

# Energy Transfers

## Temperature Changes

Define internal energy, giving its units.

The energy stored in the movement of particles, measured in Joules (J).

Define temperature, giving its units.

How hot or cold an object is, measured in degrees Celsius (°C).

Does a hot or cold object have more internal energy?

A hot object has more internal energy.

What three factors affect the internal energy of an object?

1. Its temperature
2. The material it is made of
3. Its mass

How does our body regulate temperature?

Keeping cool	Keeping warm
Sweating	Shivering
Getting a red face	Skin can go pale
Hairs lie flat	Hair stands upright

What is Albert Einstein's famous quote about energy?

"Energy cannot be created or destroyed, it can only be changed from one form to another."

## Transferring Energy

Give details of the following forms of heat transfer, giving an example of each.

Conduction - Energy transferred through the vibrations of particles. The vibrations pass through the material. Conduction occurs best in solids because the particles are very close together. A radiator is an example of conduction.

Convection - Energy can be transferred through liquids and gases by convection. When part of a fluid is heated, it expands and becomes less dense than the fluid around it. It floats upwards, causing the cooler fluid to take its place, forming a convection current. Boiling water is an example of convection.

Radiation - Energy is transferred from hot objects by radiation (infrared radiation). Everything gives out (emits) infrared radiation. The hotter the object, the more infrared radiation it emits. Radiation travels in waves and does not need a medium to travel through. When radiation hits something, it can be absorbed or reflected. The Sun heating the Earth is an example of radiation.

State nine forms of energy stores, giving an example for each one. The first one has been done for you.

1. Thermal energy - energy stored in hot objects, e.g. a hot saucepan.
2. Light energy - lightbulb
3. Sound energy - talking
4. Electrical energy - kitchen appliances
5. Kinetic energy - a moving car
6. Strain energy - elastic band
7. Chemical energy - food, batteries
8. Gravitational potential energy - a book on the bookshelf
9. Nuclear potential energy - nuclear bomb

## Controlling Transfers

Will a thermometer painted white or black heat up faster? Why? A thermometer painted black will heat up faster as it is a better absorber of infrared radiation.

How can the heat loss be reduced in a house?

1. Loft insulation
2. Double glazing
3. Cavity wall insulation

What is payback time? The time it takes to save the money spent on an energy-saving solution. How cost effective the solution is.

Give the equation for payback time.

Payback time =  $\text{cost} \div \text{saving per year}$

If savings are bigger than costs then the method is cost effective and worth doing.

## Paying for Energy

What is the equation for energy use? Give units in your answer.

Energy use (kWh) = power rating (kW) × time (hours)

A 1 kW electric fire operates for 5 hours. How much energy does it use? 5 kWh

## Power and Efficiency

What is the unit of power? Watt (W)

What do power ratings show?

The highest power input allowed to flow through the appliance. Power being the amount of energy transferred per second.

What does 'efficiency' mean? Give the efficiency equation in your answer.

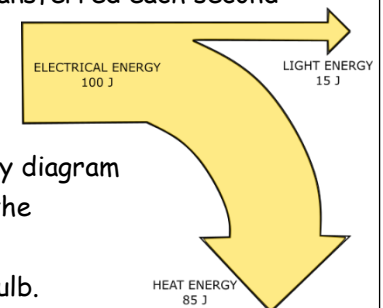
How much of the energy transferred by a machine is useful.

Efficiency =  $\frac{\text{useful energy}}{\text{input energy}} \times 100$

Use the efficiency equation to calculate the % efficiency of the following appliances.

Useful (J)	Starting (J)	Efficiency (%)
50	100	50
25	200	25
10	40	25

100 J is supplied to a lightbulb each second by electricity. 15 J of the energy input is transferred each second by light and 85 J is transferred each second by heating.



Draw a Sankey diagram to illustrate the efficiency of this lightbulb.

# Plants and their Reproduction

## Classification

Name the five kingdoms and their characteristics.

Kingdom	Characteristic
Animals	Multicellular, cells have a nucleus and no cell walls, feed on other organisms.
Plants	Multicellular, cells have a nucleus and have cell walls made of cellulose, can make their own food.
Fungi	Multicellular, cells have a nucleus and cell walls made of chitin, feed off dead organisms and decaying material.
Prokaryotes	Unicellular, cells have no nucleus.
Protoctista	Unicellular, cells have a nucleus.

Define biodiversity.

The variety of species in an area, e.g. the Amazon rainforest.

## Germination and Growth

What is needed for a plant to grow and keep on surviving?

Water, nutrients, light, air, room to grow, the right temperature, time.

Where specifically does photosynthesis occur?

Photosynthesis occurs in chloroplasts in cells in the leaf.

Give the word equation for photosynthesis.

carbon dioxide + water → glucose + oxygen

What is the opposite of photosynthesis? Give its name and the equation. Respiration:

oxygen + glucose → carbon dioxide + water

## Types of Reproduction

Name the two types of reproduction.

