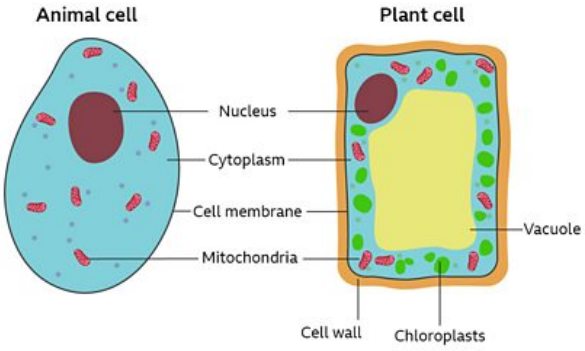
- **Biological World**

BW1: Investigate the structures of animal and plant cells and relate them to their functions



- List and explain the 7 characteristics of life (Mrs. Gren)
- Draw a diagram of a plant and animal cell and label the nucleus, cell membrane, cell wall, and give functions of each
- Label the parts of a microscope and give the function for each part
- Define what is meant by a cell, tissue, organ, system and organism
- Recall the procedure you followed to examine plant and animal cells using a microscope and list the stains/dyes you used in each.
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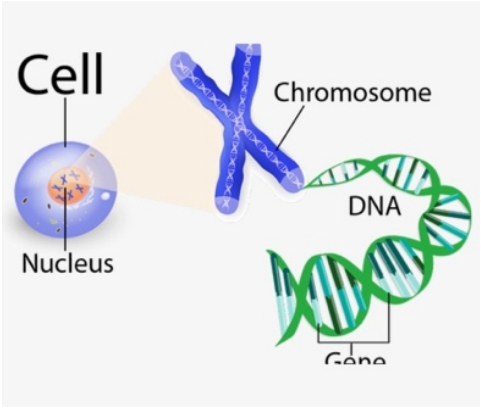
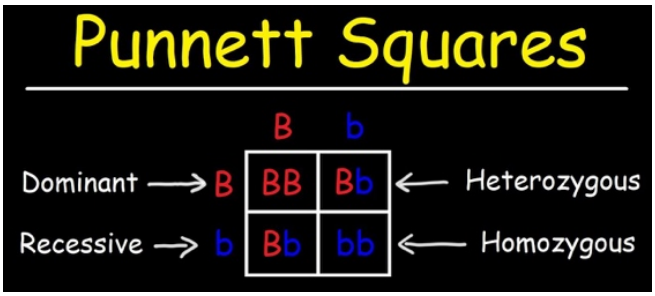
BW2 - Describe asexual and sexual reproduction; explore patterns in the inheritance and variation of genetically controlled characteristics

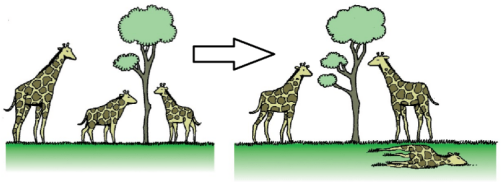


- Describe the difference between sexual and asexual reproduction
- Label the male and female reproductive systems
- Give the functions of the testes, scrotum, sperm duct, penis, urethra, ovary, fallopian tube, womb, cervix and vagina
- Describe what is meant by sexual intercourse and fertilisation
- Recognise the main stages of the menstrual cycle
- Define what is meant by genetics, chromosomes, genes, natural selection, species, variation, evolution, homozygous, heterozygous, inherited traits and acquired traits
- Recognise the number of pairs of chromosomes we have (23 pairs, 46 chromosomes in total) and recognise that genes are the part of the chromosome that control heritable characteristics
- List what chromosomes are made of (DNA and protein)
- Construct genetic crosses using punnet squares

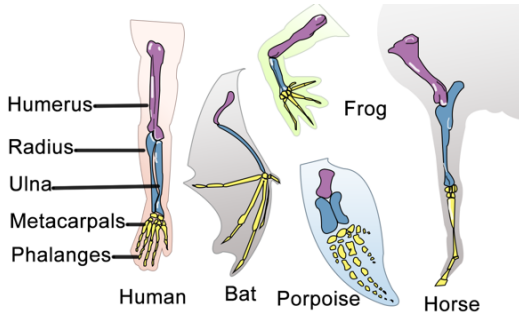


BW3 – outline evolution by natural selection and how it explains the diversity of living things

- Outline the theory of evolution by natural selection and describe how Darwin came up with the theory
- Define what is meant by natural selection, fitness and evolution
- List and describe evidence for evolution having occurred (homologous structures in cats, whales, bats and humans)



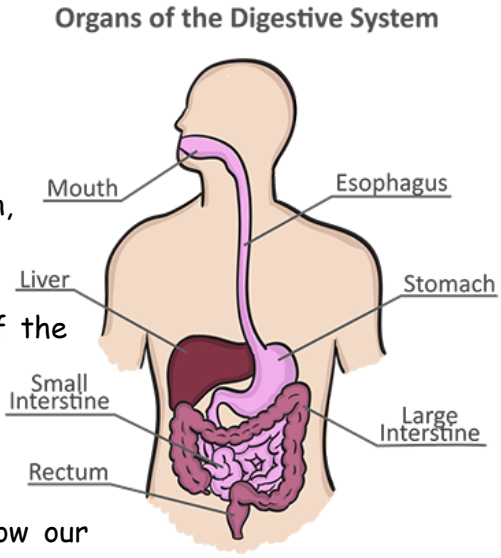
Natural Selection in action



BW4 - Describe the structure, function, and interactions of the organs of the human digestive, circulatory, and respiratory systems

