Topic: Photosynthesis

Duration: 7 lessons (5 weeks)

Compo

Key vocabulary:

Chloroplasts

Biomass

Palisade cell

Guard cell

Stoma

Stomata

Starch

Endothermic

Concentration

Factor

Temperature

Intensity

Proportion

Inversely

Diffusion

Osmosis

Translocation

Active transport

Root hair

Xylem

Phloem

transpiration

Core knowledge Components

Know that plant processes (photosynthesis) is the basis for all other increases in biomass in organisms.

Name and label the main structures in a leaf.

Be able to recognise stomata from diagrams and practical activity.

Explain from graphical data how limiting factors are affecting the rate of Photosynthesis.

Be able to identify linear relationships and proportionality from graphs.

Explain how light intensity will vary with distance.

Know how water enters a plant and is moved around.

The structure and function of the roots.

Explain how plants absorb minerals against a concentration gradient.

How does water get from a root into the leaf?

How can water movement be measures and what conditions promote the most uptake of water?

Measuring and calculating the rate of water loss from a plant.

How is the plant designed to distribute the sugars from photosynthesis?

Powerful knowledge components crucial to commit to long term memory

State the word equation for photosynthesis

State what type of reaction is taking place in photosynthesis.

Identify the cells in the leaf where most photosynthesis occurs.

State the function of stomata

Name 3 limiting factors that could reduce the rate of photosynthesis.

Name the process that occurs when water enters a root hair cell.

Give one adaptation of a root hair cell.

What is carried in phloem tubes?

What is carried in xylem tubes?

What is the function of a potometer?

Links to prev future topics

Yr7 Cells, Eco

Yr8 Plants

Yr10 / 11 CB Structures ar Functions

Topic: Ecological Relationships 1-3

Duration: 12 Weeks

Composite:

Key vocabulary:

Ecosystem
Population
Habitat
Producer
Consumer
Food web
Biomass
Ecosystem
Distribution
Abiotic
Biotic
Pollutants
Competition
Predation
Parasite
Mutualist
Biodiversity

Native
Non-indigenous
Eutrophication
Nitrate
Reforestation
Endangered
Desalination
Distillation
Potable
Decomposer
Decay
Crop rotation
Legumes
Bioaccumulation

Core knowledge Components

Describe some relationships between organisms in a habitat.

Use data from sampling to estimate the number of individuals in an area.

Link abiotic factors to distribution of organisms.

Give examples of the environmental impact of some pollution events.

Give examples of case studies where reintroductions have increased biodiversity.

Give examples of other types of relationships that are parasitic and mutualistic.

Explain the impacts of human activities on diversity including fish farming, introduction of non-native species and eutrophication.

How can the impact of human activity that has reduced biodiversity be reversed?

Describe the processes in the water cycle.

Describe the processes in the carbon cycle and how each part of the process functions.

Explain the impact of burning fossil fuels.

State the role of microbes in the nitrogen cycle including decomposers, nitrifying bacteria and denitrifying bacteria.

Powerful knowledge components crucial to commit to long term memory

Be able to identify producers, primary consumers, predators, and top predators in a food chain.

What is a quadrat used for?

How can you ensure quadrat sampling is as accurate as possible?

Name examples of abiotic and biotic factors.

What is bioaccumulation?

What is meant by biodiversity?

What is a parasite?

What is a mutualist?

What does non-native mean?

What activity is responsible for eutrophication?

Why does eutrophication lead to fish death?

What is desalination?

What is distillation?

Name the process that removes CO_2 in the carbon cycle.

Name 2 other process that release CO_2 in the carbon cycle.

Why do plant need nitrogen?

How do plants obtain nitrogen?

Links to previous and future topics

Yr 7 Ecology / moving and breathing.

Yr8 Microbes and plants.

Yr10/11 -CB9 Ecosystems and material cycles

Topic: Earth and Atmosphere

Duration: 6 lessons

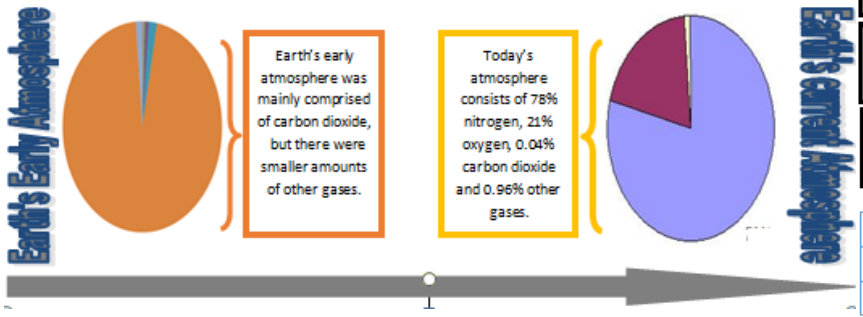
Composite:

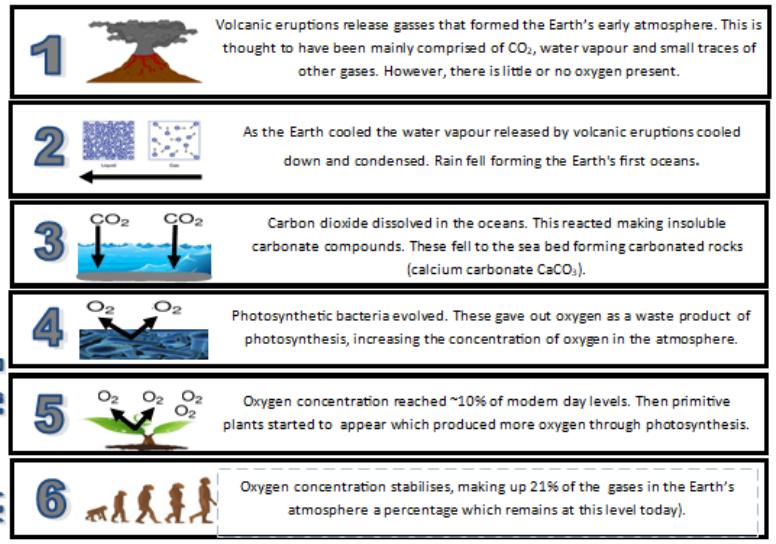
Key vocabulary:

Earth
Volcanic
Gaseous
Eruptions
Inhospitable
Atmosphere
Stabilised
Vapour
Condensing
Absorb
Evolved
Algae
Photosynthesis
Decomposition
Nominal
Insoluble
Concentration
Radiates
Emitted
Respiration
Combustion
Sparse

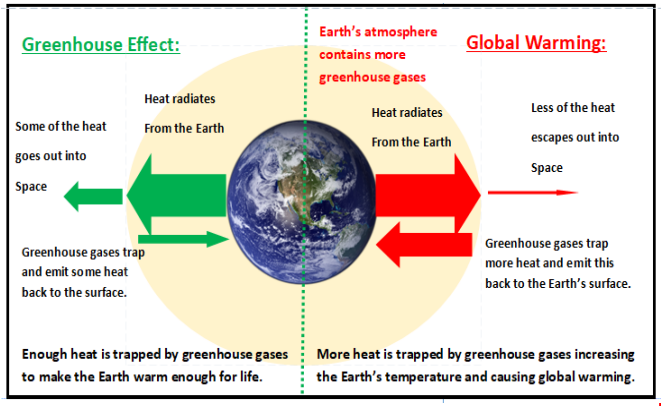
Core knowledge:

Gas	Has the gas concentration increased or decreased over time?	What caused this?
Carbon dioxide	Decreased	CO_2 was absorbed in the oceans and also removed by photosynthesis (plants)
Oxygen	Increased	A by-product of photosynthesis carried out by primitive plants and algae
Water vapour	Decreased	As the Earth cooled water vapour in the early atmosphere condensed forming the oceans





Respiration	glucose + oxygen → carbon dioxide + water	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
Photosynthesis	carbon dioxide + water → glucose + oxygen	$6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$
Combustion	hydrocarbon + oxygen → carbon dioxide + water	$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$



Powerful knowledge:

1) Recall that the gases produced by volcanic eruptions formed the Earth's early atmosphere.

2) Describe that Earth's early atmosphere was thought to consist of mainly CO_2, some water vapor and other gases.

3) Describe the composition of today's atmosphere as 21% - O_2, 78% - N_2, 0.04% - CO_2 and 0.96% - other gases.

4) Recall the cooling of Earth led to water vapour in the early atmosphere being condensed and falling as rain over millions of years. This formed the first oceans.

5) Explain that CO_2 concentration in the early atmosphere was reduced as it was dissolved in the newly formed oceans and taken up by primitive plants and algae performing photosynthesis.

