

Question

What are the 3 ways in which energy can travel?

Question

Explain what conduction is

Question

What type of materials are good conductors and what type of materials are bad conductors (good insulators)?

Question

Does conduction happen best in solids, liquids or gases?

Explain your answer

Question

Explain what convection is

Question

What is a vacuum and which forms of energy movement does it stop (convection / conduction / radiation)

Answer

When energy is passed from one particle to another (via vibrations)

Answer

Conduction, convection and radiation

Answer

Solids - the particles are close together

Answer

Metals are good conductors (e.g. copper) and non-metals are good insulators (e.g. plastics)

Answer

A vacuum is a space with no particles - this prevents energy transfer via conduction and convection (radiation can pass)

Answer

Heat rises because particles gain energy, spreading out and becoming less dense - when they lose energy they become more dense, sinking and forming the convection current

Question

Does convection happen best in solids, liquids or gases?

Explain your answer

Question

How does the outside temperature affect the rate at which heat is transferred?

Question

What type of objects usually emits radiation energy?

Question

What type of material absorbs radiation and what type of material reflects radiation?

Question

Which home insulation methods are usually the most cost effective?

Question

Give 3 examples of how energy can be lost from a house and explain how heat loss can be reduced

Answer

The greater the temperature difference the greater the heat transfer (loss or gain)

Answer

Convection happens best in liquids and gases as the particles are able to move

Answer

Black matt materials absorb radiation the most

White shiny materials reflect radiation the most

Answer

Hot objects as well as black objects are good emitters of radiation

Answer

Windows - use double glazing / thick curtains

Walls - use cavity wall insulation

Loft - use loft insulation (fibre glass)

Answer

Cavity wall insulation

Question

What are the 10 types of energy?  
Explain each one

Question

What 2 things affect the amount of energy an appliance transfers?

Question

What is power, and what units is it measured in?

Question

What is the equation for working out power?

Question

What units is energy measured with?

Question

Draw out the following energy transfers: -

- Toaster
- Battery operated torch
- Skateboarding down a hill
- Solar operated fan

Answer

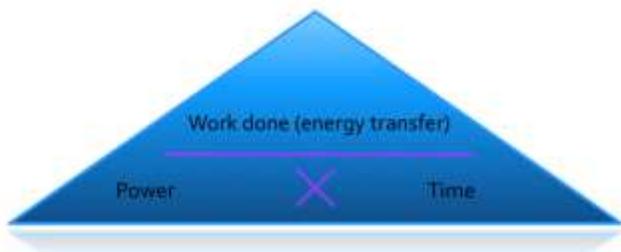
Power and length of time the appliance is on

Answer

Electrical; light; sound; kinetic (movement); nuclear; thermal (heat transfer from hot to cold objects); radiant (electromagnetic radiation from hot objects); gravitational potential; elastic potential; and chemical

Answer

Power (W) = Energy (J) ÷ Time (s)



Answer

Power means "how much energy per second", measured in watts (W) or kilowatts (kW)

Answer

- Toaster - electrical → thermal
- Battery operated torch - chemical → electrical → light (+ thermal)
- Skateboarding - gravitational potential → kinetic → thermal (frictional)
- Solar operated fan - light → electrical → kinetic

Answer

Joules (J) or kilojoules (kJ)

Question

What happens to the energy that is wasted in energy transfers?

Question

What does energy efficiency mean and how is it worked out?

Question

How would you make these items more efficient: -

- Toaster
- Light bulb
- Car

Question

What are the different energy resources?

Question

What are the 3 types of fossil fuel?

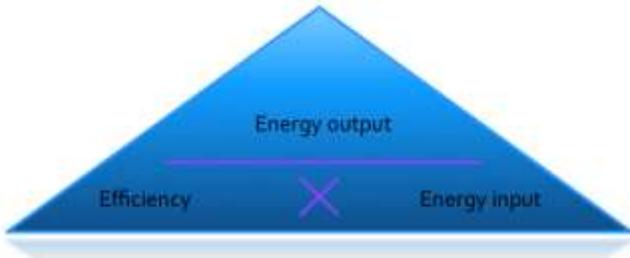
Question

How can you work out the cost of energy transferred from the mains supply?