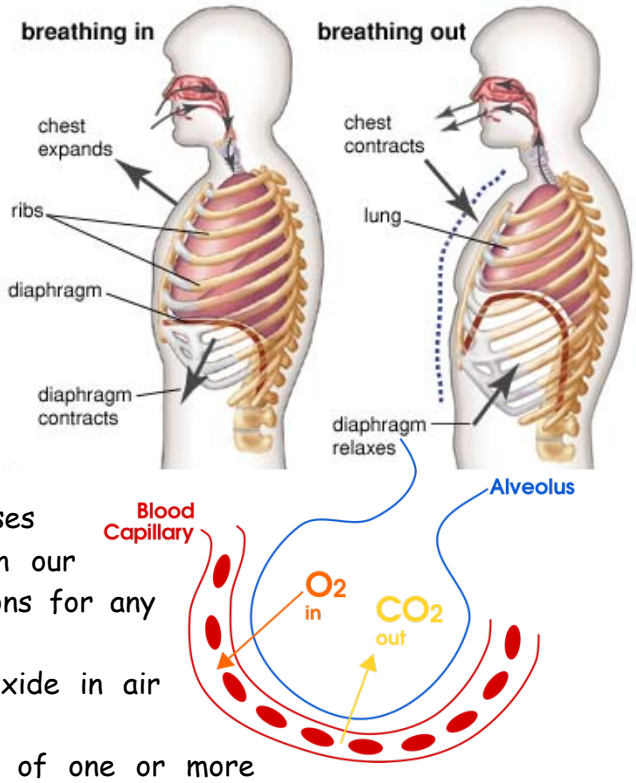
Digestive

- Explain why we need food
- List the main nutrients in food
- Describe the function of each nutrient
- List and explain the stages of nutrition (ingestion, digestion, absorption, assimilation and egestion)
- List and give functions of the main structures of the digestive system
- State what digestion is
- Explain the difference between chemical and physical digestion
- Explain what is meant by a balanced diet and how our lifestyle can affect out nutrition requirements
- List and explain the characteristics of one or more diseases associated with the digestive system



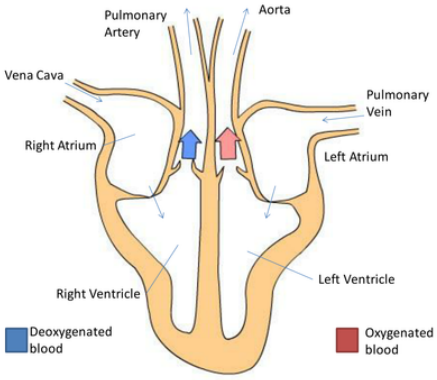
Respiratory

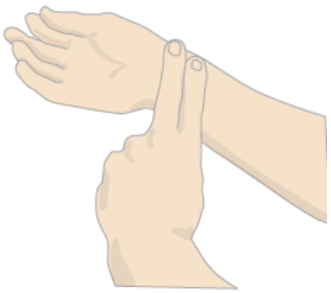
- Describe the roles of the respiratory system (take oxygen in, release carbon dioxide and speech)
- List and give functions of the main structures of the respiratory system
- Give adaptations of alveoli and explain how gaseous exchange occurs in the alveoli (diffusion) in the lungs – Name what gas enters and leaves the blood
- Describe the difference between inhalation and exhalation and outline what happens strictures of the respiratory system during both processes
- Describe the effect of exercise on our breathing rate and explain the reasons for any changes
- Outline how to test for carbon dioxide in air (limewater experiment)
- List and explain the characteristics of one or more diseases associated with the respiratory system



Circulatory

- Draw and label the structure of the heart. Know all the main chambers (ventricles and atriums) and the blood vessels (aorta, pulmonary artery, pulmonary vein, vena cava)
- State the difference between veins and arteries
- Give the names and functions of the parts of the blood (red blood cells, white blood cells and platelets)
- State why is the left side of the heart bigger than the right?
- Outline what happens as blood is pumped by the heart around the body (where does it enter and leave and where does it pick up oxygen and release carbon dioxide or pick up carbon dioxide and release/lose oxygen)
- Describe what a pulse is and how to measure it
- Explain why our heart rate increases while exercising





BW5 – conduct a habitat study; research and investigate the adaptation, competition and interdependence or organisms within specific habitats and communities

- Define what is meant by ecology, habitats and ecosystems
- Describe how to use a quadrat, sweep net, pitfall trap and pooter
- Distinguish between qualitative and quantitative data
- Recall how to carry out a qualitative study of plants and animals
- Recall how to carry out a quantitative study of plants and animals (percentage frequency and percentage cover)

Plant species	1	2	3	4	5	% Frequency
Grass	✓	✓	✓	✓	✓	100
Dock leaf		✓				20
Lesser celandine			✓		✓	40
Thistle	✓		✓			40
Dandelion		✓	✓	✓		60

- Define what is meant by adaptation, competition and interdependence and give examples of each
- Distinguish between a food chain and a food web and represent energy flow using both
- Define what is meant by a producer, primary consumer, secondary consumer and tertiary consumer
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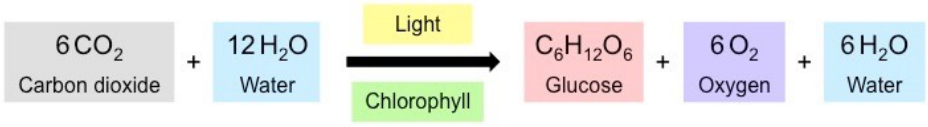
BW6 – evaluate how human health is affected by; inherited factors and environmental factors including nutrition; lifestyle choices; examine the role of micro-organisms in human health

- Explain why we need food
- List the main nutrients in food
- Describe the function of each nutrient
- Explain what is meant by a balanced diet and how our lifestyle can affect out nutrition requirements
- List and explain the characteristics of one or more diseases associated with the digestive system
- Define what is meant by mutations
- Explain how mutation introduces variation and their role in common genetic disorders
- Define what is meant by a micro-organism
- Describe the characteristics of bacteria, viruses and fungi and list pros and cons of each in relation to human health (bacteria and viruses can cause illnesses, bacteria can be used to make milk, cheese etc. and fungi are a food source and penicillin is used in antibiotics)

