THE DUSTON SCHOOL
Knowledge itself is power
4-19

Year 7 Science Knowledge Booklet

Term 4

Name:	**Class:**
Homework 1 Due: 3rd March 2025	**Homework 2 Due: 17th March 2025**
Homework 3 Due:	

Science Homework 1

Read all of this knowledge organiser. The work covered will be in the first knowledge quiz of the term.

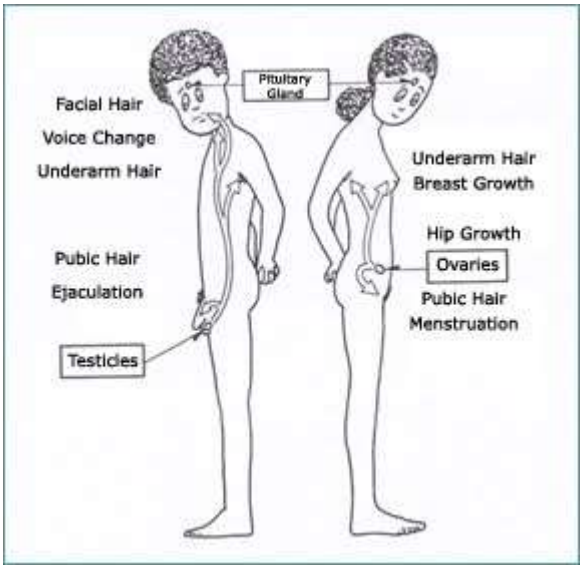
Key vocabulary

Adolescence	**changing from a child to an adult**
Puberty	**physical changes that the body goes through during adolescence**
Hormones	**chemical messengers, transported via the bloodstream to targeted cells**
Gamete	**sex cell**
Male reproductive system	**produces male sex hormones, sperm cells and insert sperm cells into females**
Sperm cell	**male sex cell (animals only)**
Female reproductive system	**produces female sex hormones, egg cells and grow a baby**
Egg cell / Ova	**female sex cell (plants and animals)**
Semen	**mixture of sperm cells with fluid released by male sex glands**
Fertilisation	**fusing of the sperm and egg cell nuclei in the female oviduct**
Zygote	**fertilised egg**
Contraception	**the deliberate use of artificial methods or other techniques to prevent pregnancy**
Period	**part of the menstrual cycle, where uterus lining thickens, breaks down then leave the body if the egg is not fertilised**
Menstruation	**scientific term for period**
Mammal	**warm blooded, females normally birth live babies and feed them by making milk e.g. breastmilk in humans**
Sexual intercourse	**sexual contact between individuals involving penetration**
Sexual reproduction	**production of new organisms by combining genetic information from 2 individuals of different sexes**
Implantation	**attachment of a fertilised egg to the uterus wall at the start of pregnancy**
Embryo	**zygote (fertilised egg) divides rapidly until it forms a ball of cells called an embryo**
Chromosome	**found in the nucleus of a cell, carries genetic information in the form of genes**
Ovulation	**release of a mature egg cell (ova)**
Pollen	**male sex cell in plants**
Pollination	**pollen grains transfer from the plant's male part to the female part**
Self-pollination	**pollen and egg cell are from the same plant**
Cross-pollination	**Pollen and egg cell are from different plants**

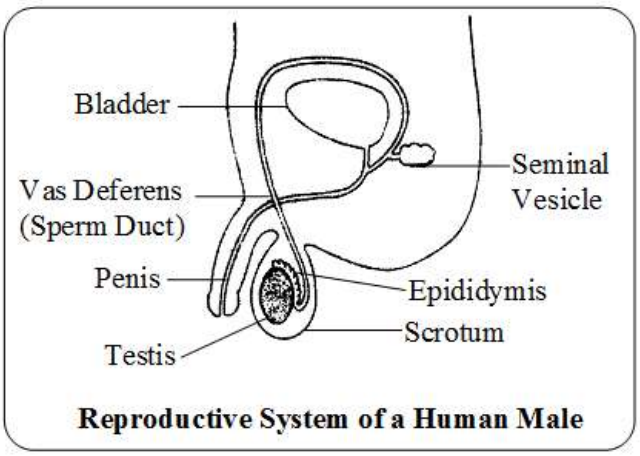
What happens at puberty?