6) Describe that various gases in the atmosphere (CO_2, CH_4 and H_2O), absorb heat radiated from the Earth, subsequently emitting energy back to the surface which keeps the Earth warm (the greenhouse effect).

7) Increasing the concertation of greenhouse gases (CO_2, CH_4 and H_2O) means more energy is absorbed by greenhouse gases rather than escaping

Links to previous and future topics

Links to prior learning in KS3:

Most pupils will have had some experience of topics such as:

Combustion, Photosynthesis, Carbon cycle, Particle model, Renewable energy, Non-renewable energy

Links to future Learning at KS4:

Links to this content can be found in Chemistry, Biology and Physics at KS4:

Ecosystems and material cycles

Calculating angles of pie chart

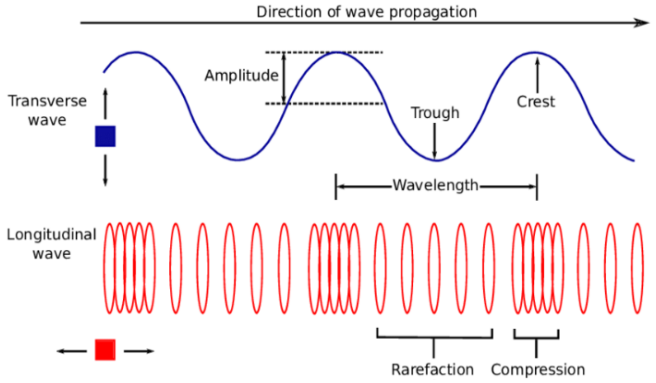
States of matter

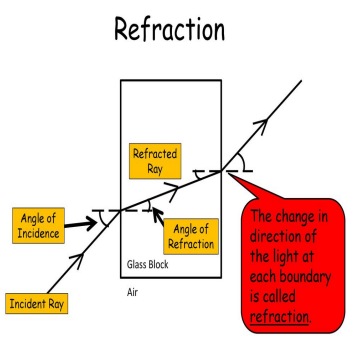
Fuels and Earth Science

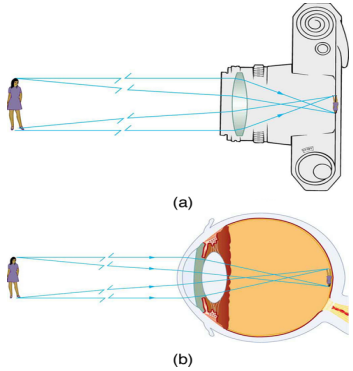
Plant structures and functions

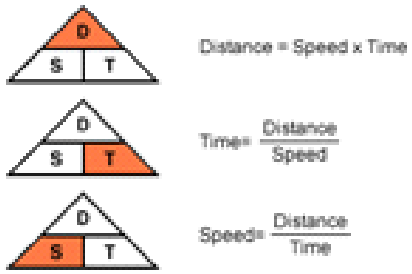
Light and the electromagnetic spectrum

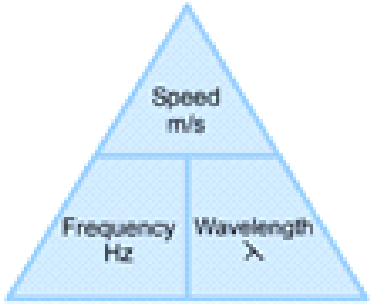
Topic: YEAR 9 WAVES	Duration: 10 lessons	Composite: Unit test

