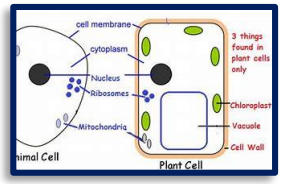
B1 – Cells Biology

Prior and Prerequisite learning:

At KS3 you have learnt about animal, plant and specialised cells along with their functions.
You should be able to identify parts of a cell and describe the functions

Cells

Microscopy



Cell Differentiation and Specialised Cells

Binary Fission

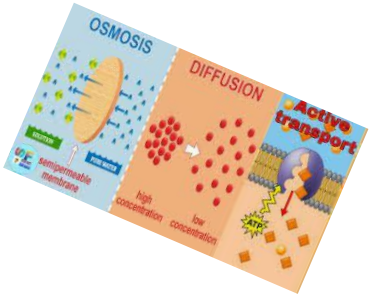
Mitosis

Microscopy and Magnification

Culturing Microorganisms

Stem Cells

Diffusion



Active Transport

Osmosis

Exchanging Surfaces

Exchanging Substances

Why are we learning this?

We all start life as a single cell but grow and adapt to become the amazing complex humans we are today, made up of billions of specialised cells. You will learn the basics of how this happens. You will gain a knowledge of how we can look at cells in more detail and the processes by which cells exchange substances.

Next steps:

You will be learning about how cells can be organised into different systems in the B2 Organisation topic.

Dudley Academies Trust
Discover more

B2 Organisation

Prior and Prerequisite learning:

At KS3 you have learnt about health and disease and what we can do to be healthy.
You should be able to identify body systems and describe how they work.

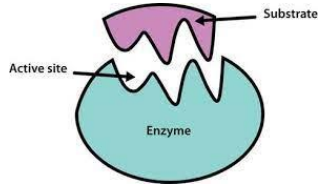
Why are we learning this?

It is important to have an understanding of how our body systems work and how we can look after our bodies to be healthy. We also need to have an understanding how plant organ systems work.
It is also important to recognise how non communicable diseases and the effects in society.

Cell Organisation

Enzymes

Enzymes and Digestion



Investigating Enzymatic Reactions

Food Tests

The Lungs

Blood Vessels

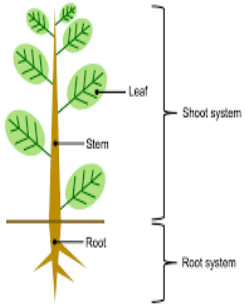
Blood

The Heart

Cardiovascular Disease

Health and Disease

Non-communicable Disease



Next steps

Transpiration, Translocation and Stomata

Plant Cell Organisation

Cancer

You will be learning about how diseases develop and how we can protect ourselves against disease in the
B3 Infection and Immunity topic.

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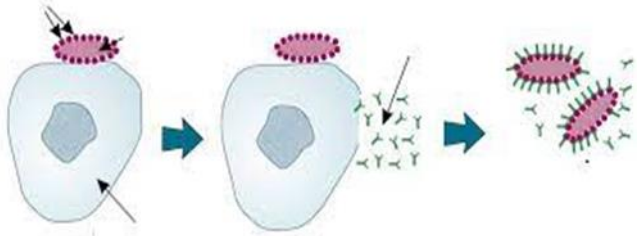
Discover more

B3 Infection and Response

Prior and Prerequisite learning:

In Year 9 we looked health and disease, blood cells and their particular roles. We will know build upon this in this topic in how the body protects us against disease.



Pathogens and Communicable Disease

Bacterial Diseases

Viral Diseases

Fungal and Protist Diseases

Human Defence and White Blood Cells

Vaccination

Drugs

Antibiotics

Developing Drugs

Monoclonal Antibodies

Plant Diseases and Defences

Why are we learning this?

Pathogens are microorganisms such as viruses and bacteria that cause infectious disease in animals and plants. We need to have an understanding of how our bodies can protect us to help fight disease.

Next steps:

The knowledge gained in this topic can be used when learning about photosynthesis and respiration in the B4 Bioenergetics topic

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Discover more

B4 Bioenergetics

Prior and Prerequisite learning:

In Year 9 we looked at the structure and function of plants cells and how they are adapted to carry out photosynthesis. We will build on this in this topic and look at respiration and metabolism.