BW7 – describe respiration and photosynthesis as both chemical and biological processes; investigate factors that affect respiration and photosynthesis

- Describe the stricture of flowering plants and give the roles of each part (roots, stem, leaves, flower)
- Describe what is meant by photosynthesis and recognise the conditions necessary for photosynthesis
- Examine the effect of light intensity on the rate of photosynthesis
- List the word and chemical equation for photosynthesis



- Describe what is meant by respiration
- Recognise the difference between aerobic and anaerobic respiration
- Examine the effect of temperature on the rate of respiration
- List the word and chemical equation for respiration
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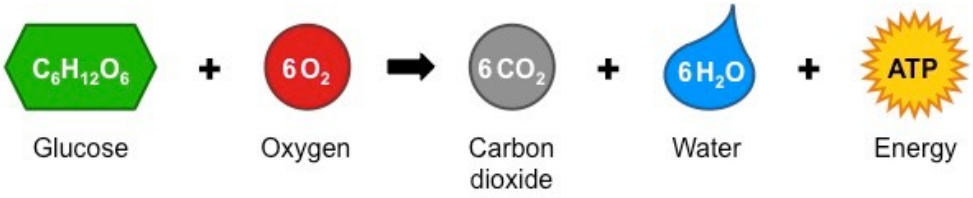
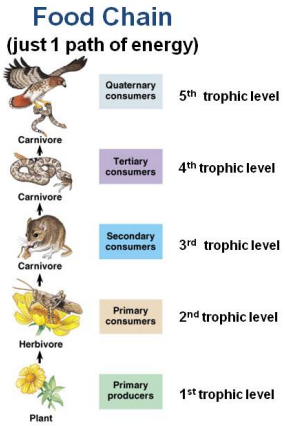
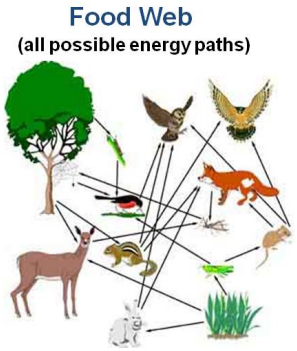


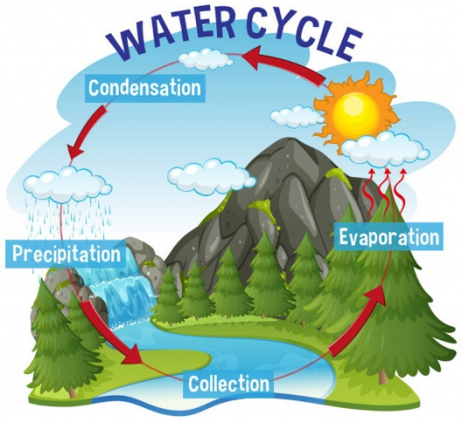
BW8 – explain how matter and energy flow through ecosystems

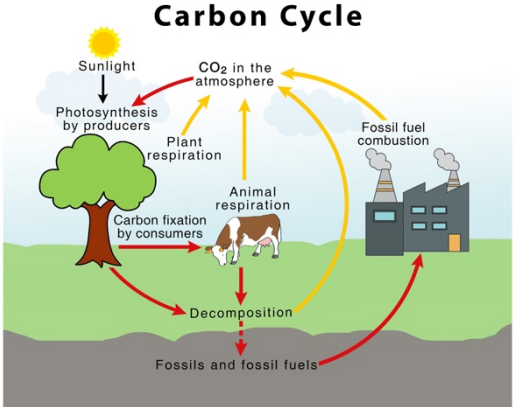
- Distinguish between a food chain and a food web and represent energy flow using both
- Define what is meant by a producer, primary consumer, secondary consumer and tertiary consumer
- Describe the stages of the Carbon and Water cycle
- Distinguish between a carbon source and a carbon sink and give examples of each.





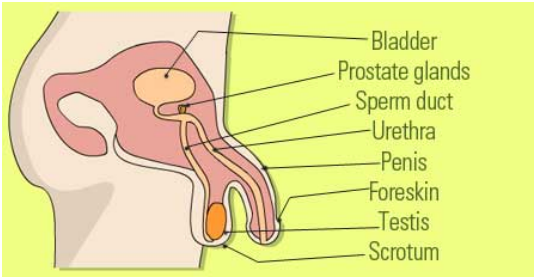
The *arrow* points to the eater and shows the transfer of energy.

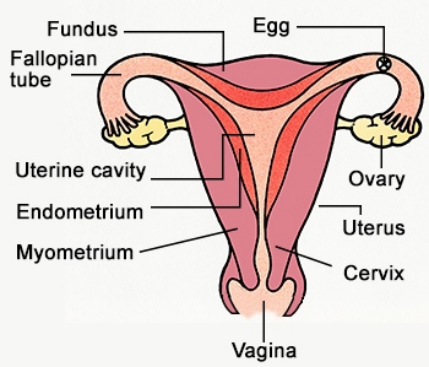


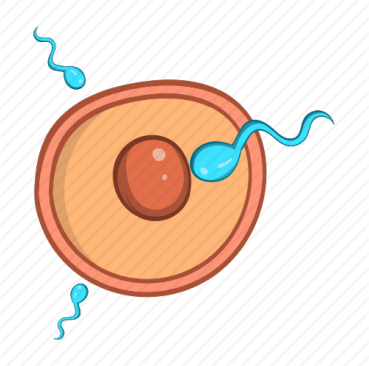


BW9 – explain human sexual reproduction; discuss medical, ethical and societal issues

- Describe the difference between sexual and asexual reproduction
- Label the male and female reproductive systems
- Give the functions of the testes, scrotum, sperm duct, penis, urethra, ovary, fallopian tube, womb, cervix and vagina
- Describe what is meant by sexual intercourse and fertilisation
- Recognise the main stages of the menstrual cycle
- Describe some of the medical, ethical and societal issues associated with sexual reproduction (infertility, designer babies and contraception)