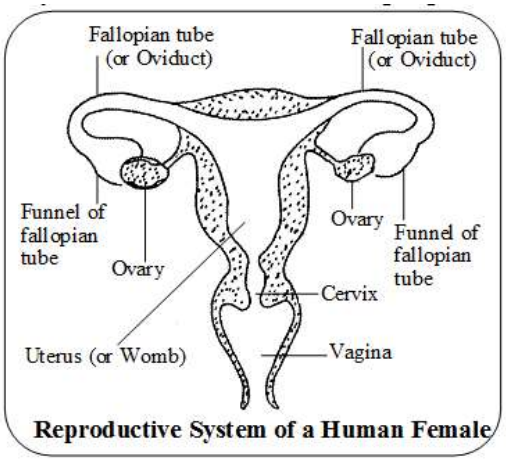
Female stages	Age at the start	Noticeable changes
1	After the 8th birthday	None
2	From age 9–11	Breast "buds" start to form; pubic hair starts to form
3	After age 12	Acne first appears; armpit hair forms; height increases at its fastest rate
4	Around age 13	First period arrives

Male stages	Age at the start	Noticeable changes
1	After the 9th or 10th birthday	None
2	Around age 11	Pubic hair starts to form
3	Around age 13	Voice begins to change or "crack"; muscles get larger
4	Around age 14	Acne may appear; armpit hair forms



What are the reproductive organs of humans?



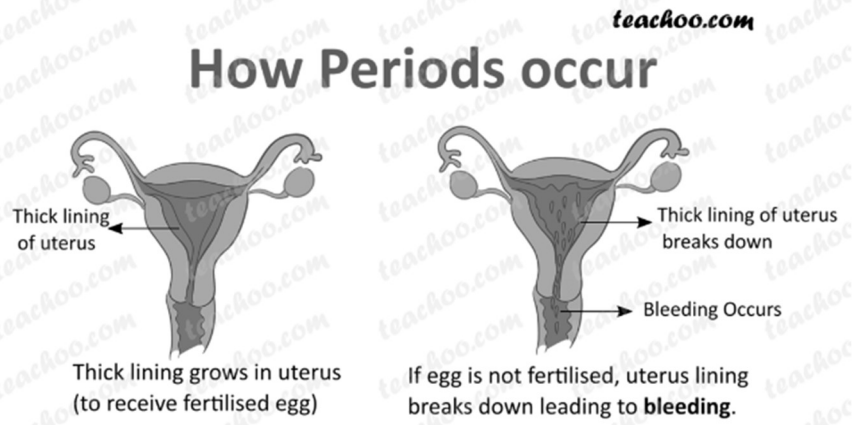


Science Homework 2

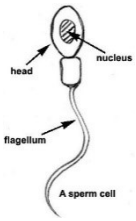
Try to answer all of these key knowledge questions. Then check your answers using the last page. These are some of the questions that will be in the knowledge quizzes and the end of term tests.

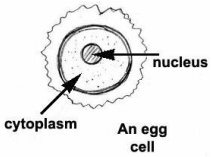
Key knowledge question	**Your answer**
Describe the 3 adaptions of gas exchange surfaces	
Describe the function of the placenta and umbilical cord	
Give an example of active transport in plants	
Give the definition of active transport	
Give the definition of osmosis	
How long is an average human pregnancy?	
Name the gametes for animals and plants	
State happens on day 14 of the menstrual cycle?	
State the function of the testes	
The monthly hormonal cycle of female humans is called the _____ cycle.	
Two muscles working in pairs are called?	
What 4 things does your skeleton/ bones do?	
What do we call 2 or more different tissues working together to carry out a function?	

What are periods?



How do mammals reproduce?





Sperm cell – Male Gamete

- smaller
- can swim / mobile
- made constantly
- millions of sperm released each ejaculation

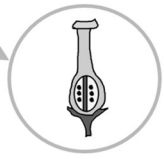
Egg cell – Female Gamete

- larger
- must be moved by cilia
- made before birth, only mature during puberty
- only 1 egg released per month

Fertilisation → fusing of sperm **nucleus** and egg **nucleus**
Only 1 sperm enters the egg!

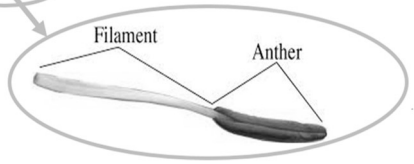
How do flowering plants reproduce?