- Sexual reproduction
- Asexual reproduction

Define the following key terms.

- Gametes - sex cells.
- Fertilisation - when the male and female gametes (pollen grain and ovule respectively) fuse to become one cell.
- Zygotes - a cell with a complete set of chromosomes formed when a male gamete fertilises a female gamete.

## Fertilisation and Dispersal

Give details of the most common methods of seed dispersal, along with examples.

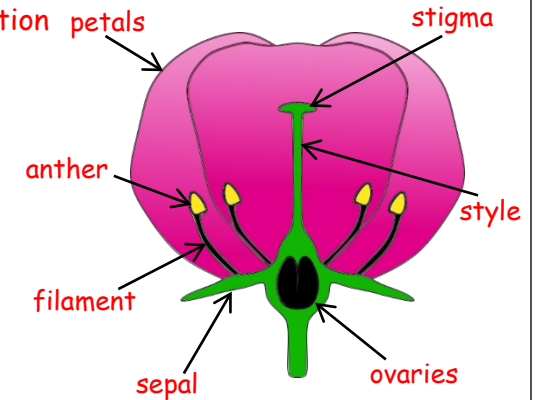
Method	Detail	Examples
Wind	Fluffy heads of the seeds help them get blown in the wind.	Dandelion, sycamore
Animals (inside)	Animals eat the fruit, then pass the seeds out in their faeces away from the parent tree.	Tomato, plum, raspberry, grape
Animals (outside)	Hooks on the seeds attach to fur on an animal and are carried away.	Burdock, goose grass
Self-propelled	Have a pod that bursts open when ripe, throwing the seeds away from the plant.	Pea pod

## Pollination

Name two ways in which plants can be pollinated.

- Insect pollination
- Wind pollination

Label parts of the flower.



Match up the different parts of the flower with its function.

Petals	Produces the female sex cells
Anther	Can be brightly coloured and scented to attract insects
Filament	Collects pollen
Sepal	A male reproductive organ - supports the anther
Stigma	A male reproductive organ - produces pollen grains
Style	Long stalk that connects the stigma and ovary
Ovaries	A leaf-like structure - protects a flower bud

# Rocks

## Rocks and Their Uses

Rocks are made of different **grains**. Grains are made up of one or more chemical compounds. In rocks, these compounds are called **minerals**. Grains come in different shapes and sizes. The combinations of these grains give the **texture** of the rock.

How do geologists classify rocks?

**Geologists classify rocks by the minerals they contain and their texture.**

When grains fit together with no gaps they are interlocking, forming **crystals**.

Rocks made up of rounded grains are **porous**, meaning the rock can absorb water as the water can get into the gaps between the grains. If water can flow through a rock, it is **permeable**.

Name a type of rock which is quarried and used as a building material.

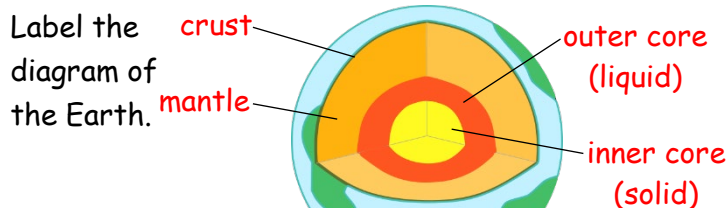
**Limestone**

## Igneous Rock

Igneous rock forms when molten rock cools down and solidifies. The property of the igneous rock formed depends on how quickly the molten rock freezes.

Rocks with small crystals form when molten rock is cooled quickly, e.g. **basalt**.

The molten rock in the mantle of the Earth is called **magma**. This molten rock cools down quickly when it reaches the Earth's surface during a volcanic eruption. Once the molten rock reaches the surface of the Earth it is called **lava**.



What affects the size of the crystals formed when molten rock cools?  
**How quickly the rock is cooled.**

## Weathering and Erosion

Define the following types of weathering:

- Chemical weathering - **The breaking down of rocks due to chemical reactions. E.g. weathering due to acid rain.**
- Biological weathering - **The breaking apart of rocks due to plants or animals. E.g. a tree root breaking a rock apart.**
- Physical weathering - **Cracks forming due to rocks being heated and cooled repeatedly. (Heat causes expansion, cooling causes contraction).**

What is freeze-thaw action?

**Physical weathering due to water inside the cracks of a rock freezing, forcing the cracks to get bigger.**

Define erosion. **The movement of pieces of rock broken up from weathering.**

Rocks can get transported if they fall into a river. Abrasion occurs when these rocks knock against each other in the river. Rocks and sand in a river are called **sediment**.

## Sedimentary Rocks

Sediment gets **deposited** by a river when the river slows down. Layers of deposited sediment will build up over time. The **pressure** of the layers on top will cause the lower layers to compress and squash together, squeezing water out of the gaps in the grains. Over time sedimentary rock is formed.