Photosynthesis

The Rate of Photosynthesis

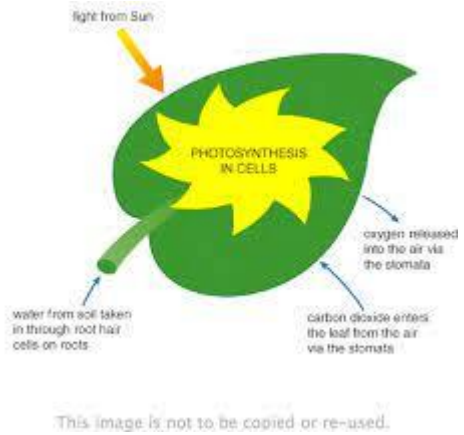
Measuring the Rate of Photosynthesis Practical

Respiration and Metabolism

Aerobic Respiration

Anaerobic Respiration

Exercise



Why are we learning this?

Photosynthesis releases oxygen which has built up over millions of years in the Earth's atmosphere. Animals and plants use this oxygen to oxidise food in a process called respiration. We need to be able to link these two fundamental life processes together in both animals and plants and explain how they are important in order to survive.

Next steps:

The knowledge gained in this topic can be used when you will learn about how the body can survive in particular situations in the next topic of B5 Homeostasis and Response

Dudley Academies Trust
Discover more

B5 – Homeostasis

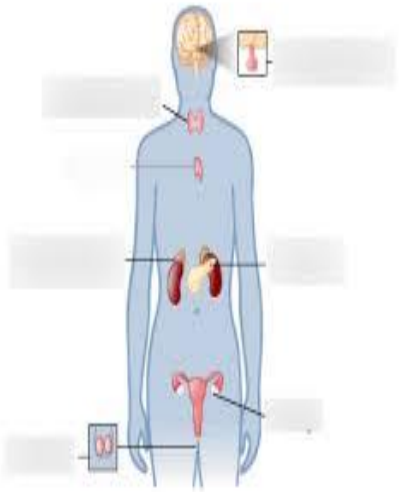
Prior and Prerequisite learning:

In Year 10 you learnt about how the body can protect itself against disease and how respiration occurs within our cells. We will build upon this by looking at how the body protects us against stimuli.

Why are we learning this?

Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.

- Homeostasis and Body Temperature
- The Nervous System
- Synapses and Reflexes
- Investigating Reaction Time
- The Kidneys
- Kidney Failure
- Puberty and the Menstrual Cycle
- Controlling Fertility
- Plant Hormones
- Adrenaline and Thyroxine
- Controlling Blood Glucose
- The Endocrine System
- The Brain
- The Eye



Next steps:

You will be learning about variation and evolution in the B6 Inheritance topic.

Dudley Academies Trust
Discover more

Prior and Prerequisite learning:

In the last topic you learnt about how the body protects us against stimuli and the role of hormones in the body. We will now build upon this topic to look at variation and evolution

Why are we learning this?

Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve. An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics.

B6 Inheritance, Variation and Evolution

DNA
Protein Synthesis
Mutations
Reproduction
Meiosis
X and Y Chromosomes
Genetic Diagrams
Inherited Disorders
The Work of Mendel
Variation
Evolution
Antibiotic Resistant Bacteria
Selective Breeding
Genetic Engineering
Cloning
Fossils
Speciation
Classification
Next steps

You will be learning about what makes an ecosystem and factors that can affect it in the B7 Ecology topic.

Dudley Academies Trust
Discover more

B7 – Ecology

Prior and Prerequisite learning:

In Year 10 we learnt about how the body can protect itself against disease and how respiration occurs within our cells. In this topic you will be learning about what makes an ecosystem and factors that can affect it.

Why are we learning this?

The Sun is a source of energy that passes through ecosystems. Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis. We will explore how humans are threatening biodiversity as well as the natural systems that support it and also consider some actions we need to take to ensure our future health, prosperity and well-being.