Core Key vocabulary:	Core knowledge Components Powerful knowledge components crucial to commit to long term memory (Powerful in red box)		Links to previous and future topics
Vibration Energy Amplitude Frequency Wavelength Peak Transverse Longitudinal Reflection Refraction Superpose Compression Rarefaction Hertz Medium Vacuum Decibel Perpendicular Incident Normal Dense Speed Direction Convex Lens Eye Electromagnetic Spectrum Radiation Radio Microwave Infrared Visible Ultraviolet X-rays Gamma` Speed Time Period Distance Time Metres Seconds	1. Waves move from a source to a receiver. E.g. radio waves move to the ear. 2. When waves hit a barrier or another substance (medium), they can:- a. Reflect = bounce off b. Refract = change speed so change direction c. Disperse = spread out thinly in all directions d. Superpose = waves add together or cancel out e. Diffract = waves spread out when they superpose 3.  Transverse wave = vibrations are perpendicular to the direction that the wave is travelling in. E.g. light, water, all EM waves. Longitudinal wave = vibrations are parallel to the direction in which the wave is travelling E.g. sound and p-wave (seismic) 4. Humans hear frequencies 20 to 20,000Hz Ultrasound = above 20,000Hz Infrasound = below 20Hz 5. Sound wave: **frequency** increases **= pitch** increases & **if Amplitude** increases = **volume** increases 6. The eye and the camera change the speed and so the direction of light.. 7. The eye and the camera result in chemical and electrical changes to photosensitive material (material that is affected by light)	• Waves are caused by vibrations from a source. E.g. a pebble landing in water • When the wave moves, it transfers energy and/or information from one place to another. • There are different types of wave that move different amounts of energy in different ways. • The 2 types of wave are called transverse and longitudinal. • Features of waves can be measured e.g. wavelength, frequency and amplitude. • Wavelength (λ) : unit = metres (m) • Frequency (f) : unit = Hertz (Hz) or 'per second' • Amplitude (A) : unit = metres (m) • Speed (s or v) : unit = metres per second (m/s) • Distance (d) : unit = metres (m) • Time (t) : unit = seconds (s)	KS3: Y8 Light and Sound KS4: Waves; Light and the EM Spectrum; Radioactivity – Electrons & Orbits KS5: Physics: Waves 1 and 2, Oscillations, Stars, Cosmology

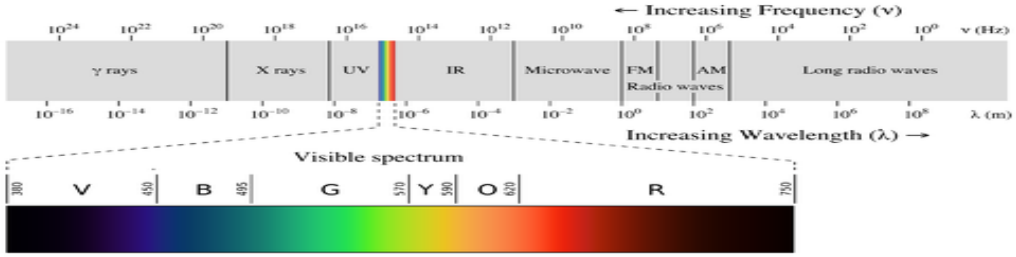








8. **White light is a spectrum of colours that each have different Wavelength, Frequency, and energy. Red has the longest wavelength, lowest frequency and lowest energy.**
9. The Electromagnetic Spectrum is a continuous wave whose amount of energy transfer changes from one end of the spectrum to the other.
10. This changing energy results in different uses and dangers for each group in the Spectrum



	Radio	Microwave	Infra-red	Visible	U-V	X-ray	Gamma
Uses	**TV Radio**	**Mobiles Oven**	**Heating food**	**Camera Eye**	**Sterilise water**	**Medical – inside body**	**Sterilising, medical imaging**
Dangers	**None**	**Unknown for phones**	**Skin burns**	**Retina damage**	**Damage cells or…**	**…mutate DNA……..**	**…….that may lead to cancer or kill cells.**

Topic: Forces in a Newtonian World	Duration: 11 lessons	Composite: Unit test

Key vocabulary:	Core knowledge Components and Powerful knowledge components (P) crucial to commit to long term memory	Links to previous and future topics

- **Force**
- **Newton**
- **Speed**
- **Velocity**
- **Acceleration**
- **Direction**
- **Gradient**
- **Area**
- **Mass**
- **Weight**
- **Gravitational Field Strength**
- **Balanced**
- **Unbalanced**
- **Initial**
- **Final**
- **Friction**
- **Resultant**
- **Magnitude**
- **Braking**
- **Stopping**
- **Thinking**
- **Momentum**
- **Light gate**

Year 10 Forces and Motion (Page 1)

Core and **Powerful (P)** knowledge questions

What is the difference between a scalar and a vector quantity? (P)
A **vector** quantity has **size** and **direction**.
A **Scalar** quantity has **size only**

Name some vector and scalar quantities

Scalars	Vectors
direction	displacement
speed	velocity
mass	forces (including weight)
temperature	acceleration
energy	momentum

State some everyday speeds:

Walking 1.5m/s
Running 3 m/s
Cycling 6m/s
Car 25m/s
Train 50m/s
Plane 250m/s

What are the units for distance, speed, acceleration, force, mass, time and momentum?