Answer

Efficient devices transfer more energy (wasting less)

$$\text{Efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$



Answer

It is transferred to the surroundings (usually heating the surroundings up)

Answer

Solar; tidal; wind;  
geothermal;  
hydroelectric; fossil  
fuels; nuclear; wave

Answer

- Toaster - stop it losing light
- Light bulb - stop it losing heat
- Car - stop it losing heat and sound

Answer

Energy transfer =  
kilowatt hours x cost  
per unit

Answer

Coal, oil and natural  
gas

Question

What is the difference between renewable and non-renewable energy resources? Give examples of each

Question

Explain how fossil fuel or nuclear power stations work

Question

What is the job of a turbine?

Question

How do generators work (what are they made of)?

Question

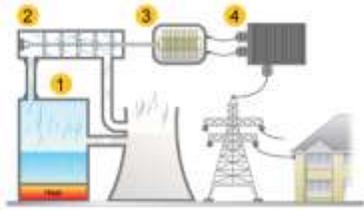
Why are fossil fuels bad for the environment?

Question

What causes acid rain, and why is it an environmental problem?

Answer

Fuel is burnt / reacted producing heat, turning water to steam - the steam turns a turbine which turns a generator, producing electricity



1. Heat is released from fuel, boiling water to make steam
2. Steam turns the turbines
3. Turbines turn generators, producing electricity
4. The electricity goes to the transformers, producing the correct voltage

Answer

Renewable resources can never run out (e.g. wind) whilst non-renewable resources will

Answer

Generators have a magnet, which spins within a coil of wire, inducing an electrical charge

Answer

Turbines are designed to spin a generator

Answer

Sulfur dioxide causes acid rain (which can kill plants and fish etc...)

Answer

Fossil fuels release carbon dioxide ( $CO_2$ ), which can lead to global warming (+ sulfur dioxide which leads to acid rain)

Question

What causes global warming, and why is this bad for the environment?

Question

How does the national grid utilise step-up and step-down transformers?

Question

What happens to the current when the voltage is increased - how does this affect heat loss from electrical cables?

Question

What are the pros and cons of producing energy using nuclear fuel?

Question

What are the pros and cons of producing energy using wind turbines?

Question

How can geothermal energy be used to generate electricity?  
What are the pros and cons?

Answer

Step-up transformers increase the voltage before the electricity goes into the cables - meaning the electricity is carried more efficiently (as there is less heat loss)

Step-down transformers reduce the voltage before the electricity reaches our house (making it safer)

Answer

Carbon dioxide causes global warming (increases temperature which can cause ice caps to melt resulting in flooding etc...)

Answer

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain; is renewable and reliable

Cons - toxic waste and expensive to decommission

Answer

Step-up transformer increases the voltage decreases the current (reducing heat loss from the cables)

Answer

Pipes take water down to hot rocks within the Earth (water is heated, forming steam which turns turbines which spin generators)

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain; is renewable and reliable

Cons - few areas suitable

Answer

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain; is renewable and reliable

Cons - ugly and noisy; unreliable; take up a lot of space

Question

How can tidal energy be used to generate electricity? What are the pros and cons?

Question

How can hydroelectric energy be used to generate electricity? What are the pros and cons?

Question

Order the following which generate electricity fastest: coal; oil; gas; and nuclear

Question

How can the Sun be used to generate electricity? What are the pros and cons?

Question

What is the main advantage of using non-renewable resources rather than renewable resources?

Question

How are the particles in a solid arranged?  
What movement can occur?

