

**Topic: Y8 Solutions & Mixtures**

**Duration: 8 lessons**

**Composite  
: Unit test**

Core knowledge Components

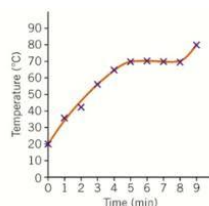
Powerful knowledge components crucial to commit to long term memory (IN RED BOX)

**Key vocabulary:**

Pure  
Impure  
Solvent  
Solute  
Solution  
Dissolves  
Saturated  
Solubility  
Filtration  
Filtrate  
Residue  
Evaporation  
Distillation  
Chromatography  
Chromatogram

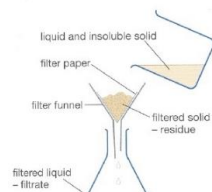
**KNOW WHAT PURITY IS: KNOW WHAT MIXTURES & COMPOUNDS ARE & TO IDENTIFY:**

- pure substances can be identified by their melting point. They have a sharp melting – melting happens at one temperature, not across a range of temperatures.

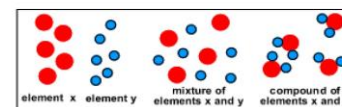


**FILTRATION**

- Residue = the liquid in the mixture
- Filtrate is = insoluble solid in the mixture
- How filtration can be used to separate mixtures: add mixture to filter funnel/filter paper; filtrate passes through into beaker; residue remains on the paper.
- Uses: oil filters; water treatment



1. Particle diagrams are used to show particles in elements, mixtures & compounds.



2. Mixtures are made up of more than 1 type of substance that are not chemically joined/bonded. They are easy to separate.
3. Compounds are made up of more than 1 type of substance that are chemically bonded. They are not easy to separate.
4. A pure substance Contains only 1 type of substance; it is not a mixture.
5. Dissolving is the spreading out of a solute in a solvent until it cannot be seen.

KS2: Use of everyday materials, states of matter, properties and changes of materials

Y7 – Particle model

Y7 – Atoms, Elements and Compounds

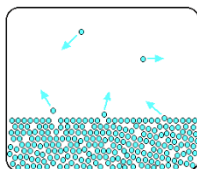
Y9 – States of Matter & Mixtures

KS4 – Methods of Separating and Purifying Substances

KS4 – Particle Model

### EVAPORATION

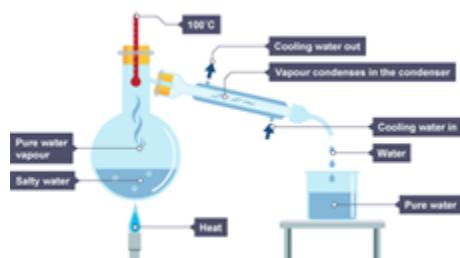
- Evaporation only affects particles on the surface of the mixture.
- It can happen at any temperature
- It can be used to separate mixtures: some liquid particles on the surface of the mixture gain energy from the surroundings. They move more and break free from the liquid. They move into the surroundings as a gas. Left behind are particles that don't have enough energy to leave.
- Uses: getting salt or water from sea-water, glue



**Evaporation is different to boiling. Evaporation happens to particles on the surface and can happen at any temperature. It is usually slow.**

### DISTILLATION

- The liquid in the solution boils.
- The gas leaves the solution.
- The gas travels down the condenser and cools down.
- The gas condenses to form a liquid.
- The liquid collects in another container.
- Uses: refining oil, distillery, obtaining drinking water