Competition

Abiotic and Biotic Factors

Adaptations

Food Chains

Using Quadrat and Transects

Environmental Change and The Water Cycle

The Carbon Cycle

Decay

Investigating Decay

Biodiversity and Waste Management

Global Warming

Deforestation and Land Use

Biomass Transfer

Pyramids of Biomass

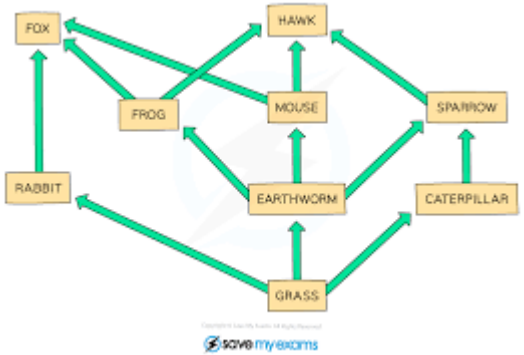
Trophic Levels

Maintaining Ecosystems and Biodiversity

Biomass Transfer

Food Security and Farming

Biotechnology



Next steps:

KS5 in:
A – Level Biology
T levels in Science
Science BTEC Diplomas
Science Apprenticeships

Dudley Academies Trust
Discover more

C1 – Atomic Structure and the Periodic Table

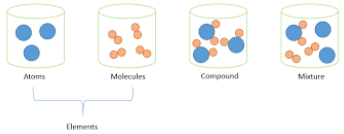
Prior and Prerequisite learning:

From KS3 you should be able recognise a simple model of an atom and be able to identify atoms in chemical reactions and describe some real life examples.

Why are we learning this?

Everything around us is made from atoms and it is these that interact to form elements, compounds and mixtures. You need to have an understanding of the history, how atoms are represented in different chemical reactions and how they can be separated. The periodic table is an important tool used in Chemistry, we need to know how it was devised along the current periodic table used today.

Atoms, Elements and Compounds

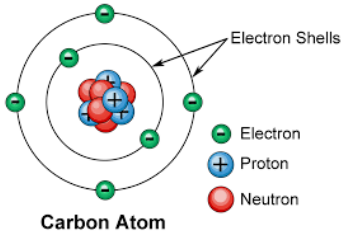


Compounds and Mixtures

Separation Techniques

Chromatography

Chemical Equations



Distillation

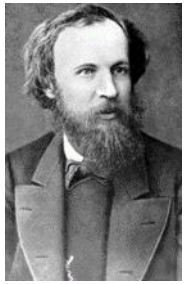
The History of an Atom

Electronic Structure

Metals and Non-Metals

The Modern Periodic Table

Development of the Periodic Table



Group I Elements

Group 7 Elements

Group 0 Elements

Next steps:

You will be taking knowledge from this topic and applying it to different types of bonding and different states of matter in C2 Bonding, Structure and Properties of Matter

Dudley Academies Trust
Discover more

C2 – Bonding, Structure and Properties of Matter

Prior and Prerequisite learning:

From KS3 you should be able to describe the particle model and discuss changes of state with real life examples. You should be able to identify the main parts of an atom.

Why are we learning this?

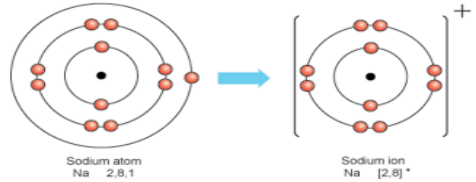
Everything around us is made from atoms. Atoms can bond in three ways to form different structures. You need to have an understanding of how these structures can be used in the real world.

Formation of Ions

Ionic Bonding

Ionic Compounds

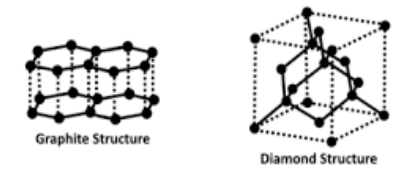
Covalent Bonding



Simple Molecular Substances

Polymers and Giant Covalent Structures

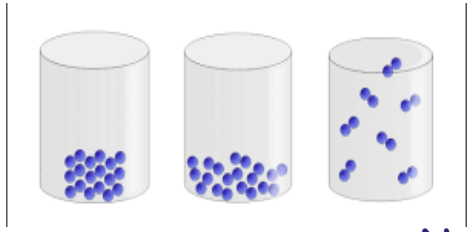
Structures of Carbon



Metallic Bonding

States of Matter

Changing State



Nanoparticles

Uses of Nanoparticles

Next steps:

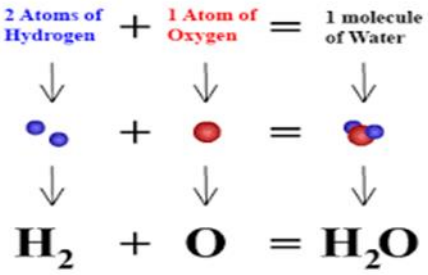
You will be taking knowledge from this topic to explore further the idea of mass and concentration in chemical reactions in C3 Quantitative Chemistry

Dudley Academies Trust
Discover more

C3 - Quantitative Chemistry

Prior and Prerequisite learning:

In Year 9 we learned about how to use chemical symbols and formulae to represent elements and compounds. In this topic we will look at how to quantify the number of atoms in a compound with the use of equations.



Conservation of Mass and Balancing Equations

Relative Atomic Mass

Relative formula Mass

Percentage of an Element

Relative Masses and Moles

Balanced Equations to Calculate Mass

Using Moles to Balance Equations

Limiting Reactants

Concentration of Solution

Volume of Gases

Atom Economy

Reactions and Industry

Why are we learning this?

Chemical reactions can be classified in various ways. Identifying different types of chemical reaction allows chemists to make sense of how different chemicals react together, to establish patterns and to make predictions about behaviour of other chemicals. Chemical equations provide a means of representing chemical reactions and are a key way for chemists to communicate chemical ideas.

Next steps:

You will be taking your maths skills and use of equations in the next topic C4 Chemical Changes

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Discover more

C4 – Chemical Changes

Prior and Prerequisite learning:

In the last topic you learned about how to quantify the number of atoms in a compound with the use of equations. In this topic we will look the reactivity series and the importance of metals.

Why are we learning this?

Knowing about different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. The extraction of important resources from the Earth makes use of the way that some elements and compounds react with each other and how easily they can be 'pulled apart'.

Acids and Bases

Titrations

Strong Acids and Weak Acids

Reactions of Acids

The Reactivity Series

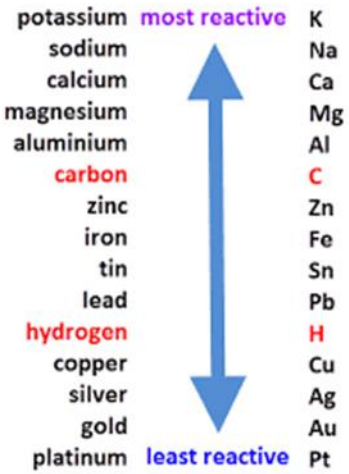
Separating Metals from Metal Oxides

Electrolysis of Molten Ionic Substances

Redox Reactions

Electrolysis of Metal Ores

Electrolysis of Aqueous Solutions



Next steps:

You will be taking knowledge from this topic and applying it to different reactions in C5 Energy Changes

Dudley Academies Trust
Discover more

C5 Energy Changes

Prior and Prerequisite learning:

In the last topic we learned about the reactivity series and the importance of metals. In this topic we will look at energy changes and examples of different reactions.

Why are we learning this?

Energy changes are an important part of chemical reactions. The interaction of particles often involves the transfers of energy due to the breaking and formation of bonds.

Exothermic and Endothermic Reactions

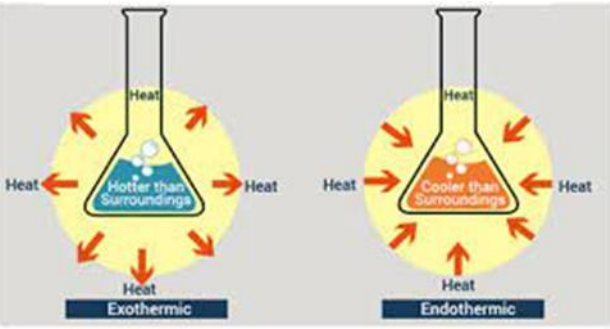
Measuring Energy Changes Practical

Bond Energies

Reaction Profiles

Cells and Batteries

Fuel Cells



Next steps:

You will be taking knowledge from this topic and applying it to rates of reaction in C6 The Rate and Extent of Chemical Change

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Discover more

C6 – The Rate and Extent of Chemical Change

Prior and Prerequisite learning:

In the last topic we learned about energy changes and examples of different reactions. In this topic we will look at reversible reactions and how to measure rates of reaction

Why are we learning this?
Chemical reactions occur at different rates and many variables can be manipulated in order to speed them up or slow them down. In industry, chemists and chemical engineers determine the effect of different variables on reaction rate and yield of product.