Answer

Water falls through turbines, which spin generators

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain; is renewable; reliable and can be stored

Cons - environmentally damaging to area (destroys habitat / ecosystems)

Answer

Tides run through turbines (on tidal barrages), which spin generators

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain and is renewable

Cons - affects habitats of wading birds and is unreliable

Answer

Solar cells use light energy to generate electrical current

Pros - no carbon dioxide or sulfur dioxide so no global warming / acid rain; is renewable

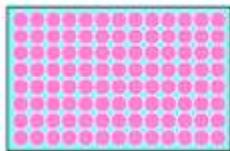
Cons - very expensive and is unreliable

Answer

Gas  
Oil  
Coal  
Nuclear

Answer

Solids



Close together with a regular pattern

Particles are able to vibrate on the spot

Answer

Non-renewable energy resources release a lot of energy quickly, and relatively cheaply

Question

How are the particles in a gas arranged?

What movement can occur?

Question

How are the particles in a liquid arranged?

What movement can occur?

Question

Draw out a basic heating curve for water (melting point  $0^{\circ}\text{C}$  and boiling point  $100^{\circ}\text{C}$ )

Question

Draw out a basic cooling curve for salol (melting point  $69^{\circ}\text{C}$ )

Question

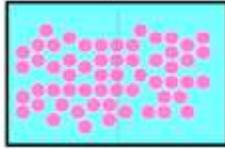
Where are metals generally extremely good at conducting both heat and electricity?

Question

What is a Leslie cube?

Answer

### Liquids

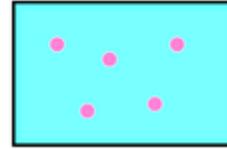


Close together but random

Particles are able to move around one another

Answer

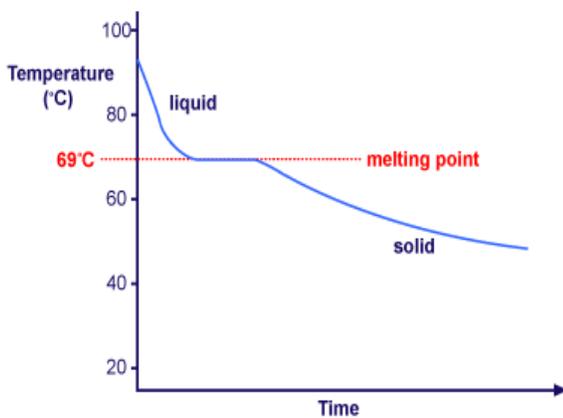
### Gases



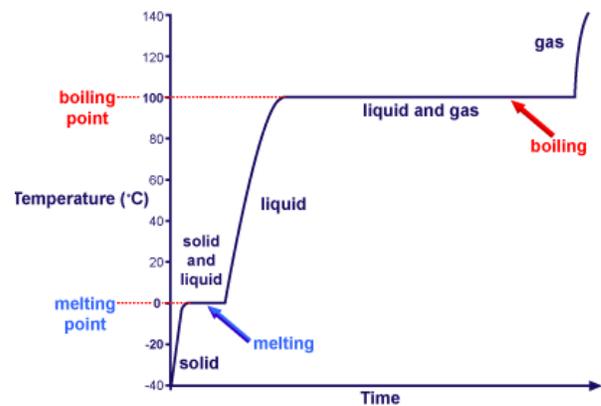
Far apart and random

Particles are able to move quickly in all directions

Answer



Answer



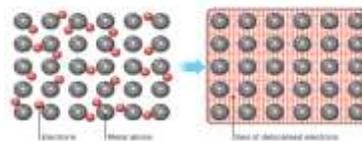
Answer

A Leslie cube is a device which has sides made of different materials - when filled with hot water the energy emitted from each surface will vary



Answer

Metals have a sea of delocalised electrons - these gain energy when the metal is heated and as they are not attached to any specific atom can move through the metal quickly



Question

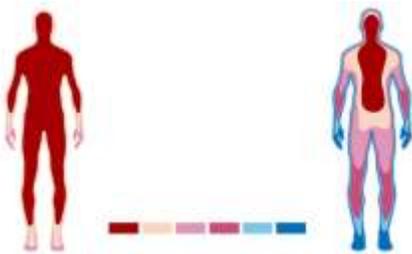
How does a thermos flask work to reduce heat loss (by design)?