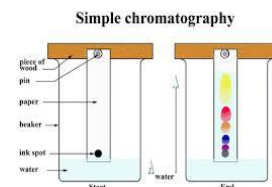


### UNDERSTAND WHAT IS MEANT BY SOLUBILITY AND HOW SOLUTIONS ARE FORMED

- **solubility of the solute = the mass of solute that dissolves in 100g of water**
- **How temperature affects solubility: as temperature increases, solubility increases – more solute can dissolve**
- **solute = the solid or gas that dissolves in a liquid**
- **solvent = the liquid in which a solid or gas dissolves**
- **solution = a mixture of a liquid with a solid/gas. All parts of the solution are the same**
- **solutions are formed by dissolving a solute in a solvent.**
- **saturated solution = a solution in which no more solute can dissolve**
- **UNDERSTAND HOW AND WHEN TO USE THE 4 MAIN METHODS FOR SEPARATING MIXTURES: filtration, evaporation, distillation and chromatography.**
- **Filtration: Used to separate an insoluble solid from a liquid**
- **Evaporation: Used to separate a soluble solid from a liquid**
- **Distillation: Used to separate 2 or more liquids or a soluble solid from a liquid**
- **Chromatography can be used to separate substances in a mixture that are soluble in the same solvent.**

### CHROMATOGRAPHY

How: Draw pencil line of chromatography paper. Add dot of mixture to pencil line. Place paper into solvent making sure pencil line is above. Allow solvent to move up the paper. Observe the separation of the mixture.



Impressive reading	Impressive speaking	Impressive writing	Resilience	Employability via:
<a href="http://www.bbc.co.uk/bang/handson/forensic_detective.shtml">http://www.bbc.co.uk/bang/handson/forensic_detective.shtml</a>  (The above link includes practical work for students to carry out)  Explain how chromatography can be used to solve crimes	Students to offer suggested answers to Think Hard questions.	Describe how separation techniques can be used to identify components within a mixture.	Demonstrate understanding to select the most appropriate separation technique dependant on the solution	Detectives, brewers, Oil refinery workers, forensic scientists, Aid workers (water provision)

CULTURE CAPITAL: CULTURE CAPITAL: [https://www.youtube.com/watch?v=L03C\\_ZukGKY](https://www.youtube.com/watch?v=L03C_ZukGKY) How the use of a Paper-fuge can separate blood, be used to identify diseases and thus save lives particularly in poorer countries.

## SEND

- Opening activity/theme is 'then, now, what' to ensure student buy in.
- Links to prior learning explicitly highlighted to support non-verbal reasoning – lessons have a knowledge recall starter and use of 'then, now, next'.
- Skills ordered logically and sequenced with an increase in complexity as shown on each lesson's power-point presentation.
- Repetition of key vocabulary in every lesson – each lesson has specific key words that appear regularly on slides. Students either write/provided with a copy for their books.
- Uses of separating techniques: examples of separating methods chosen as relatable.
- Opportunities for retrieval practice and building on prior knowledge throughout lessons and in each End of Topic test.
- Multi-sensory approach using: practical work, teacher demonstrations, listening to the teacher and reading information, writing, reading, paired work, the provision of a Topic Overview and Knowledge Organiser

# Topic: FOOD AND DIGESTION

KS3 National Curriculum sub-topics:-

Duration: 8 lessons

Composite : Unit test

Key vocabulary:

Core knowledge Components

Links to previous and future topics

Powerful knowledge components crucial to commit to long term memory (in red box)

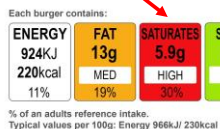
Respiration  
Carbohydrates  
Lipids (fats)  
Proteins  
Vitamins  
Minerals  
Fibre  
Enzyme  
Protease  
Carbohydrase  
Lipase  
Amylase  
Oesophagus  
Stomach  
Liver  
Intestine  
Rectum  
Anus  
Bacteria  
Bile  
Malnourishment  
Starvation  
Obese  
Deficiency  
Digestion  
Nutrient  
Balanced diet  
Hypothesis  
Catalyst

## Nutrients and Healthy Diet:

Food packaging shows us:-

- what ingredients are present in food
- how much of a nutrient is present in a serving.
- how much energy the food contains.
- There is colour coding on a label on the front that indicates if the food is healthy/ contains certain nutrients in high amounts.