Female Reproductive System is called the **carpel**
Carpel → stigma AND style AND ovary



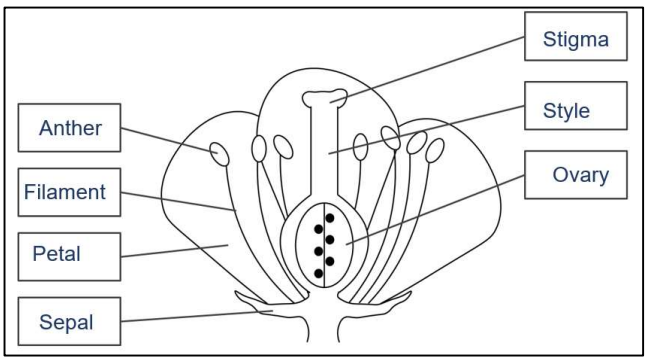
Ovary → produces egg cells (female gametes)
Stigma → sticky part that catches pollen
Style → holds up the stigma

Male Reproductive System is called the **stamen**
Stamen → anther AND filament



Anther → produces pollen, the male gamete

Filament → holds up the anther



Pollination → transfer of pollen grains **from** the **anther** to the **stigma**

Key knowledge question	**Your answer**
Describe the 3 adaptions of gas exchange surfaces	Short diffusion pathway (thin surface), Large concentration gradient maintained (eg blood supply), large SA
Describe the function of the placenta and umbilical cord	Placenta- exchange of nutrients, oxygen and waste between mothers and fetus' blood.
Give an example of active transport in plants	Mineral ions entering roots
Give the definition of active transport	Movement of particles from an area of low concentration into an area of high concentration, across a partially permeable membrane, involving energy
Give the definition of osmosis	Movement of WATER from dilute solution to concentrated solution across a partially permeable membrane
How long is an average human pregnancy?	40 weeks (9 months)
Name the gametes for animals and plants	Animal- sperm and egg, Plant- Pollen and egg/ ovule
State happens on day 14 of the menstrual cycle?	Ovulation/ egg released from ovary
State the function of the testes	Produce sperm and testosterone
The monthly hormonal cycle of female humans is called the _____ cycle.	The menstrual cycle
Two muscles working in pairs are called?	Antagonistic
What 4 things does your skeleton/ bones do?	Structure, movement, protection, making blood cells
What do we call 2 or more different tissues working together to carry out a function?	An organ

6.4 Waves

Big questions

What are waves?
What are the properties of waves?
How do sound waves travel?
How does light travel?
What are the differences between light and sound?
What happens when light hits a surface?
How can we use reflection?
What happens when light goes through an object?
How do lenses work?
What is the electromagnetic spectrum?

Key vocabulary

Wave	Ways of transferring energy and information through a medium without overall movement of the medium.
Wavelength	The length of one complete wave. Measured in metres.
Amplitude	The maximum displacement of a point on the wave. (measured form the undisturbed position)
Frequency	The number of complete waves passing every second. Measured in Hertz (Hz)
Transverse wave	A wave whose vibrations are at right angles to the wave direction. Light and all electromagnetic radiations are transverse waves.
Longitudinal wave	A wave whose vibrations are along the direction of wave travel. Sound waves are longitudinal waves.
Wave speed	The speed that wave crests travel. In metres per second.
Refraction	The change of direction of a wave when it crosses a boundary. Caused by a change in wave speed.
Reflection	When a wave bounces off a surface.
Normal	A line drawn at right angles to a boundary where the wave crosses the boundary. All angles of waves are measured from the normal.
Specular reflection	Reflection from a smooth surface like a mirror. All waves coming from the same direction are reflected at the same angle.
Electromagnetic spectrum	The range of radiations in the same family as visible light. All electromagnetic radiations are transverse waves and travel at the speed of light.

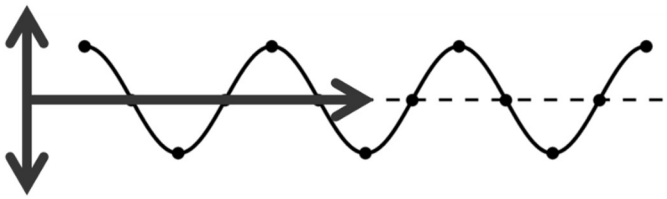
What are waves?

A wave is an oscillation or vibration that transfers energy, not matter
Waves can transfer energy and information without a net motion of the medium through which they travel. They involve vibrations (oscillations) of some sort.