Rate of Reaction

Factors Affecting Rates of Reaction

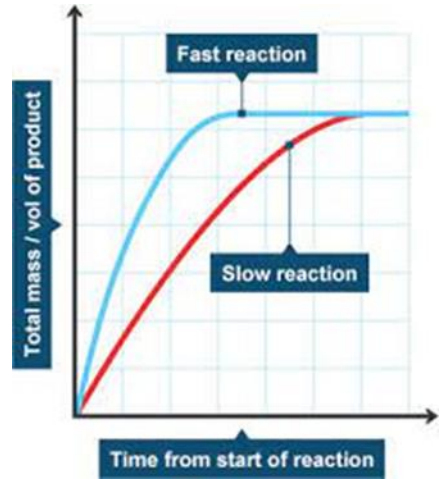
Measuring Rates of Reaction

Graphs of Rates of Reaction

Working Out Reaction Rates

Reversible Reactions

Le Chatelier's Principle



Next steps:

You will be taking knowledge from this topic and applying it to carbon compounds in C7 Organic Chemistry

Dudley Academies Trust
Discover more

C7 – Organic Chemistry

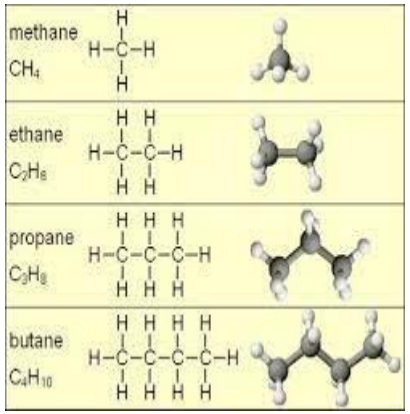
Prior and Prerequisite learning:

In the last topic we learned about measuring rates of reaction and factors that can affect it. In this topic we will look at organic compounds and their uses within Chemistry.

Hydrocarbons

Crude Oil

Fractional Distillation



Cracking

Alkenes

Reactions of Alkenes

Addition Polymers

Carboxylic Acids

Alcohols

Condensation Polymers

Natural Occurring Polymers

Why are we learning this?

This branch of chemistry gets its name from the fact that the main sources of organic compounds are living, or once-living materials from plants and animals. These sources include fossil fuels which are a major source of feedstock for the petrochemical industry. Chemists are able to take organic molecules and modify them in many ways to make new and useful materials such as polymers, pharmaceuticals, perfumes and flavourings, dyes and detergents.

Next steps:

You will be taking knowledge from this topic and applying it to carbon compounds in C8 Chemical Analysis

Dudley Academies Trust
Discover more

C8 – Chemical Analysis

Prior and Prerequisite learning:

In the last topic we learned about organic compounds and their uses within Chemistry. In this topic we will look at analysing chemicals through various techniques.

Purity and Formulations

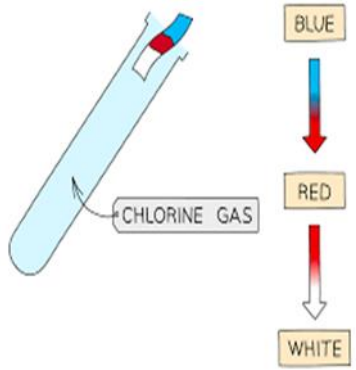
Paper Chromatography

Using Chromatograms

Tests for Gases

Tests for Ions

Flame Emission Spectroscopy



Why are we learning this?

Analysts have developed a range of qualitative tests to detect specific chemicals. Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small. Forensic scientists and drug control scientists rely on such instrumental methods in their work.