Red means high (these are foods that should be cut down on and eaten less and in small amounts)



Green means low (healthy)

Amber means medium (so you can eat foods with all or mostly amber on label most of time)

## Nutrient Deficiencies:

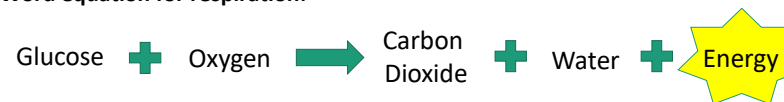
If you have too little of a particular nutrient, we say that you have a deficiency in that nutrient.

- iron deficiency can cause anaemia, where there are too few red blood cells
- vitamin A deficiency can cause blindness
- vitamin D deficiency or calcium deficiency causes rickets, which makes the legs bow outwards in growing children
- vitamin C deficiency causes scurvy, which makes the gums bleed (see picture below)

- If the amount of energy you get from your food is different from the amount of energy you need, your diet will be imbalanced and this will have a negative impact on health:
- too little food may lead to a person being underweight (anorexic)
- too much food may lead to a person being overweight (obese)

## POWERFUL KNOWLEDGE

1. Respiration is the process that the body uses to release energy from digested food (glucose).
2. Word equation for respiration:



3.

### Sources and functions of different nutrients:

Nutrient	Sources (where it is found)	Function (why it is important in the body)
Carbohydrates	Bread, rice, pasta, noodles, potatoes, cereals	To release energy
Protein	Meat, eggs, fish, tofu, pulses, cheese, nuts	For growth and repair of body tissue
Fats	Butter, oils, margarine	To release energy and to form cell membranes
Fibre,	Vegetable and fruit, brown bread, brown rice, pasta, whole-wheat cereals	To keep the digestive system working and to prevent constipation
Vitamin C	Oranges, lemons, limes	Prevents scurvy
Vitamin D	Sunlight, oily fish	For healthy growth of bones and prevents rickets
Iron	Meat, nuts, fortified cereals, kale,	To create red blood cells and to prevent anaemia
Calcium	Milk, cheese	Strong teeth and bones

KS2 – Animals including Humans, Living things and their habitats

KS3 – Y7 Cells; Organisation

KS4 – movement of substances in/out of cells: diffusion, osmosis and respiration

KS4 – Rates of Reaction

KS4 – Health & Disease

**Food tests:**

Food Test	Method	Positive Result
Starch	Add iodine to sample	Orangey-brown iodine turns <b>blue-black</b>
Protein	Add biuret solution to sample	Blue solution turns purple
Fats	Rub food on greaseproof paper	Translucent stain on paper
Glucose	Add Benedict's solution to sample and leave in a water bath for 5-10 mins	Blue solution becomes yellow-orange-red (depending on amount of glucose, red being most)

**Digestive System:**

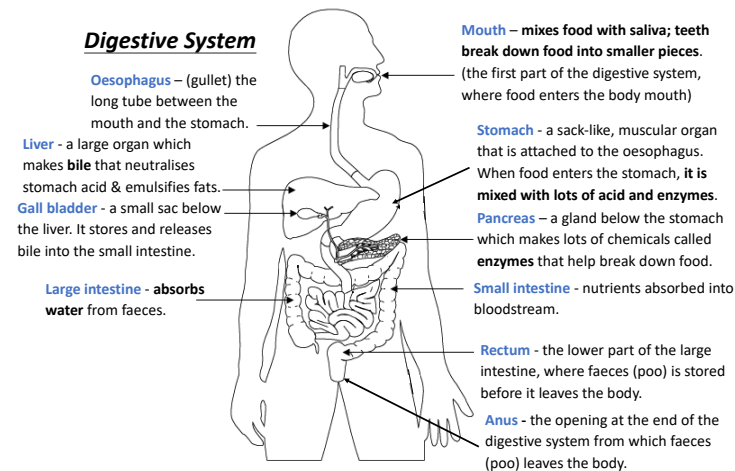
- **Physical (mechanical) digestion** = breaking down of food into smaller pieces.
- **Chemical digestion** = breaking down of large molecules into smaller more soluble molecules through the use of enzymes.