Question

Explain the key principles of a thermos flask and how it works

Question

How does evaporation help when we sweat?



Question

Why does condensation occur?

Question

How do plants keep themselves cool?

Question

What is a U-Value?

What does it measure?

Answer

- Glass bottle is double-walled with a vacuum between the two walls
- Walls either side of the vacuum are silvered
- Bottle is supported by insulating form
- Stopper is made of plastic and filled with cork or foam
- The whole design minimises any heat loss through conduction, convection or radiation

Answer

A thermos flask reduces heat loss via conduction, convection and radiation



Answer

When particles lose enough energy to the surroundings they can change state from a gas to a liquid

Answer

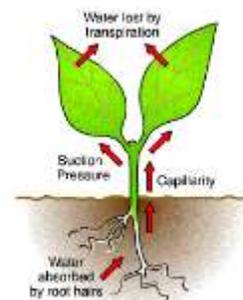
Evaporation helps to cool us down by removing heat from our body to the environment (utilising sweat) - as the sweat evaporates from liquid to gas a small amount of heat is taken from that area of the skin...

Answer

A U-Value is a measurement of the effectiveness of the insulation in a home - the lower the U-Value the more effective the insulation

Answer

Plants utilise a transpiration stream to keep themselves cool - water is moved from the roots to the surface of the leaves where it evaporates



Question

What is payback time?

Question

What is specific heat capacity and how can it be worked out?

Question

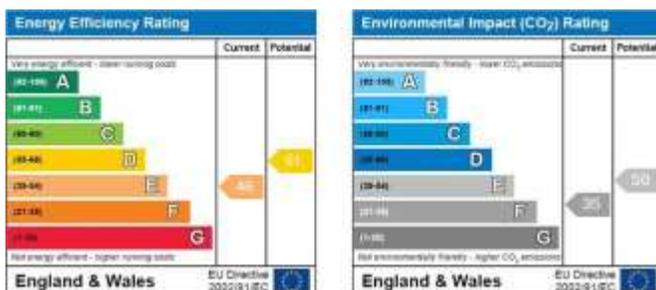
What is the equation to work out the energy needed to heat something?

Question

What is a Sankey diagram?

Question

What are efficiency ratings?



Question

What is a power rating?



Answer

The amount of energy it takes to heat up 1kg of the substance by 1°C - this is the specific heat capacity

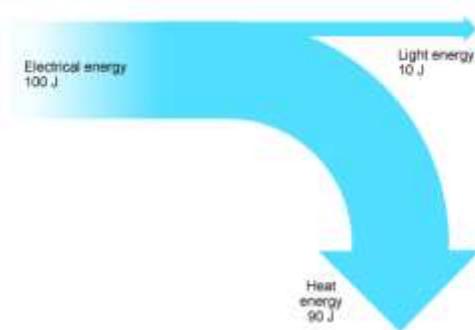
Answer

Payback time is the time it takes to get your money back from investing in insulation

Payback time (years) = cost of insulation (£) ÷ savings per year in fuel costs (£)

Answer

Sankey diagrams summarise the energy transfers occurring



Answer

Energy (J) = Mass (kg) × Specific Heat Capacity (c) × Change in Temperature (°C)

$$Q = mc\Delta T$$

Answer

Power rating is how much energy a device uses (1 watt = 1 joule per second)

Answer

Efficiency ratings show how much energy an appliance (or house) uses as well as an indication to their running costs

Question

What are generators  
and how do they  
work?

Question

How are generators  
spun?

Answer

Generators are spun via a connecting turbine - this is either spun directly (i.e. from a wind farm) or turned when fossils fuels or nuclear fuel heats water which turns to steam and drives the turbine

Answer

Generators are devices which transfer kinetic energy into electrical - they induce a current by spinning a coil of wire within a magnet

