Toy car travelling down a ramp.
Parachute falling through the air.
Gas particles moving in the air.

d

What is the equation linking elastic potential energy, spring constant and extension?

elastic potential energy
= $\frac{1}{2}$ x spring constant x (extension)^2

Write the units for the following:

elastic potential energy: **(E_e), joules, J**

spring constant: **(k), newtons per metre, N/m**

extension: **(e), metres, m**

List some examples of objects with elastic potential energy stores.
(These are just a few examples. There will be many more.)
Stretched elastic band.
Tennis ball that has been squashed.
Extended spring.

e

What is the equation linking gravitational potential energy, mass, gravitational field strength and height?
gravitational potential energy
= mass x gravitational field strength x height

Write the units for the following:
gravitational potential energy: **(E_p), joules, J**
mass: **(m), kilograms, kg**
gravitational field strength: **(g), newtons per kilogram, N/kg**
height: **(h), metres, m**

List some examples of objects that have gravitational potential energy stores.
(These are just a few examples. There will be many more.)
Apple on a tree.
Plant pot on a windowsill.
Aeroplane in the sky.

f

What is the equation linking change in thermal energy, mass, specific heat capacity and temperature change?

change in thermal energy
= mass x specific heat capacity x temperature change

Write the units for the following:

change in thermal energy: **(ΔE), joules, J**

specific heat capacity: **(c), joules per kilogram per degree Celsius, J/kg °C**

Write a definition for specific heat capacity.

The amount of energy needed to increase the temperature of a 1kg material by 1°C.

g

Define Power.

The rate at which energy is transferred.

The rate at which work is done.

What is the equation linking power, energy transferred and time?

power = energy transferred ÷ time

What is the equation linking power, work done and time?

power = work done ÷ time

Write the units for the following:

power: **(P), watts, W**

energy transferred: **(E), joules, J**

time: **(t), seconds, s**

work done: **(E), joules, J**

An LED bulb has a power rating of 8W, a halogen bulb has a power rating of 28W but they both have a similar brightness. What is the difference?

The LED bulb transfers less energy per second than the halogen bulb.

The power output of a hairdryer is 2000W. How much energy is transferred per second?

2000 joules per second.

a

What is the law of conservation of energy?

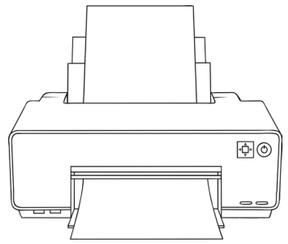
Energy cannot be created or destroyed. It can be transferred, stored or dissipated.

Define dissipation.

Energy being transferred to the surroundings.

b

The following questions are about energy stores and transfers in a printer.



The printer transfers energy from the chemical energy in the power station to the moving parts of the printer. How is the energy transferred from the power station to the printer? **electrically**

What is the final energy store? **kinetic**

Some of the energy to the printer is transferred to the surroundings. This energy is wasted. How is the energy transferred to the surroundings? **by heating**

What is the final energy store? **internal (thermal)**

c

For the following situations, suggest methods to reduce unwanted energy transfers and what the unwanted energy transfers are.
Hot water stored in a tank.

Insulation around the water tank. Reduces dissipation of energy to the surroundings into thermal energy stores.

Moving parts in a car.

Lubricating the moving parts. Reduces dissipation of energy to the surroundings into thermal energy stores.

d

Describe how thermal conductivity of a material affects how it transfers energy by conduction.

If a material has a high thermal conductivity, it will transfer heat via conduction at a much quicker rate.

e

How is energy lost from a building? What factors affect this?

Energy is transferred to thermal energy stores of the surroundings. The factors that affect this are the thermal conductivity of the walls and the thickness of them.

f

What is the equation linking efficiency, useful output energy transfer and total input energy transfer?

efficiency = useful output energy ÷ total imput energy transfer

What is the equation linking efficiency, useful power output and total power input?
efficiency = useful power output ÷ total power output

When energy is transferred in a closed system, what happens to the total amount of energy?
Total energy does not change.

How can the efficiency of an energy transfer be increased?

By increasing the useful output by reducing the wasted energy.

g

Which lorry is more energy efficient and why?

The red lorry is streamlined and so is more energy efficient . It wastes less energy due to air resistance and so has a higher useful output energy.

h

List the main energy resources.

Fossil fuels (coal, oil and gas) N **Nuclear fuel N** **Biofuel R**

Wind R **Hydroelectricity R** **Geothermal R**

Tidal R **Waves R** **Sun R**

i

Define renewable and non-renewable energy resources.

A renewable energy resource can be replenished.

A non-renewable energy resource will eventually run out.

j

For the energy resources that you have listed, write an R next to those that are renewable and N next to those that are non-renewable.

Except for oil, all energy resources are used for electricity generation. Which are used for heating?

geothermal, solar, fossil fuels (coal, oil and gas)

k

My main areas for improvement are:

l

Energy Resource	Enviromental Impact	Reliability of Output
Coal	Produces carbon dioxide, a greenhouse gas and sulphur dioxide which contributes to acid rain.	Reliable.
Oil	Produces carbon dioxide, nitrogen dioxide and sulphur dioxide. If it is spilt there can be disastrous environmental consequences.	Reliable.
Gas	Produces carbon dioxide.	Reliable.
Nuclear	Produces radioactive waste.	Reliable.
Biofuel	A lot of land is needed for growing the fuel.	Reliable.
Wind	Can be noisy and the turbines are dangerous for birds.	Unreliable.
Hydroelectricity	Large areas of land are needed and can cause disruption to ecosystems.	Reliable.
Geothermal	None.	Reliable.
Tidal	Can affect habitats.	Not always reliable due to changing tides.
Waves	Can affect habitats.	Unreliable.
Solar	None.	Unreliable.