**Bacteria and Enzymes in Digestion**

- Bacteria in the digestive system are important. For example, they:
  - can digest some substances that humans cannot digest, such as certain carbohydrates
  - reduce the chance of harmful bacteria multiplying and causing disease
  - produce some vitamins that humans need, such as vitamins B & K
- An enzyme is a biological catalyst.
- Enzymes are proteins.
- A catalyst is something that speed up the breakdown large molecules into smaller molecules without being used up in the reaction.
- Factors that affect enzyme action include temperature and pH.
- Enzymes have an optimum pH and temperature that they work best at and this varies for different enzymes.

**POWERFUL KNOWLEDGE**

4. **A balanced diet is when:-**
  - a person eats food containing the right nutrients in the correct amounts.
  - a diet provides important vitamins, minerals, and nutrients to keep the body and mind strong and healthy.
5. **Eating well can also:-**
  - help ward off numerous diseases and health complications
  - help maintain a healthy body weight
  - provide energy
  - allow better sleep
  - improve brain function.
6. **The Digestive system: names of parts and their function:-**



Impressive reading	Impressive speaking	Impressive writing	Resilience	Employability via:
Culture capital task: Read an article from BHF about sugar levels in our diet and complete tasks around this.	Students to present to the class their findings in	Describe how to carry out food test.	Learning the names & spellings of the organs of Digestive system and describing their function	Diet and nutrition; Sports Science; gastroenterology

<ul style="list-style-type: none"> <li>• Read aloud in pairs – evaluate information in article by highlighting key information</li> <li>• What is your opinion?</li> </ul>	relation to the Impressive reading task.			
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**CULTURE CAPITAL: British Heart Foundation: link between blood sugar levels and diet.**

### SEND

- Opening activity/theme is opening slide to ensure learner buy in
- Opportunities for retrieval practice and building on prior knowledge: knowledge recall slide
- Multi-sensory approach using watching, listening, practical work, paired working, observing models, reading, speaking
- BHF: diet and glucose levels study chosen to support cultural capital at KS4/KS5
- BHF: diet and glucose levels study chosen as relatable
- BHF: diet and glucose levels study chosen due to cross curricular links with PE
- Repetition of key vocabulary in every lesson
- Curriculum time allocated for the explicit teaching of key vocabulary
- Skills ordered logically and sequenced with an increase in complexity
- Links to prior learning explicitly highlighted to support non-verbal reasoning
- Activities are scaffolded with over-learning of previous content to encourage independence

# Topic: Heating and Cooling

- KS3 National Curriculum sub-topics:-
- Energy Changes and Transfers
  - Energy in Systems

Duration: 8 lessons

Composite  
: Unit test

## Key vocabulary:

Conservation  
Energy  
Dissipates  
Thermal  
Kinetic  
Chemical  
Elastic  
Gravitational  
potential  
Temperature  
thermometer  
Equilibrium  
Conduction  
Convection  
Infrared  
Radiation  
Insulators

## Core knowledge Components

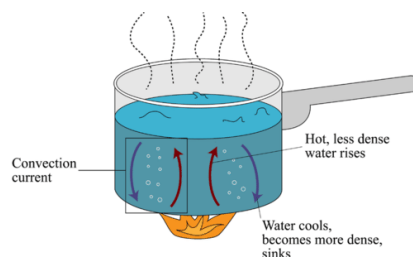
Powerful knowledge components crucial to commit to long term memory (in red box)

### Heat Transfers

Heating particles changes the way that they move, causing them to either vibrate quicker or move randomly with faster speeds.

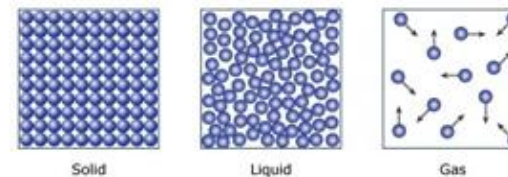
Heat can be transferred in three ways by convection, conduction, or radiation.