The 2 types of waves are:

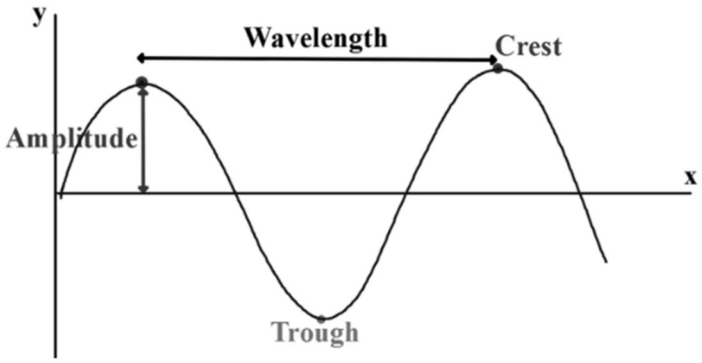
Longitudinal waves
Particles vibrate parallel to the direction the wave travels e.g. sound waves

Transverse waves
Particles vibrate at right angles to the direction the wave travels e.g. light



What are the properties of waves?

Amplitude (A) is the maximum displacement of a wave. (Distance from the middle to the top or bottom of a wave)



Wavelength (λ) is the distance between two peaks (or any two equivalent adjacent points).

Frequency (f) is the number of waves that passes a point each second.

The unit of frequency is **Hertz (Hz).**
1 Hz = 1 wave per second

Time Period (T) is the time for one oscillation**.**

Time period $= \frac{1}{frequency}$ $\quad T = \frac{1}{f}$

T is measured in seconds

Reflection involves a change in direction of waves when they bounce off a barrier.
Wave speed, frequency and wavelength all stay the same.

Diffraction is the spreading out of a wave after passing around an obstacle or through a gap.
Wave speed, frequency and wavelength all stay the same.

Refraction is when a wave changes direction and occurs at a boundary/ surface when a wave moves from one material to another.
Wave speed and wavelength change but frequency stays the same. There may also be a change in direction.

When two waves meet they add together.
This is called **superposing.**

How do sound waves travel?

- Sound waves are caused by vibrations.
- The vibrations cause air particles to vibrate and the vibrations are passed on by the particles in the air to your ear and cause your ear drum to vibrate.
- Sound travels through solids and liquids as well as gases.
- Sound travels faster in solids and slowest in gases.
- This is because the particles are closer together in a solid so the vibrations are passed on quicker.
- Sound cannot travel in a vacuum because there are no particles to vibrate.

Substance	Speed of sound
Air	343 m/s
Water	1493 m/s
Steel	5130 m/s

How does light travel?

- Light is a transfer of energy.
- Light is emitted by a luminous source like the Sun, a light bulb and fire.
- Light travels in straight lines.
- Light travels as a wave.
- Light can travel through a vacuum. (Sound cannot travel through a vacuum).
- Light travels at the speed of light = 300,000,000 m/s (3×10^8 m/s).
- Light can be reflected, transmitted or absorbed.
- A transparent object transmits most light (some can be reflected or absorbed)
- An opaque object does not transmit light – light is reflected or absorbed
- A translucent object transmit some light

What are the differences between light and sound?

Light is a transverse wave, sound is a longitudinal wave.
The speed of light is 300,000,000 m/s. That is almost 1 million times faster than the speed of sound.
Light can travel through a vacuum, it does not need particles.

Science Homework 3

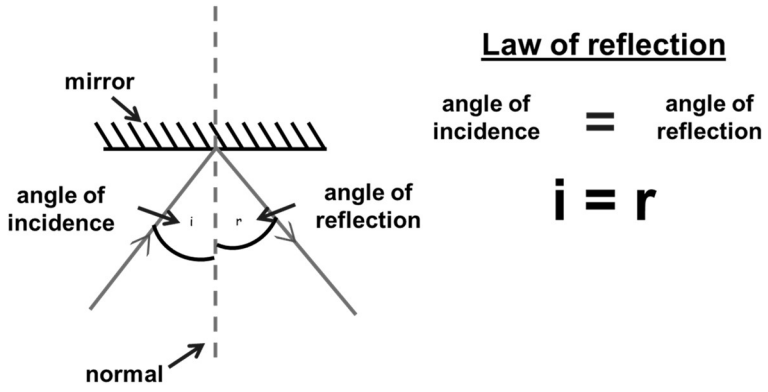
Try to answer all of these key knowledge questions. Then check your answers using the last page.