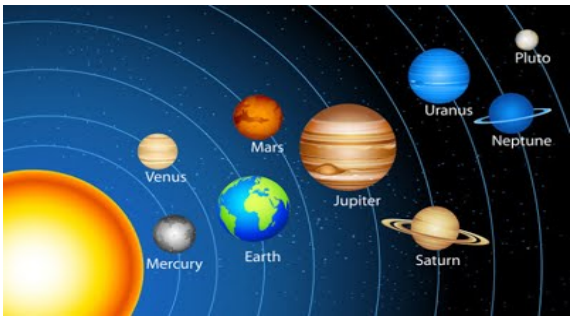
BW10 – evaluate how humans can successfully conserve ecological biodiversity and contribute to global food production; appreciate the benefits that people obtain from ecosystems

- Define what is meant by biodiversity
- List some of the benefits people obtain from ecosystems (wellbeing, physical activity, food, medicine etc.)
- Recognise and list efforts being made to conserve biodiversity (ban on hunting, deforestation, captive breeding programs, fund education programmes etc.)

- ## Earth & Space

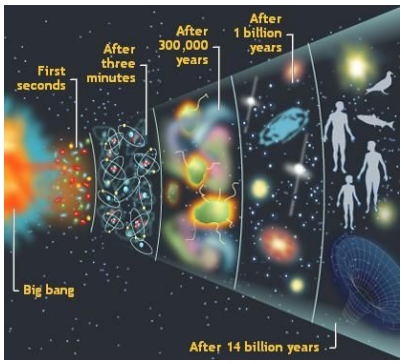
ES1 – Describe the relationship between various celestial objects including moons, asteroids, comets, planets, stars, solar systems, galaxies and space

- List the 8 planets
- Distinguish between inner and outer planets and their composition
- Define the terms associated with the main celestial bodies (planets, dwarf planets, comets, asteroids, stars, moons, galaxies and solar system)



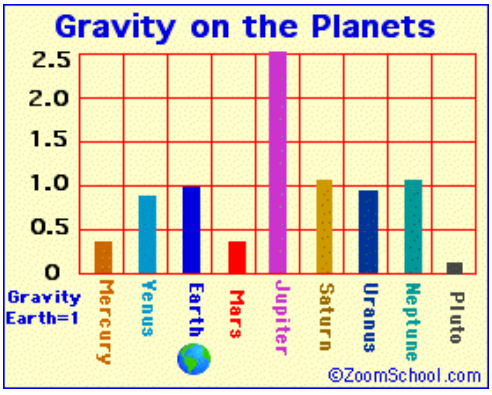
ES2 – Explore a scientific model to illustrate the origin of the universe

- Outline how our understanding of the universe has changed over time
- Explain what is meant by the Big Bang Theory
- Describe the key pieces of evidence for the Big Bang theory

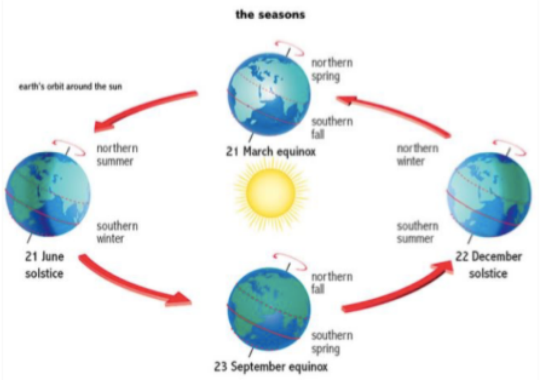


ES3 – Interpret data to compare the Earth with other planets and moons in the solar system, with respect to properties including mass, gravity, size and composition

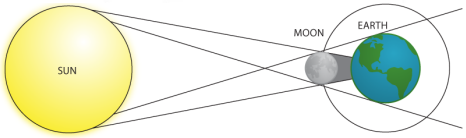
- List the 8 planets
- Distinguish between inner and outer planets and their composition
- Compare the Earth with other planets and solar systems making reference to mass, gravity, size and composition. This comparison can be words, diagrams or charts such as bar charts

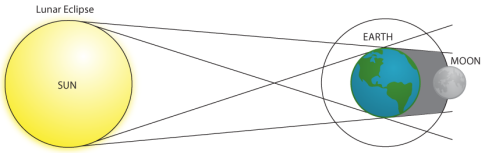


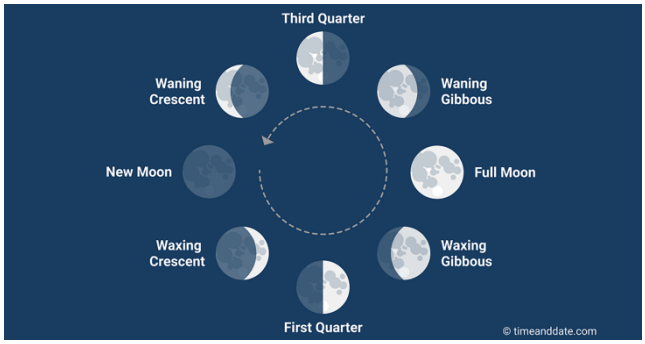
ES4 – Develop and use a model of the Earth-Sun-Moon system to describe predictable phenomena observable on Earth, including seasons, lunar phases, and eclipses of the Sun and the Moon



- Define what is meant by a season
- Explain and illustrate how the Earth's tilt affects the seasons and draw a relevant diagram to outline the seasons in the Northern and Southern Hemisphere
- Outline the phases of the moon and define relevant terms such as waxing, waning, gibbous, crescent and new moon
- Distinguish between solar and lunar eclipses and draw relevant diagrams