Convection -> When particles in one area of a fluid gain thermal energy and spread farther apart. This decreases the density of the particles, so they rise up through the fluid. As they rise, they transfer their thermal energy to other particles of the fluid and cool off in the process. With less energy, the particles move closer together so they sink back down through the fluid. When they reach the bottom of the fluid, the cycle repeats. This is called a **convection current**.



Radiation -> The transfer of heat which does not require particles. The most common example is the transfer of heat from the Sun to Earth.

### States of Matter



**Energy is measured in Joules (J)**

**Law of the Conservation of Energy: Energy cannot be created or destroyed but is transferred between stores into different forms.**

**Energy stores: thermal, kinetic, chemical, gravitational potential, elastic.**

**Useful energy: energy that is transferred to the desired store.**

**Wasted energy: energy that is not transferred to the desired store**

**Wasted energy often dissipates (spreads out thinly to the thermal store in the surroundings.**

**Thermal energy moves from a hotter area to a cooler area.**

Links to previous  
and future topics

KS3: Particles and their behaviour

KS4: States of Matter

KS4: Heat energy changes in chemical reactions

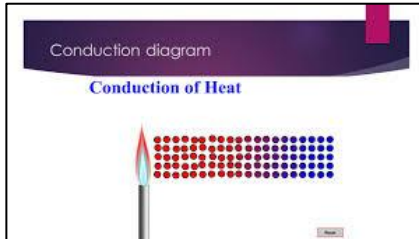
KS4: Earth and Atmospheric Science

KS4: Conservation of Energy

KS4: Electromagnetic Spectrum

KS4: Particle Model

Conduction -> The transfer of heat in a solid due to the vibration of the particles. One particle vibrates due to gaining heat, colliding with the particle next to it. This causes the heat to transfer down the solid.



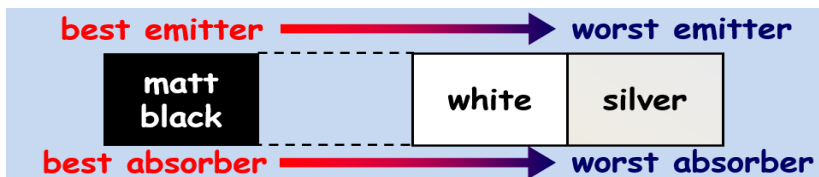
### Infrared Radiation

Heat can be transferred via infrared radiation which is invisible to the naked eye. We can see infrared radiation using a thermal imaging camera.



The red areas show large amount of infrared radiation leaving the house. This is often referred to as 'wasted' energy as it is being dissipated into the surroundings.

Different colours can emit and absorb different amounts of infrared radiation.



**Thermal equilibrium means there is no difference in temperature between 2 areas.**

The internal energy is the total amount of kinetic energy and potential energy of all the particles in the system.

Heating particles changes the way they move.

When energy is given to raise the temperature , particles speed up and gain kinetic energy.

Thermal energy transfers by: Conduction, Convection and/or radiation.

Conduction happens in solids.

Convection happens in liquids and gases.

Radiation does not need particles present.

The method that thermal energy transfers depends on whether particles are present and the State of Matter of the substances involved.

Insulation reduces the amount of wasted energy transfers.

Insulator = material that reduces thermal energy transfer.

Impressive reading	Impressive speaking	Impressive writing	Resilience	Employability via:
<p data-bbox="109 148 656 212"><a href="https://www.energysavingtrust.org.uk/home-insulation">https://www.energysavingtrust.org.uk/home-insulation</a></p> <p data-bbox="129 256 640 392">Carry out research to design an eco-House which lessens wasted thermal energy losses via conduction, convection and radiation.</p>	<p data-bbox="723 185 1144 212">Present Eco-house design to peers.</p>	<p data-bbox="1283 148 1514 427">Using K/U of thermal energy transfer, design a T-shirt that will keep the wearer cool in Summer but warm in Winter.</p>	<p data-bbox="1536 148 1771 392">Concisely and coherently explaining thermal energy transfer via conduction, convection and radiation</p>	<p data-bbox="1816 148 2074 212">Engineering, Product Design, Architecture.</p>

