

Year 7 - Combined Science - Cycle 1

Key vocabulary

- **Efficiency:** The proportion of energy a system transfers usefully.
- **Energy:** the ability of a system to do work, measured in Joules (J).
- **Fuel:** a substance which contains a store of chemical or nuclear energy that can be easily transferred.
- **Gravitational potential energy:** energy stored in an object due to its position in a gravitational field.
- **Insulation:** method or material used to reduce energy transfer by heating.
- **Kinetic energy:** energy stored in a moving object.
- **Non-renewable (fuel):** an energy resource which will run out as the supply cannot be replaced.
- **Renewable (fuel):** An energy resource that will never run out.

Week 1 - Energy stores and transfers

- **Energy** can be **stored** in different forms:
 - Gravitational potential energy,
 - Kinetic energy,
 - Elastic potential energy,
 - Chemical energy,
 - Nuclear energy,
 - Magnetic energy,
 - Thermal energy.
- Energy can be **transferred** between these stores by: Heating (thermal), Light (radiant), Sound, Electrical Current.
- Kinetic energy = $\frac{1}{2} \times \text{mass} \times \text{velocity}^2$
- Gravitational potential energy = $\text{mass} \times \text{gravitational field strength} \times \text{height}$

Week 2 - Energy transfer by heating

- The **Conservation of Energy** states that energy cannot be created or destroyed, only transferred between stores in a system.
- **Useful energy** is energy in the form needed, in the place it is needed.
- **Wasted energy** is energy in an unwanted form or in an unwanted place.
- The efficiency of a system can be calculated as:
$$\text{Efficiency} = \frac{\text{Useful energy transferred}}{\text{Total energy transferred}}$$
- Wasted energy often **dissipates** (spreads out) to the surroundings as heat.

Week 3 - Energy resources

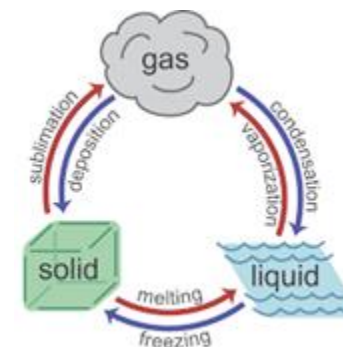
- Energy transfers can be reduced by **insulation**.
- Materials such as plastic and gas are good insulators. Materials which trap air prevent convection.
- **Electricity** is generated from **non-renewable fuels** including fossil fuels (coal, oil and natural gas) which emit **greenhouse gases** and nuclear fuels (uranium), which emit no greenhouse gases but do produce radioactive waste.
- Greenhouse gases including **carbon dioxide** that cause global warming and contribute to climate change.
- **Renewable resources:** Solar; wind, wave, geothermal, tidal, hydroelectric power. These emit no carbon dioxide as no fuel is burned.
- Renewable resources can be **unreliable**.

Week 4 - The particle model

- All **matter** is made up of tiny particles.
- The **particle model** explains state changes in terms of the arrangement, movement and energy stored in its particles.
- **Solids:** the particles are held closely together, by strong forces of attraction. Particles are arranged in a regular pattern and vibrate (wobble) about fixed positions.
- **Liquid:** the particles are also held closely together by fairly strong forces of attraction. However, the particles can move past each other.
- **Gas:** the particles are far apart from each other because the forces of attraction between them are weak. Particles move quickly in all directions.

Week 5 - Changes in state

- Transferring **energy** to a substance causes an increase in temperature.
- When the particles of a substance gain enough energy, the substance will undergo a **change in state**.



- Changes in state are **physical changes**, which means they can be reversed.

Key vocabulary

- **Atom:** the smallest particle of a chemical element that can exist
- **Compound:** contains two or more types of atom chemically combined together
- **Element:** a substance that contains just one type of atom
- **Mixture:** contains two or more substances that are not joined together
- **States of matter:** one of three different forms a substance can have (solid, liquid or gas)
- **Cell surface membrane:** thin barrier surrounding the cell that controls what enters and leaves.
- **Cytoplasm:** this is the jelly-like substance where the chemical reactions take place in the cell.
- **Mitochondria:** a structure found inside cells where aerobic respiration happens.
- **Nucleus:** a large structure that contains genes that control the activities of the cell .

Week 6 - Mixtures and purity

- **Pure substances:** are the same in all parts (fixed composition) and we can't separate them into other substances using physical methods (e.g. filtering or picking bits out).
- Pure substances can be an **element** or **compound**, with no other substances mixed in.
- Pure substances have a **fixed melting and boiling point**.
- **Mixtures** are **impure substances**, that contain elements and/or compounds that are not chemically joined together.
- Mixtures do not have a fixed composition and can be **separated** using physical methods.
- Mixtures melt and boil over **range** of temperatures.
- A flat section on a **heating/cooling curve** indicates a change in state.

Week 7 - Cells

- All living things carry out the 7 **life processes: Movement, Respiration, Sensitivity, Growth, Reproduction, Excretion and Nutrition.**
- **Cells** are the basic units from which **tissues** and all living things are made.
- Animal and plant cells have a **nucleus** and are described as **eukaryotic** cells.
- All animal cells have the same basic parts: **nucleus, cytoplasm, cell surface membrane, mitochondria** and **ribosomes**.
- Plant cells have thick **cell walls** and may have other features not found in animal cells: **chloroplasts** and a **permanent vacuole**.
- **Bacteria cells** do not have a nucleus and are described as **prokaryotic** organisms.

Week 8 - Specialised cells

- Some cells are **specialised** and have special functions (jobs). There are about 200 different types of specialised cells in humans.
- All human cells have the same basic design, but their sizes, shapes and sub-cellular structures can be different, so that specialised cells are **adapted** to their functions.
- **Differentiation** describes the process by which less specialised cells become more specialised for a particular function.
- **Nerve cells** (neurones) carry electrical impulses around your body. They are long and thin.
- **Red blood cells** transport oxygen around your body. They have a disc shape and unlike most animal cells they have no nucleus.
- **Root hair cells** have a large surface area to enable them to absorb water and nutrients from soil

Week 9 - Organising organisms

- A group of similar cells that perform a particular function are known as a **tissue**.
- 2 or more tissues working together are known as an **organ**.
- A number of organs working together in the body are known as an **organ system**. E.g. the digestive system and the nervous system.
- An **organism** is made up of a number of organ systems.
- The **skeletal system** is made up of your bones, ligaments and tendons. It provides structure, produce blood cells and protect your body.
- Your **muscular system** works with your skeletal system to enable your body to move.
- Your muscles work in **antagonistic pairs** - when one muscle contracts and shortens, the other muscle relaxes and lengthens.

Week 10 - Using microscopes

- A **microscope** is used to magnify tiny things, such as cells.
- To use a light microscope safely:
 1. Always start with the **objective lens** with the lowest magnification.
 2. Place the slide you want to observe on the stage, holding it in place with the clips.
 3. Adjust the light source so that the light goes up through the slide.
 4. Look through the **eyepiece** and adjust the focusing wheel slowly until the image is clear. .
 5. Repeat steps 1 to 4 using an objective lens with a **higher magnification** to see the object in greater detail.
- **Electron microscopes** have a higher magnification and greater resolution, but are more expensive and cannot destroy the sample being observed