Next steps:

You will be taking knowledge from this topic and applying it to carbon compounds in C9 Chemistry of the Atmosphere

Dudley Academies Trust
Discover more

Prior and Prerequisite learning:

C9 – Chemistry of the Atmosphere

In the last topic we learned about analysing chemicals through various techniques. In this topic we will look at theories of how the atmosphere has evolved along with gases involved.

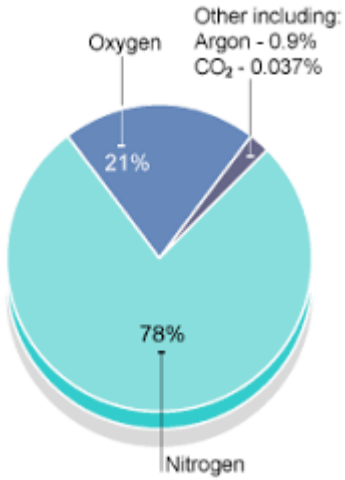
The Evolution of the Atmosphere

Greenhouses Gases and Climate Change

Carbon Footprints

Air Pollution

Next steps:



Why are we learning this?

Theories about what was in the Earth's early atmosphere and how the atmosphere was formed have changed and developed over time. Evidence for the early atmosphere is limited because of the time scale of 4.6 billion years. You need to be able to, give appropriate information, interpret evidence and evaluate different theories about the Earth's early atmosphere

You will be taking knowledge from this topic and applying it to carbon compounds in C10 Using Resources

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Discover more

C10 – Using Resources

Prior and Prerequisite learning:

In the last topic we learnt about the various theories of how the atmosphere has evolved along with gases involved. In this topic we will look at the Earth's natural resources and how they can be sustained.

Why are we learning this?

Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment, and environmental chemists study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised.

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Ceramics, Composites and Polymers

Properties of Materials

Corrosion

Finite and Renewable Resources

Life Cycle Assessments

Potable Water

Reuse and Recycling

Waste Water Treatment

The Haber Process

NPK Fertilisers

Next steps:

KS5 in:

- A – Level Chemistry
- T levels in Science
- Science BTEC Diplomas
- Science Apprenticeships

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Discover more

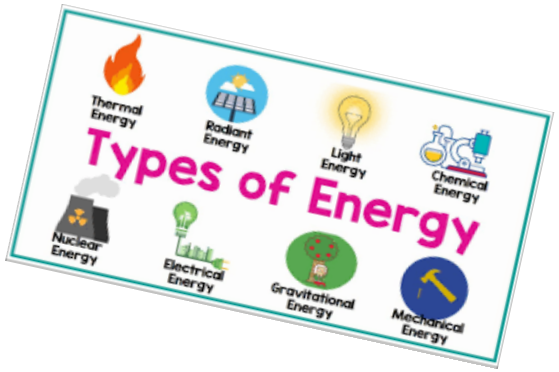
P1 – Energy

Prior and Prerequisite learning:

From KS3 you should be able to identify and describe examples of different energy types with examples. You should be aware of the term "conservation of energy" in terms of energy transfer.

Why are we learning this?

Energy is fundamental to our everyday lives in terms of movement, home appliances and even eating. It is important we understand how energy can be transferred, how we can be "environmentally friendly" by being energy efficient and save money.



Energy Stores and Systems

Conservation of Energy and Power

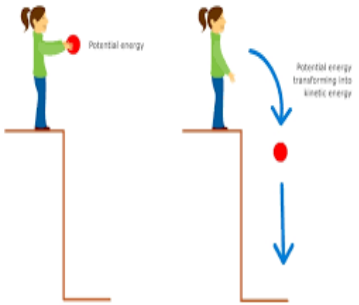
Kinetic and Potential Energy Stores

Investigating Specific Heat Capacity

Conduction and Convection

Power

Reducing Unwanted Energy Transfers



Efficiency

Wind, Solar and Geothermal

Energy Resources and their Uses

Next steps:

Hydro-electricity, Waves and Tides

Bio-fuels and Non-renewables

Trends in Energy Resource Use

You will be taking knowledge from this topic and applying it to energy in different states of matter in P3 Particle Model of Matter

Dudley Academies Trust
Discover more

P2 Electricity

Prior and Prerequisite learning:

In Year 9 you learned about different types of energy and renewable and non renewable resources. In this topic we will build upon this to apply this to electricity.