CULTURE CAPITAL: ECO-Housing – benefits to the individual, the country and the global environment. Using resources: <https://www.energysavingtrust.org.uk/home-insulation> and <https://www.youtube.com/watch?v=NMBdkoUdh8k>

**SEND**

- Opening activity/theme is starter slide to ensure learner buy in
- Opportunities for retrieval practice and building on prior knowledge on knowledge recall slide.
- Multi-sensory approach using reading, writing, listening, watching, doing practicals, participating in paired/group work, watching teacher demo/modelling
- ECO housing theme chosen to support cultural capital at KS4/KS5 and is relatable with cross-curricular links to Geography.
- Repetition of key vocabulary in every lesson
- Curriculum time allocated for the explicit teaching of key vocabulary
- Skills ordered logically and sequenced with an increase in complexity
- Links to prior learning explicitly highlighted to support non-verbal reasoning
- Texts used/alternative texts available with a consideration to reading age
- Activities are scaffolded with over-learning of previous content to encourage independence

<b>Topic: Y8 MICRORGANISMS</b>	<b>Duration: 13 LESSONS</b>	<b>Composite : Unit test</b>
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<b>Key vocabulary:</b>	<b>Core knowledge Components</b> <b>Powerful knowledge components crucial to commit to long term memory (in red box)</b>	<b>Links to previous and future topics</b>
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Unicellular  
Multicellular  
Bacteria  
Antibiotic  
Fungus  
Fermentation  
Respiration  
Decay  
Virus  
Vaccination  
Immunity  
Toxin  
Antibody  
Antiseptic  
Antibacterial  
Resistance  
Mutation  
Kingdom  
Domain

**Impressive Vocabulary:**

Classification  
Microorganism  
Microbe  
Immunological memory  
Eutrophication

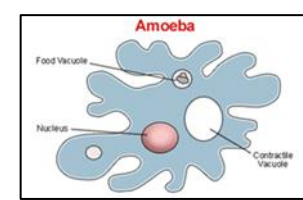
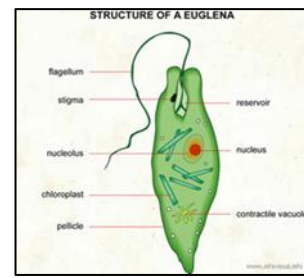
KEYWORDS	DEFINITIONS
Bacteria	Unicellular organisms, some of which can cause disease e.g. <i>E. Coli</i> , Salmonella, Cholera and Meningitis
Eutrophication	Excess of nutrients in a body of water due to run off from the land which causes a dense growth of plant life
Antibiotic	A medicine that inhibits the growth of or destroys bacteria
Fungus	A spore-producing organism that feeds on organic matter
Respiration	A process in living organisms where energy is released
Decay	Process of rotting or decomposing through the action of bacteria or fungi
Virus	A particle that can infect cells and cause the cells to make copies of the virus
Vaccination	A substance containing dead or weakened diseases introduced to the body to make the person immune to that disease
Immunity	The ability of an organism to resist a particular infection or toxin
Microorganism	A microscopic organism especially a bacteria, virus or fungus
Fermentation	Process where yeast produces carbon dioxide and ethanol from sugar

1. Organisms are grouped into categories based on their characteristics; this is called classification.
2. Microorganisms are microscopic organisms.
3. 5 Kingdoms: Plants, Animals, Protists, Fungi, Prokaryotes.
4. Organisms can be unicellular or multicellular. Unicellular = only 1 cell; multicellular = more than 1 cell.
5. Bacteria are microorganisms; they can be beneficial or harmful.
6. Some bacteria can be killed using antibiotics.
7. Antibiotic resistance means certain antibiotics can no longer destroy some bacteria; it is on the rise.
8. Aerobic respiration involves oxygen to release energy.
9. Anaerobic respiration does not involve oxygen to release energy.
10. Decay is a vital process in the recycling of substances such as Carbon.
11. Viruses are not organisms; they are not alive.
12. Some viruses can be destroyed using vaccinations.