Questions in *italics* are from older work.

Key knowledge question	Your answer
Waves can be divided into 2 types, one is transverse, what is the other?	
What do we call a wave bouncing off a surface?	
What is the unit of frequency?	
What equation links frequency, wavelength and wave speed?	
At what angle to wave direction are the vibrations in transverse waves?	
Light, X-rays and radio waves are all part of what?	
The length of one complete wave measured in metres is its?	
The maximum displacement of a point on a wave is called its?	
What do we call a wave changing direction as it moves from one material to another?	
What do we mean by a waves frequency?	
Which, out of solids, liquids and gases can the particles only vibrate?	
How can you tell from a heating curve when state change occurs?	
In which state of matter do particles have the greatest energy?	
Which out of solids, liquids, and gases can easily be compressed?	

What happens when light hits a surface?

The Law of Reflection states that i = r



Shiny smooth surfaces reflect regularly. This is called specular reflection. Other surfaces also reflect light but if the surface is rough the light is reflected in all directions. We call this diffuse reflection.

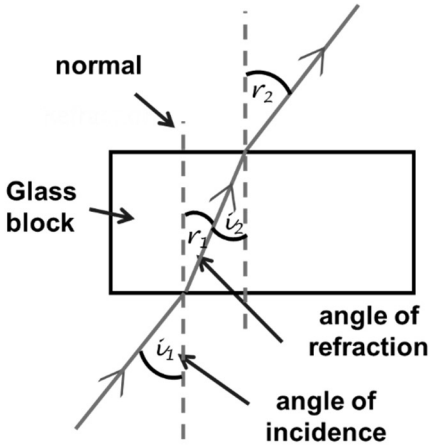
How can we use reflection?

Mirrors inside cars reflect light to help drivers see objects behind them.
Reflective strips on clothing and bikes help cyclists to be extra visible at night.
'Cat's eyes' on the road reflect light from car headlamps to help the driver see the road at night.

Peri a prefix meaning “about” or “around’’.
A word that originated from the Greek language as a preposition.
Scope- indicating an instrument for observing, viewing, or detecting: *microscope, stethoscope.*

What happens when light goes through an object?

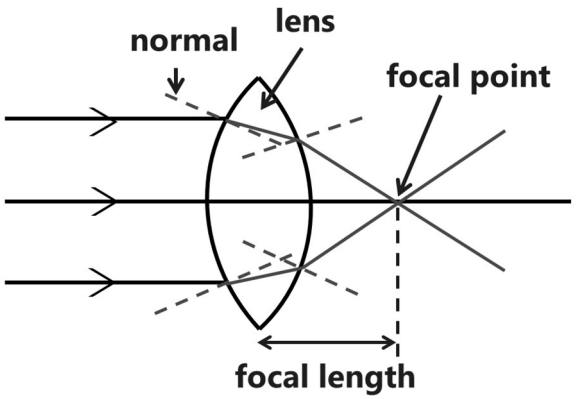
When light travels from one medium to another (e.g. air to water) it changes direction at the boundary between the two mediums. This is called refraction.
The wave slows down as it goes into a denser medium so changes direction.



The angle of incidence is greater than the angle of refraction for light entering a glass block
Light bends towards the normal.
The angle of incidence is less than the angle of refraction for light emerging from a glass block
Light bends away from the normal