Sedimentary rocks are made from **grains**, not from **interlocking crystals**.

Properties of sedimentary rock depends on the types of **sediment** the rock was made from.

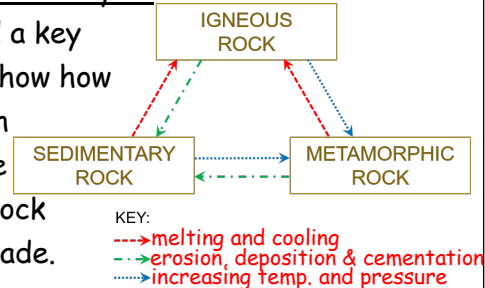
## Metamorphic Rock

Metamorphic rocks form when rocks get **compressed** (squashed). High temperatures and pressures in the Earth can cause the rock minerals to change and new crystals to form.

Metamorphic rocks are always made from interlocking crystals, and usually have different **properties** to the rocks from which they were made.

## The Rock Cycle

Add a key to show how each type of rock is made.



# Earth and Space

## Gathering the Evidence

How long does it take the moon to orbit the Earth? **The moon takes just over 27 days to orbit the Earth.**

We now know the planets in our solar system orbit the sun. What was the original assumption? **That the Sun and the other planets in our solar system orbit the Earth.**

Give the advantages and disadvantages of the following ways of exploring space.

	Advantages	Disadvantages
Space probes	<b>Much cheaper and safer than manned spacecraft.</b>	<b>Impossible to repair once out of the Earth's gravitational pull.</b>
Fly-by	<b>Easiest and least expensive type of mission to another planetary body. Can explore outside or Solar System.</b>	<b>Very limited data and information sent back as they are a long way from the Earth.</b>
Rover	<b>Can analyse rocks that make up the surface of a planet.</b>	<b>Cannot explore the whole surface of a planet. Expensive and impossible to repair if they are damaged.</b>
Crewed Spacecraft	<b>Astronauts can make decisions during the mission if things change. Better data can therefore be collected.</b>	<b>Manned missions are more expensive and carry much higher risks.</b>

## Beyond the Solar System

What is a galaxy?

**A large group of stars.**

Name the galaxy that contains our solar system.

**The Milky Way**

What is a light year?

**The distance travelled by light in one year.**

What is a star?

**A huge ball of gas that gives off a large amount of energy.**

## Magnetic Earth


What is a compass?


**A magnetised piece of metal that can swing around, with one end always pointing north.**


What is a magnetic field?

**The space around a magnet where the magnet can affect magnetic materials or other magnetics.**

Would the following magnets attract or repel? Annotate the diagrams.

**attract**  **Opposite charges attract, like charges repel**

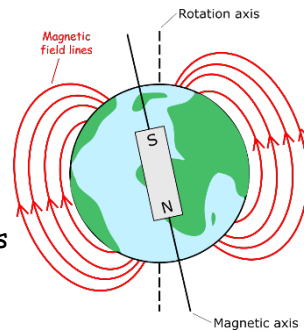
**repel**  **Opposite charges attract, like charges repel**

**repel**  **Opposite charges attract, like charges repel**

Name three magnetic materials

- Iron**
- Nickel**
- Cobalt**

Add the magnetic field lines to the diagram of the Earth. This explains why compasses always point north.



## Gravity in Space

What is gravity?

**Gravity is an attractive force that acts between all objects that have mass.**

What two factors affect the force of gravity between two objects?

- The mass of the objects.**
- The distance between the objects.**

## Seasons

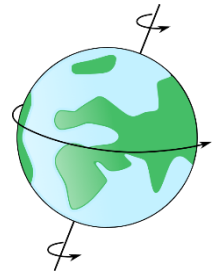
The Earth is divided into two **hemispheres**, separated by the **equator**.

It takes Earth 365.25 days or a **year** to orbit the **Sun**.

The Earth is slightly **tilted** at 23.5 degrees from the vertical. This causes the **seasons** or changes in the climate.

**Day and Night** - Earth spins on its **axis** as it **orbits** the Sun. It takes the Earth **24** hours to make one complete turn on its axis, so an Earth day is 24 **hours** long. As the Earth spins, we move from **shadow** to **light** and back to shadow.

When it is daytime in the UK, our part of the planet is facing **towards** the Sun. It is night-time in the UK when our part of the planet is facing **away** from the Sun.



Mass and weight are **not** the same.

Define mass.

**Mass is the amount of matter in an object.**

Define weight.

**Weight is a force caused by the pull of gravity acting on a mass.**

What is the equation for calculating weight? Give units in your answer.

**Weight (kg) = mass (N) x gravitational field strength (N/kg)**

What is the gravitational field strength of the Earth?

**10 N/kg**

What is a satellite?

**A satellite is anything that orbits a planet.**