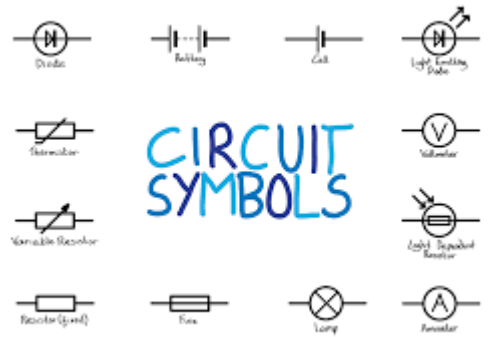
Why are we learning this?

Electric charge is a fundamental property of matter everywhere. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment, remote sensing and control.

Current and Charge

Potential Difference and Resistance

Series Circuits



Investigating Resistance

Parallel Circuits

LDRS and Thermistors

Electricity in the Home

The National Grid

Power of Electrical Appliances

Static Electricity

Electric Fields

Next steps:

You will be taking knowledge from this topic and applying it to P4 Atomic Structure

Dudley Academies Trust
Discover more

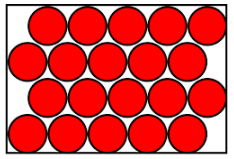
P3 – Particle Model of Matter

Prior and Prerequisite learning:

From KS3 you should be able to identify and describe different states of matter with particle diagrams and the movement of gas particles.

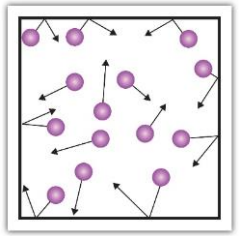
Why are we learning this?

Everything around us is made up of particles. Understanding the movement of these particles and their internal make up improves our understanding of materials and their properties.



The Particle Model

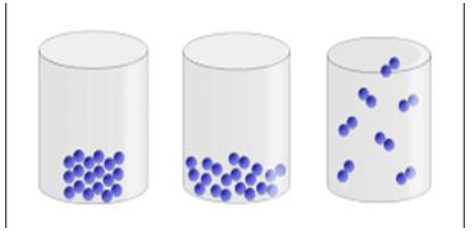
Motion in Gases



Density of Materials

Internal Energy

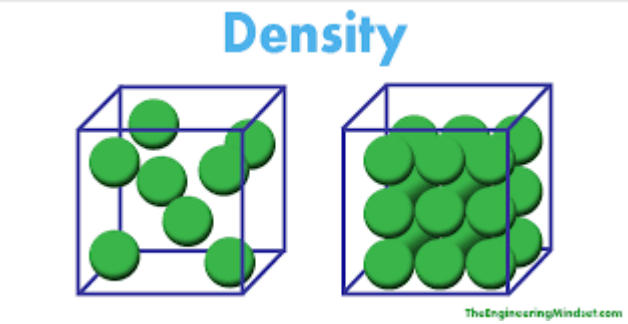
Changes of State



Specific Latent Heat

Next steps:

You will be taking knowledge from this topic and applying it to energy movement in P2 Electricity



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P4 Atomic Structure

Prior and Prerequisite learning:

In the last topic we learned about different types of circuits, how to measure current and electricity in the home. In this topic we will look at the subatomic parts of an atom and different types of radiation.

Why are we learning this?

Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation.

Developing the Model of the Atom

Isotopes and Nuclear Radiation

Nuclear Equations

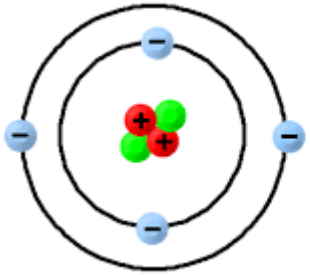
Half-life

Background Radiation

Uses and Risk

Contamination

Fission and Fusion



Proton
Neutron
Electron

Next steps:

You will be taking knowledge from this topic and applying it to P2 Electricity.