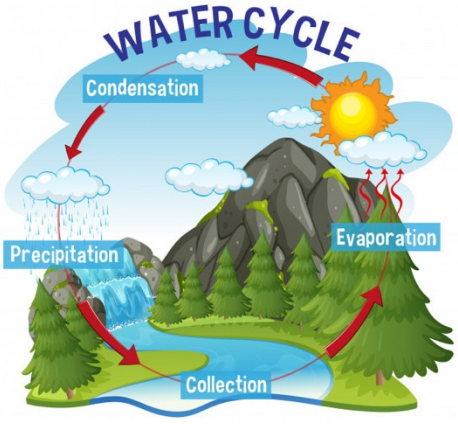


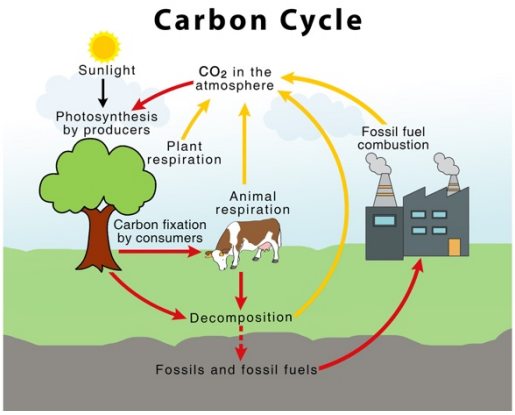




ES5 – Describe the cycling of matter, including that of carbon and water, associating it with biological and atmospheric phenomena

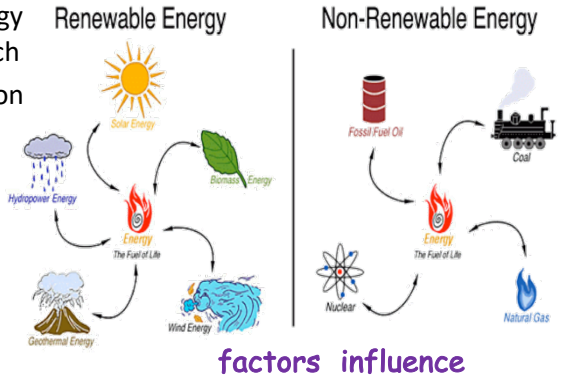
- Outline the stages in the water cycle and draw a relevant diagram
- Outline the stages in the carbon cycle and draw a relevant diagram
- Distinguish between a carbon source and a carbon sink and give examples of each.



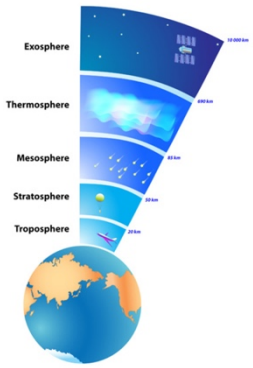


ES6 – Research different energy sources; formulate and communicate an informed view of ways that current and future energy needs can be met

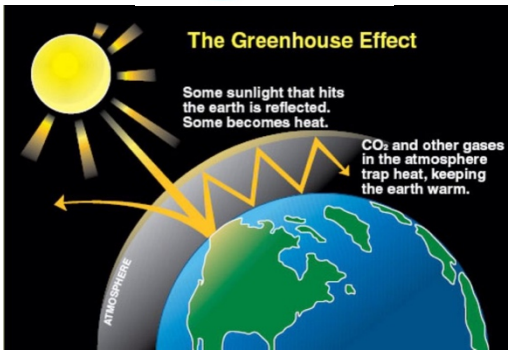
- Explain the difference between renewable and non-renewable energy sources
- Give examples of renewable and non-renewable energy sources and give advantages and disadvantages of each
- Explain the process of nuclear fission and nuclear fusion
- Consider future sources of renewable energy such as improved solar power, and sing nanotechnology to make batteries more efficient and build more sturdy, lightweight wind turbines



ES7 – Illustrate how earth processes and human factors influence Earth's climate, evaluate effects of climate change and initiatives that attempt to address those effects



- Recognise that the atmosphere is a mixture if gases that blanket the Earth
- List the layers of the atmosphere
- Read weather charts and recognize that high pressure causes good weather and low pressure causes bad weather
- Appreciate the significance of the huge explosion of the human population in the last 30 years
- Describe human behaviours such as deforestation, burning of fossil fuels and pollution that damage the Earth
- Define what is meant by the greenhouse effect and support your answer with a relevant diagram
- Outline what is meant by climate change and the effects that climate change can have such as rising sea levels, increased temperatures and extinction of animals



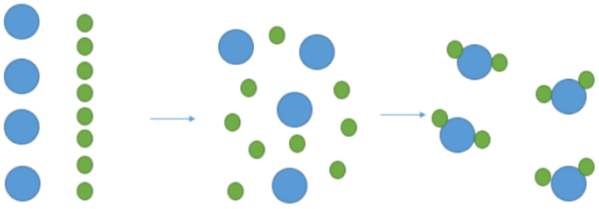
ES8 – Examine some of the current hazards and benefits of space exploration and discuss the future role and implications of space exploration on society

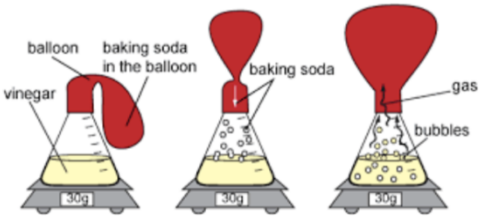
- Recognise some key stages in the history of human space flight such as the first man on the moon, first person in space etc.
- Describe hazards and benefits of space exploration

- Chemical World

CW1 – Investigate whether mass is unchanged when chemical and physical changes take place

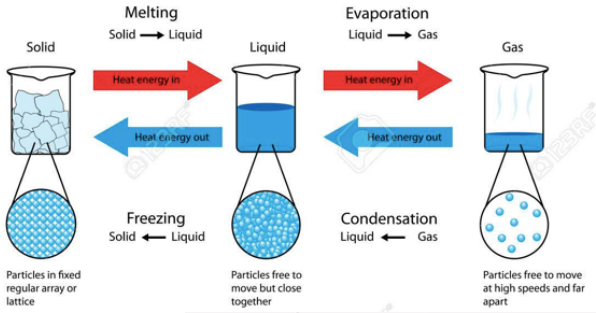
- Distinguish between a chemical and physical change and use an appropriate diagram to show the difference between
- Give examples of chemical and physical changes
- Define the law of conservation of mass