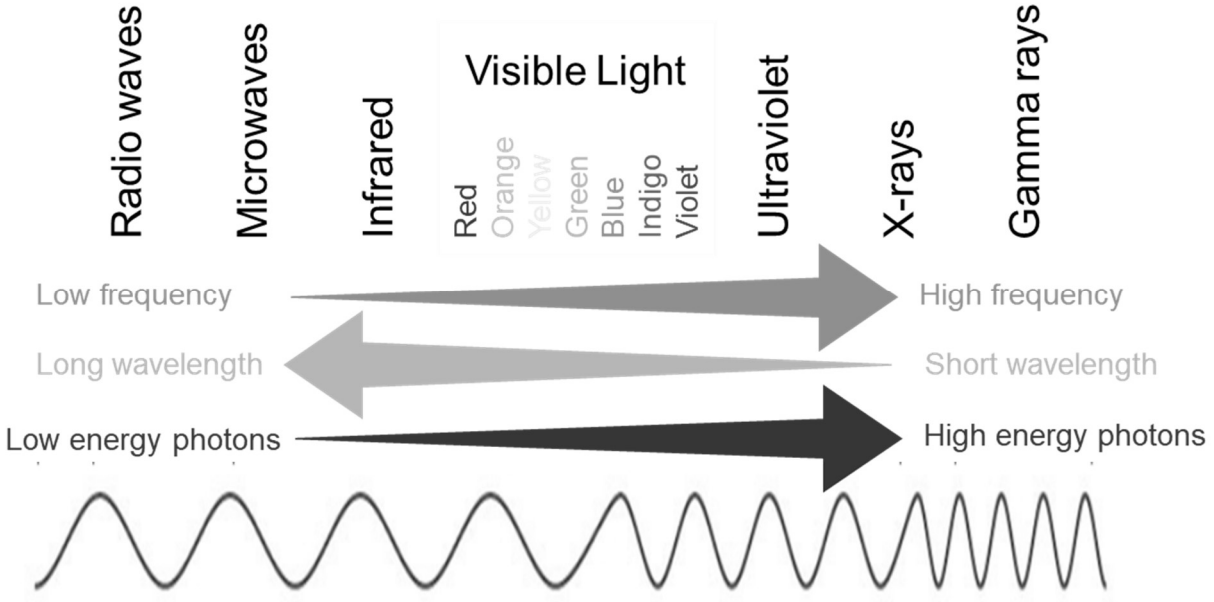
How do lenses work?

Lenses use refraction to change the direction of light rays, they cause images to be enlarged or reduced.



What is the electromagnetic spectrum?

Electromagnetic waves carry energy. The waves are transverse vibrations in electrical and magnetic fields, not vibrating particles.
Electromagnetic waves do not need matter to travel through - they can travel through empty space (a vacuum).
In a vacuum, all electromagnetic waves travel at $3x10^8$ ms^{-1} - the fastest speed possible. They slow down a bit when travelling through matter (e.g. light travelling through glass)



Key knowledge question	Answer
Waves can be divided into 2 types, one is transverse, what is the other?	Longitudinal
What do we call a wave bouncing off a surface?	Reflection
What is the unit of frequency?	Hertz (Hz)
What equation links frequency, wavelength and wave speed?	wave speed(m/s) = frequency (Hz) X wavelength (m)
At what angle to wave direction are the vibrations in transverse waves?	Right angles/ 90 degrees
Light, X-rays and radio waves are all part of what?	The electromagnetic spectrum
The length of one complete wave measured in metres is its?	Wavelength
The maximum displacement of a point on a wave is called its?	Amplitude
What do we call a wave changing direction as it moves from one material to another?	Refraction
What do we mean by a waves frequency?	The number of complete waves passing per second
Which, out of solids, liquids and gases can the particles only vibrate?	***Solids***
How can you tell from heating curve when state change occurs?	***Heating continues but temperature does not change (a flat line)***
In which state of matter do particles have the greatest energy?	***Gas***
Which out of solids, liquids, and gases can easily be compressed?	***Gases***

Wider reading

Real-life tractor beam levitates objects using sound waves

It may seem straight out of "Star Trek," but it's real: Scientists have created a sonic "tractor beam" that can pull, push and pirouette objects that levitate in thin air.

The sonic tractor beam relies on a precisely timed sequence of sound waves that create a region of low pressure that traps tiny objects that can then be manipulated solely by sound waves, the scientists said in a new study.

Read more and watch a video at - https://www.cbsnews.com/news/real-life-tractor-beam-levitates-objects-using-sound-waves/

How to get the most out of your knowledge organiser:

- To get the most use out of the knowledge organisers you should be learning sections and then self-testing.

- There are several different things you can do
  - Look, cover, write, check, correct
  - Read through the organisers
  - Mind maps
  - Key spellings
  - Make a glossary
  - Missing out key words
  - Questions/answers answers/questions
  - Flash cards
  - Revision clock learning
  - Mnemonics

Look at the separate booklet you have been given about self-testing to help you

Science Learning Tools and wider study:

The Oak Academy – Online Science lessons
BBC Bitesize KS3 science
<u>You tube channels:</u>
Fuse school
Ted talks
Free science lessons
Primrose Kitten
<u>Shows on Netfilx</u>
Our planet
Tiny creatures
A life on our planet