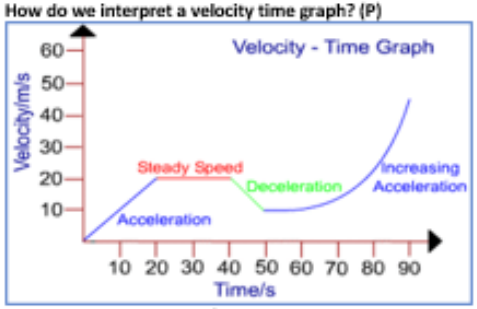
Distance, m	Speed, m/s	Acceleration, m/s2	Force, N	Mass, kg	Time, s	Momentum kgm/s

What equation links velocity, distance and time? (P)

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

How do we interpret a distance time graph? (P)

How do we interpret a velocity time graph? (P)



What does the gradient of a velocity time graph equate to? (P) Acceleration

What does the area under a velocity time graph equate to? (P) Distance travelled

What is the equation that links acceleration with change in velocity and time? (P)

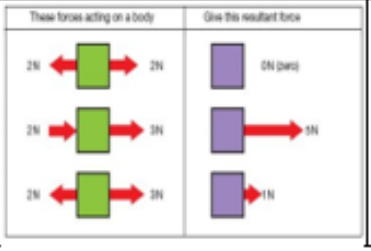
$$a = \frac{(v-u)}{t}$$

Which equation links acceleration with change in velocity and distance travelled?

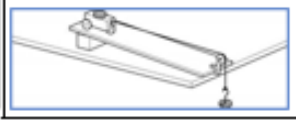
$$v^2 - u^2 = 2 \times a \times x$$

What happens to an object if there is a resultant force acting on it? (P) The object moves in a straight line at a steady speed

What happens to an object if there is no resultant force acting on it? (P) The object accelerates



Required practical: Watch again: Investigating force, mass and acceleration



KS2: Forces & Magnets, Forces

Y7: Forces & Space

Y9 Forces

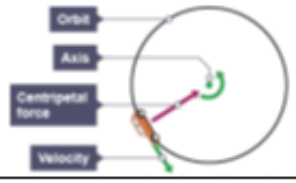
KS4: Forces & Motion; Forces & Matter

Year 10 Forces and Motion (Page 2)

Core and **Powerful (P)** knowledge questions

What is the name of the type of force that keeps an object moving in a circle? (H)
Why is an object moving in a circle constantly accelerating? (H)

Objects travelling in a circular motion are prevented from moving off in a straight line by **centripetal force**. This resultant force pulls objects toward the centre of the circle, continually changing the direction that an object is travelling in to keep it in circular motion.



What does Newton's First Law of Motion State?

An object remains in the same state of motion unless a resultant force acts on it. If the resultant force on an object is zero, this means:

- a stationary object stays stationary
- a moving object continues to move at the same velocity (at the same speed and in the same direction)

What does Newton's Second Law of Motion State?

The law can be described by this equation which shows that the acceleration of an object is:

$F = m \times a$

- proportional to the resultant force on the object
- inversely proportional to the mass of the object

In other words, the acceleration of an object increases if the resultant force on it increases, and decreases if the mass of the object increases

What is the equation that links force, mass and acceleration? (P)

$$F = m \times a$$

What is weight?
What is the difference between mass and weight?

Mass and weight are not the same!

- Mass is the amount of matter in an object and is measured in kilograms. Mass is not a force.

  Mass will have the same value anywhere in the Universe, including space.

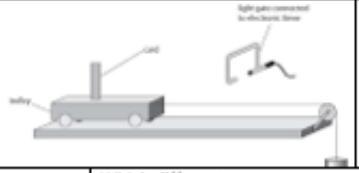
- Weight is a force and is caused by the pull of gravity acting on a mass . Like other forces, weight is measured in newtons and has both magnitude and direction.

What does Newton's Third Law of Motion State?

Whenever two objects interact, they exert equal and opposite forces on each other

How do light gates work?

A **light gate** is connected to a device that measures the time the **light** is blocked when the card passes through it.



What is the equation that links momentum, mass and velocity? (H)

$$p = m \times v$$

What equation links change in momentum to force? (H)

$$F = \frac{(mv - mu)}{t}$$

How is overall stopping distance linked to braking and thinking distance?

Stopping distance = Thinking distance + Braking distance

Which different factors affect thinking and braking distance?

Thinking distance	Braking distance
Speed of car	Speed of car
Drugs and alcohol	Road conditions
Tiredness	Condition of tyres
Medication	Condition of brakes