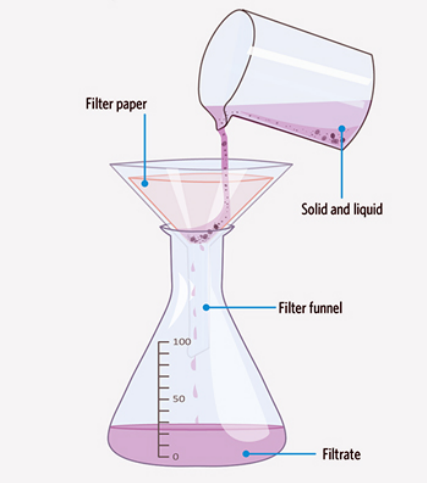


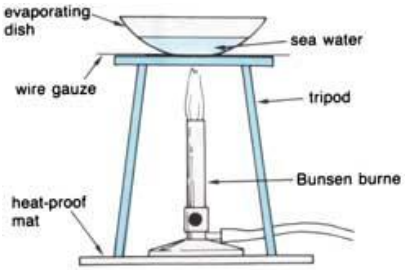


CW2 – Develop and use models to describe the atomic nature if matter; demonstrate how they provide a simple way to account for the conservation of mass, changes of state, physical change, chemical change, mixtures and their separation

- Distinguish between a chemical and physical change and use an appropriate diagram to show the difference between
- Give examples of chemical and physical changes
- Define the law of conservation of mass
- Describe what is meant by matter (something that has mass and volume)
- List 3 states of matter – solid, liquid and gas
- Draw the particle structure of solids, liquids and gases
- Use the particle theory to describe the changes that happen to each state as heat is added and taken away
- Explain the terms melting, boiling, evaporation, condensation and freezing
- Define what is meant by a mixture, solute, solvent, solution, soluble and insoluble
- Describe the steps involved in the main separation techniques (filtration, evaporation, distillation and chromatography) and recognise what they are used to separate e.g filtration – insoluble solid and a liquid

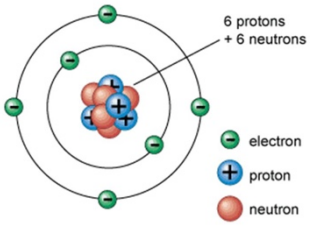




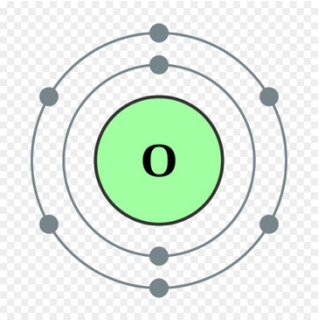


CW3 – Describe and model in terms of the nucleus, the structure of the atom protons, neutrons and

electrons; comparing mass and charge of protons, neutrons and electrons

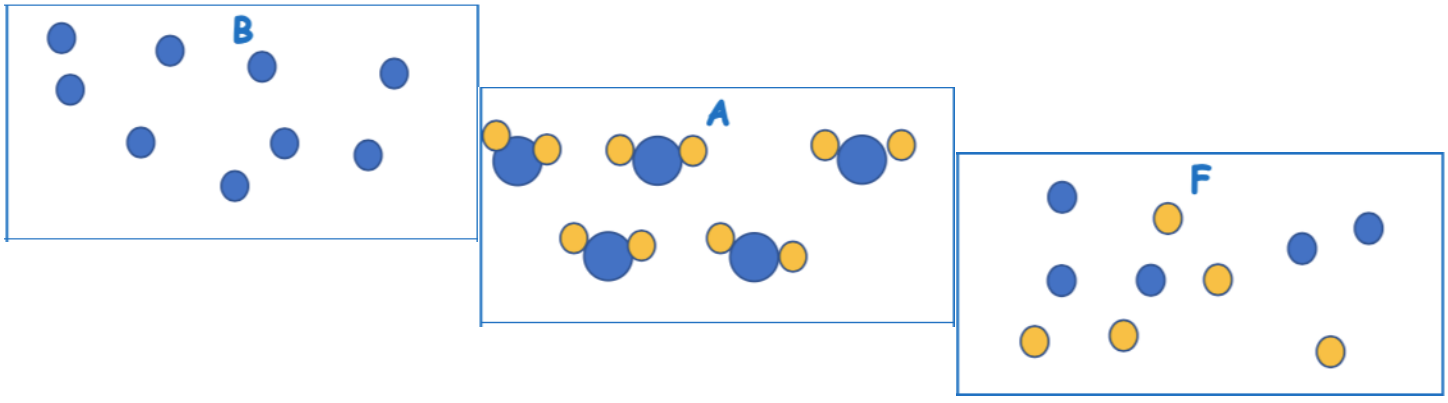


- Define what is meant by an atom and draw an appropriate diagram to represent it
- List the main particles found in an atom and give - their location (shells or
- nucleus) and their charges (positive, negative or neutral)
- Know the difference between atomic and mass number
- Define what is meant by an isotope
- Draw atomic structures (Bohr structures()of elements given their atomic and mass number
- State what an alloy is and give an example and a use for it
- Give the names of the groups 1,2,7 and 8 in the periodic table.



