a

Describe what a system is.

_____

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 _____ and the _____ store of the ball increases.

A squash ball hitting a wall.

When the ball hits the wall, the kinetic energy store of the ball _____ and the _____ store increases. Some of the energy is also transferred to the surroundings. The thermal energy store of the _____ increases and some of the energy is carried by sound waves.

A car accelerating.

As the car moves, the chemical energy store of the petrol _____and the _____ of the car increases. Some of the energy is also transferred by _____ waves to the surroundings and the energy store of the surroundings also increases.

A car decelerating.

As the car slows down, the _____ energy store decreases and the _____ energy store of the surroundings and brakes _____. Some of the energy is also transferred by _____ waves to the surroundings.

Bringing water to the boil.

The electric current transfers some of the _____ and the _____ energy store of the water increases, which increases the _____ energy stores of the particles that make up the water.

c

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

_____

Write the units for the following:

kinetic energy: _____

mass: _____

speed: _____

A toy car moving down a ramp has a kinetic energy store. Give two more 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: _____

A tennis ball that has been squashed has an elastic potential energy store. Give two more 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: _____

An apple on a tree is an example of an object that has a gravitational potential energy store. Give two more examples.

_____

_____

_____

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

Power is:

the rate at which _____

and the rate at which _____

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

_____

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

_____

Write the units for the following:

power: _____

energy transferred: _____

time: _____

work done: _____

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

_____

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?

_____

_____

a

What is the law of conservation of energy?

Energy cannot be _____ or destroyed. It can be _____,

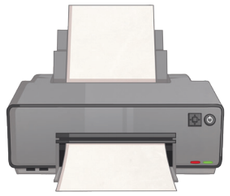
_____ or dissipated.

Define dissipation.

_____

b

The following questions are about energy stores and transfers in a printer. Choose the answers from the box.



by heating	electrically	internal (thermal)	kinetic

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?

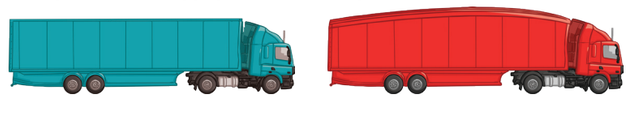
_____

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	Environmental Impact – what does it produce that is harmful/can it affect wildlife/is a lot of land needed/does it have any environmental impact?	Reliable/Unreliable – do you always get the same amount of energy?
Coal	Produces carbon dioxide, a greenhouse gas, and sulfur dioxide which contributes to acid rain.	Reliable.
Oil		
Gas		
Nuclear		
Biofuel		
Wind		
Hydroelectricity		
Geothermal		
Tidal		Not always reliable due to changing tides.
Waves		
Solar	None.	

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 carried 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.

The electric current transfers some of the **energy** 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**

A toy car moving down a ramp has a kinetic energy store. Give two more examples of objects with kinetic energy stores.

(These are just a few examples. There will be many more.)

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**

A tennis ball that has been squashed has an elastic potential energy store. Give two more examples of objects with elastic potential energy stores.

(These are just a few examples. There will be many more.)

Stretched elastic band.

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**

An apple on a tree is an example of an object that has a gravitational potential energy store. Give two more examples.

(These are just a few examples. There will be many more.)

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

Power is:

the rate at which energy is transferred;

and 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**

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

2000 joules per second.

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.

a

What is the law of conservation of energy?

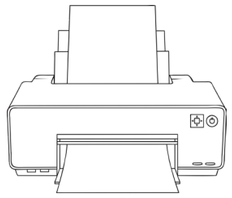
Energy cannot be created or destroyed. It can be transferred, stored or dissipated.

Define dissipation.

Energy being transferred to the surroundings.

b

The following questions are about energy stores and transfers in a printer. Choose the answers from the box.



by heating	electrically	internal (thermal)	kinetic

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	Environmental Impact – what does it produce that is harmful/can it affect wildlife/is a lot of land needed/does it have any environmental impact?	Reliable/Unreliable – do you always get the same amount of energy?
Coal	Produces carbon dioxide, a greenhouse gas, and sulfur dioxide which contributes to acid rain.	Reliable.
Oil	Produces carbon dioxide, nitrogen dioxide and sulfur 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	small amounts of greenhouse gases solar - uses up land, a lot of energy is needed to make the solar panels.	Reliable.
Tidal	Can affect habitats.	Not always reliable due to changing tides.
Waves	Can affect habitats.	Unreliable.
Solar	None.	Unreliable.