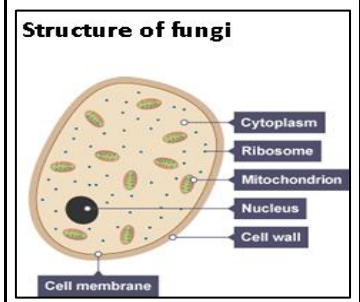
KS2: Animals including Humans; Living things and their Habitats, Earth

KS3: Y7 – Cells; Y7 – Living Processes; Y8 - Food and Digestion

KS4: Key Concepts; Cells and Control; Natural Selection; Health, Disease and the Development of Medicines; Ecosystems and Material Cycles.



Aerobic respiration	Chemical reaction that transfers energy to cells. Uses oxygen
Anaerobic respiration	Transfers energy from glucose to cells. Happens when oxygen is not present



**Uses: food (mushrooms); decay process; fermentation (making wine and beer)**

**Harmful: infections e.g. Athlete's foot**

Cytoplasm	Where chemical reactions happen
Ribosome	Where proteins are made
Mitochondrion	Where aerobic respiration occurs
Nucleus	Controls activities of the cell—where DNA is
Cell Wall	Supports and strengthens the cell. Made of chitin
Cell Membrane	Controls what can enter and leave the cell

**Bacteria**

Bacteria such as E. Coli, Salmonella and Cholera can make people very poorly, causing a range of symptoms such as vomiting and diarrhoea.

BUT

Not all bacteria are harmful! Yogurt and cheese makers use bacteria to make their products. Bacteria in our intestines help in digestion and produce vitamin K.

**How do antibiotics work against bacteria?**  
Antibiotics fight bacterial infections by either killing bacteria or slowing and suspending its growth. They do this by:

- Attacking the wall or coating surrounding the bacteria
- Interfering with bacteria reproduction
- Blocking protein production in bacteria

**How antibiotic resistance occurs**

**Viruses**

**Virus Structure**

Viruses do not have cellular structure but a core of genetic material surrounded by a protein coat.

They can only reproduce in living cells.

They are not living because they do not perform all the processes in MRS GREN

**Decay** is the process by which dead organisms are broken into smaller pieces. Organisms such as earthworms are involved in this process.

Bacteria and fungi also break down dead material.

During decay, carbon compounds in the dead matter are broken down by bacteria or fungi, releasing the carbon back into the soil.

Impressive reading	Impressive speaking	Impressive writing	Resilience	Numeracy	Employability via:
Reading of a journal article about a new antibiotic that has been developed to treat MRSA.	Correct use of key words and impressive vocabulary during spoken descriptions and explanations, in response to discussion around the journal article.	Pupils to write an account of a carbon atoms journey through the carbon cycle.	Use of characteristic s checklist to determine which kingdoms various organisms fit into.	Graph skills for investigations. (rate of fermentation with temperature; and rate of photosynthesis with light intensity)	Microbiologist Brewer Pharmacy Doctor Nurse Environmental Biologist/Chemist

**CULTURE CAPITAL:** Reading of a journal article about a new antibiotic that has been developed to treat MRSA.

**SEND**

- Opening activity/theme is opening slide to ensure learner buy in
- Opportunities for retrieval practice and building on prior knowledge: knowledge recall slide
- Multi-sensory approach using reading, listening, practical work, watching videos, dual-coding, practical work, paired working, observing teacher demonstrations
- Antibiotics & MRSA case study chosen to support cultural capital at KS4/KS5
- Antibiotics & MRSA case study as relatable
- Repetition of key vocabulary in every lesson
- Curriculum time allocated for the explicit teaching of key vocabulary
- Skills ordered logically and sequenced with an increase in complexity
- Links to prior learning explicitly highlighted to support non-verbal reasoning
- Activities are scaffolded with over-learning of previous content to encourage independence