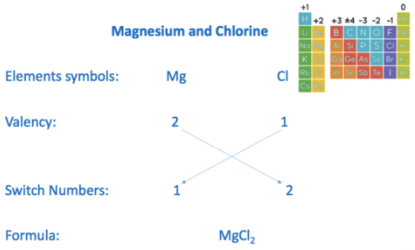
CW4 – Classify substances as elements, compounds, mixtures, metals, non-metals, solids, liquids, gases and solutions

- Define what is meant by an element, compound, mixture, metal, non-metal
- Distinguish between metals and non-metals on the periodic table
- State what an alloy is and give an example and a use for it
- Give the names of the groups 1,2,7 and 8 in the periodic table.
- List 3 states of matter – solid, liquid and gas
- Draw the particle structure of solids, liquids and gases
- Use the particle theory to describe the changes that happen to each state as heat is added and taken away
- Explain the terms melting, boiling, evaporation, condensation and freezing



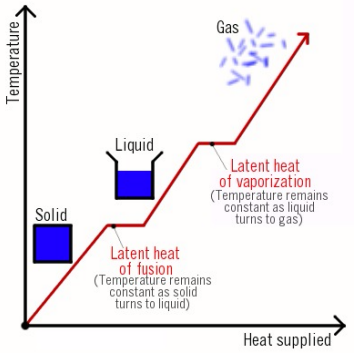
CW5 – Use the periodic table to predict the ratio of atoms in compounds of two elements

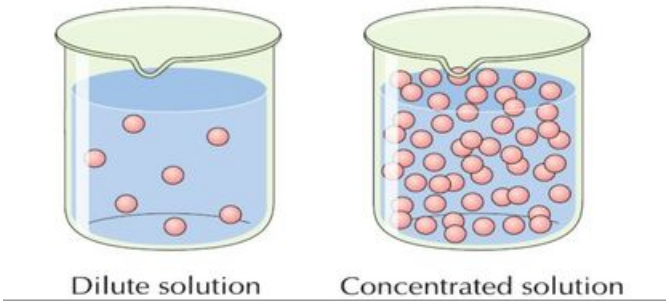
- Define what is meant by valency
- Use the periodic table to predict the ratio of atoms in compounds of two elements
- Distinguish between ionic and covalent bonding and give examples



CW6 – Investigate the properties of different materials including solubilities, conductivity, melting points and boiling points

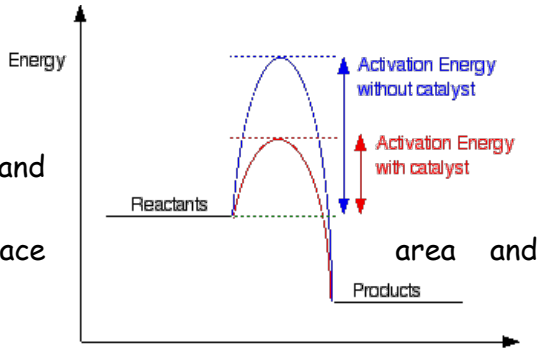
- Define what is meant by solubility, concentrated solution and dilute solution and use appropriate diagrams to represent each
- Draw and interpret solubility curves
- Define what is meant by conductivity, boiling point and melting point





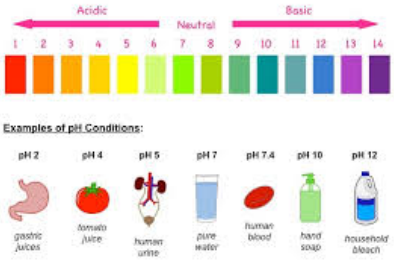
CW7 – Investigate the effect of a number of variables on the rate of chemical reactions including production of common gases and biochemical reactions

- Define what is meant by a chemical reaction
- Describe the collision theory
- Distinguish between endothermic and exothermic reactions
- Describe the effect of temperature, surface area and concentration on the rate of reactions
- Define what is meant by a catalyst
- Describe how to produce oxygen and carbon dioxide, naming the chemicals involved, knowing the chemical reaction, drawing appropriate diagrams and explaining how to test they were present



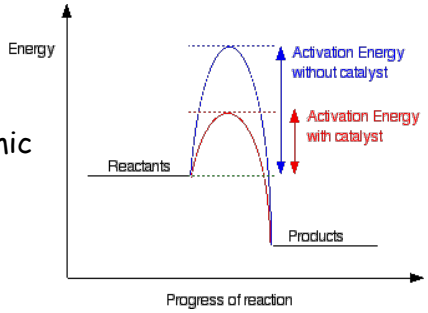
CW8 – Investigate reactions between acids and bases; use indicators and the pH scale

- Define what is meant by an acid, base and neutralization
- Recognise the products of neutralization reactions and the corresponding pH value
- Describe the structure of the pH scale



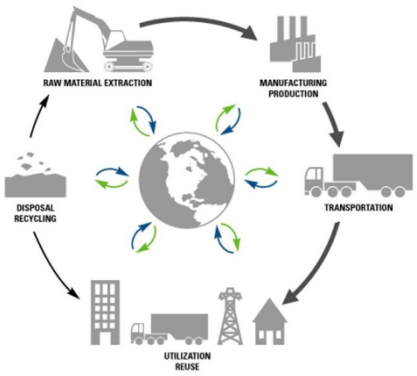
CW9 – Consider chemical reactions in terms of energy, using the terms exothermic, endothermic and activation energy, and use simple energy profile diagram to illustrate energy changes

- Describe what is meant by a chemical reaction
- Distinguish between endothermic and exothermic reactions
- Recognise and draw energy profile diagrams



CW10 – Evaluate how humans contribute to sustainability through the extraction, use, disposal and recycling of materials.

- Recognise the product life cycle
- Define what is meant by extraction
- List examples of extraction methods and the materials obtained
- Appreciate how common the use of plastic in the world is
- Recognise and list various methods of disposal of waste
- Define what is meant by sustainability

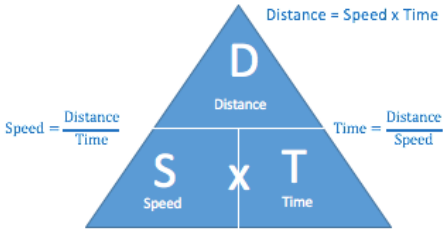


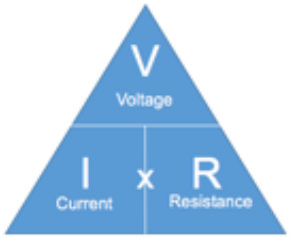
- ## Physical World

PW1: Select and use appropriate measuring instruments

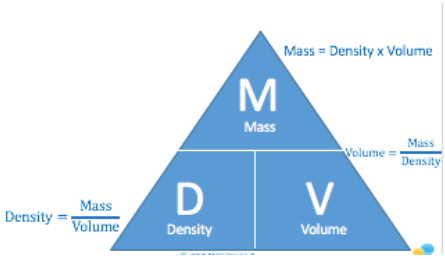
PW2: Identify and measure/calculate length, mass, time, temperature, area, volume, density, speed, acceleration, force, potential difference, current, resistance, electrical power.