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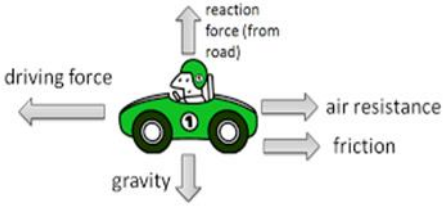
P5 – Forces

Prior and Prerequisite learning:

In the last topic we learned about subatomic parts of an atom and different types of radiation. In this topic we will look at different forces, graphs and the application to the real world.



Contact and Non Contact Forces

Weight, Mass and Gravity

Resultant Forces

Work Done

Forces and Elasticity

Investigating Springs

Moments

Fluid Pressure

Upthrust

Distance-Time Graphs

Acceleration

Velocity-Time Graphs

Distance, Displacement, Speed and Velocity

Newton's First and Second Law

Newton's Third Law

Terminal Velocity

Investigating Motion

Momentum

Braking and Energy Transfer

Investigating Reaction Time

Stopping, Braking and Thinking Distance

Why are we learning this?

Engineers analyse forces when designing a great variety of machines and instruments, from road bridges and fairground rides to atomic force microscopes. Anything mechanical can be analysed in this way. Recent developments in artificial limbs use the analysis of forces to make movement possible.

Next steps:

You will be taking knowledge from this topic and applying it to the topic of P6 Waves

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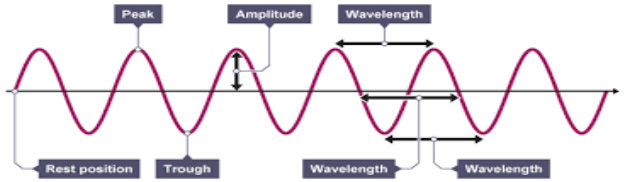
P6 – Waves

Prior and Prerequisite learning:

In the last topic we learnt about different forces, graphs and the application to the real world. in this topic we will look different waves and their uses.



Transverse and Longitudinal Waves

Experiments with Waves

Reflection and Refraction

Radio Waves

Investigating Light

Electromagnetic Waves and Uses

Dangers of EM Waves

Convex and Concave Lenses

Images and Ray Diagrams

Infra-red Radiation and Temperature

Black Body Radiation

Visible Light

Sound Waves

Ultrasound

Exploring Structures Using Waves

Why are we learning this?

Wave behaviour is common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and communication systems show how we can make the most of electromagnetic waves.

Next steps:

You will be taking knowledge from this topic and applying it to the P7 Magnetism and Electromagnetism topic

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P7 – Magnetism and Electromagnetism

Prior and Prerequisite learning:

In the last topic we learnt about different waves and their uses. In this topic we will look at magnets and their uses in the real world.

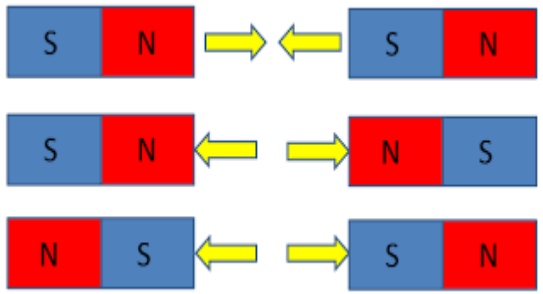
Permanent and Induced Magnets

The Generator Effect

Electromagnetism

Electric Motors and Loudspeakers

The Motor Effect



Generators and Microphones

Transformers

Next steps:

You will be taking knowledge from this topic and applying it to the P8 Space topic.

Why are we learning this?

Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this.

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P8 – Space Physics

Prior and Prerequisite learning:

In the last topic we learnt about electromagnetic effects and their uses. In this topic we will look at how, at the start of a star's life cycle, the dust and gas drawn together by gravity causes fusion reactions.

The Life Cycle of Stars

The Solar System, Orbits and Satellites

Red Shift

The Big Bang

Why are we learning this?

Within our solar system there is one star, the Sun, plus the eight planets and the dwarf planets that orbit around the Sun. Natural satellites, the moons that orbit planets, are also part of the solar system. Our solar system is a small part of the Milky Way galaxy.
The Sun was formed from a cloud of dust and gas (nebula) pulled together by gravitational attraction.

Next steps:

KS5 in:
A – Level Physics
T levels in Science
Science BTEC Diplomas
Science Apprenticeships

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