- Define what is meant by, and be able to calculate length, time, mass, temperature, area, volume, speed, acceleration, force, potential difference, current, resistance, electrical power
- Give the SI unit for each



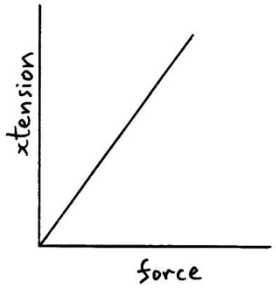


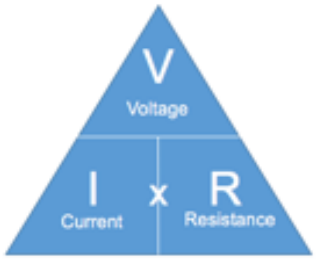
Resistance = Voltage / Current



PW3: Investigate patterns and relationships between physical observables.

- State Hooke's Law
- Investigate the relationship between the extension of a spiral spring and the force causing that extension.
- State Ohm's Law
- Investigate the relationship between voltage and current
- Calculate voltage, current and relationship





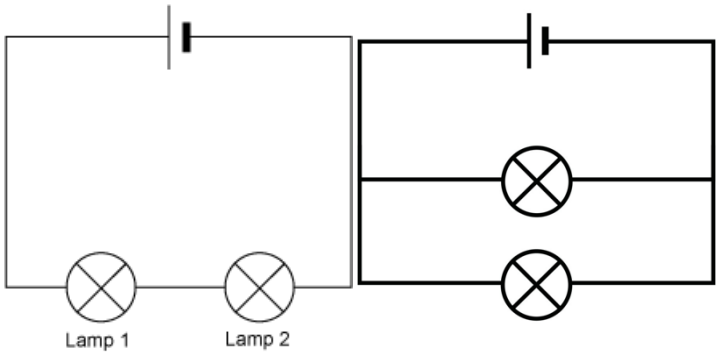
Resistance = Voltage / Current

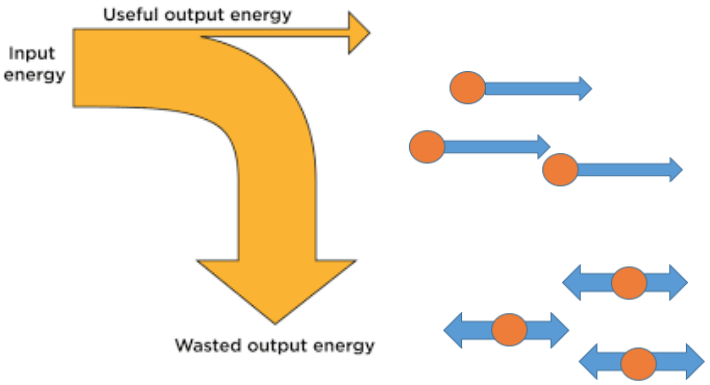
PW4: Research and discuss a technological application of physics in terms of scientific, societal and environmental impact

- List an exmple of a technological application of physics
- Exaplain (in simple terms) the scientific, societal and environmental importance of the technological application

PW5: Design and build simple electronic circuits.

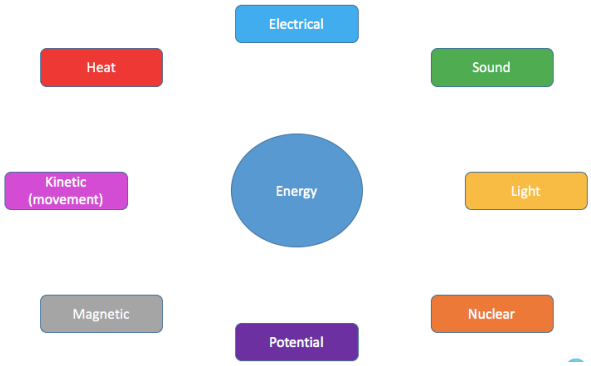
- Identify and describe static and current electricity
- Distinguish between series and parallel circuits
- Distinguish between conductors and insulators
- Define what is meant by potential difference (voltage), current and resistance and give units for each
- State Ohm's Law
- Calculate voltage, current and resistance
- Define what is meant by power
- Calculate electrical power
- Distinguish between LEDs and LDRs
- Outline uses of LEDs and LDRs
- Define what is meant by energy efficiency and calculate energy efficiency of devices





PW6: explain energy conservation and analyse processes in terms of energy changes and dissipation.

PW7: Design, build and test a device that transforms energy from one form to another in order to perform a function; describe the energy changes and ways of improving efficiency.



- Define what is meant by energy
- List and explain the different forms of energy (heat, light, potential etc.)
- Define what is meant by energy conservation
- Distinguish between useful and waste energy conversions
- Calculate % energy efficiency
- Interpret models for representing energy transfers
- Design, build and test a device that transforms energy from one form to another
- Outline steps that can be taken to make homes more energy efficient

$$\% \text{ Efficiency} = \frac{\text{Useful energy transferred}}{\text{Total energy}} \times 100$$

PW8: Research and discuss the ethical and sustainability issues that arise from our generation and consumption of electricity

- Describe some of the ethical and sustainability issues that arise from electricity generation
- Define what is meant by sustainability
- Describe future sources of renewable energy that could be used to ensure our energy needs are met