KS3 Curriculum Overview 2021 onwards

**Particle model and physical changes**

**Cells, organisation and movement**

**Elements and compounds**

**Forces (focus on contact)**

**Energy transfers**

**Speed**

**Variation**

**Interdependence**

**Evolution & inheritance**

**Separating mixtures**

**Periodic Table**

**Metals & non-metals**

**Sound**

**Wave properties & light**

**Wave effects**

**Current**

**Voltage, resistance and electromagnets**

**Fields**

**Acids and alkalis**

**Photosynthesis**

**Heating and cooling**

**Types of reaction**

**Earth structure**

**Breathing**

**Pressure**

**Digestion**

**Respiration**

**Climate**

**Reproduction**

**Energy costs**

**Work**

**Chemical energy**

**Universe**

**Acids and alkalis**

**Four or more threshold topics**

**Feeds into four or more other topics**

**Key**

|  |  |
| --- | --- |
|  | **Feeding forward**  |
| **Topic** | **Threshold topics** | **Topic link 1** | **Topic link 2** | **Topic link 3** | **Topic link 4** | **Topic link 5** | **Other subjects** |
| **Particle model & physical processes****(1 threshold concept)** | **Speed – diffusion is covered. The rate of diffusion is an important concept moving forward. Speed is a specific example of a rate. The rate of diffusion equates to the speed of diffusion as both refer to distance covered per unit time.**  | **Elements and compounds – the concept of the particle model is developed to account for compounds (including symbolic representation)** | **Separating mixtures - mixtures are separated based on physical properties. Physical properties of individual substances do not change when substances are mixed.** | **Periodic Table – patterns in physical properties in the PT. Physical properties of metals and non-metals.** | **Metals & non-metals – properties of metals & non-metals identified** | **Sound - required to understand vibrations in context, why sound can’t travel through a vacuum, why sound travels faster through denser materials etc.** |  |
| **Earth structure - The Rock Cycle is rooted in physical changes. Students will need to compare these to everyday physical changes.** | **Types of reactions - the difference between chemical and physical processes will be revisited.** **Students need to understand the particle model in order to understand chemical changes and why mass is conserved during reactions.** | **Photosynthesis - Extend task asks for knowledge of diffusion. Also, need to explain how plants obtain their resources.** | **Heating & cooling – knowledge of the particle model is required if conduction and convection are to be understood.** | **Current - current is a flow of particles called electrons (negative particles).** |  |
| **Climate - Physical and chemical processes take place so the particle model is required. Physical processes are linked to climate change etc.** | **Digestion - Diffusion is used to absorb some nutrients.** |  |  |  |  |
| **Elements and compounds****(1 threshold concept)** | **Particle model & physical processes - the concept of the particle model is developed to account for compounds (including symbolic representation)** | **Cells, organisation & movement – concept of chemical reactions occurring in the cytoplasm** | **Metals & non-metals – reactivity series requires knowledge of chemical reactivity** | **Periodic Table – trends in reactivity are covered so knowledge of what happens during a reaction is required.**  | **Energy transfers – Chemical energy stores require knowledge of what a chemical reaction is.**  | **Earth structure - This topic builds on the understanding of chemical reactions developed in other topics.** |  |
| **Types of reactions - this topic builds on the understanding of chemical reactions developed in other topics.**  | **Respiration - word equations will be used. Understanding of what a chemical reaction is will be required to understand the process.** | **Acids and alkalis - Involves chemical reactions.** | **Climate - Students need to understand chemical reactions to understand the cycling of carbon and other elements through compounds.** | **Chemical energy - This topic links chemical reactions to energy changes. Knowledge of chemical reactions is therefore required.** |  |
| **Earth resources - Extraction of metals requires understanding of chemical reactions including displacement.** |  |  |  |  |  |
| **Cells, organisation & movement****(2 threshold concepts)** | **Particle model & physical processes – diffusion.****Speed – the rate / speed of diffusion is considered in terms of cell size and why organisms develop organs.****Elements and compounds - concept of chemical reactions occurring in the cytoplasm** | **Variation – the nucleus is the source of variation. The role of the nucleus is covered in Cells, organisation, and movement.** | **Photosynthesis - Adaptations of plant organs will be discussed so organisation needs to be understood.** **The relationship between different organisational levels and life needs to be understood if photosynthesis is to be understood.**  | **Breathing - Students require the levels of organisation in order to understand the mechanics of breathing and its importance.** | **Digestion - Students identify adaptations of different organs and relate them to roles. Knowledge of organisation is essential.** **The relationship between different organisational levels will be required if the role of digestion is to be understood.** | **Respiration – Respiration is a cellular level process that is essential to all organisational levels.**  |  |
| **Reproduction – Knowledge of cells and organs required. Structure / function will be revisited in this context.**  | **Evolution & inheritance - The inheritance part of the topic looks at genetic material and its role in inheritance.** |  |  |  |  |
| **Forces****(0 threshold concepts)** | **None** | **Voltage, resistance and electromagnets - One definition of voltage is that of an electrical push.****Knowledge of magnetic fields required for electromagnetism.** | **Fields – foundation work on forces is required.** | **Pressure - Pressure is force per unit area. Therefore, the concept of forces must be understood.** | **Work - Work combines energy transfers and forces.** |  |  |
| **Energy transfers****(0 threshold concepts)** | **None** | **Sound – sound waves as an example of mechanical energy transfer.** | **Wave properties and light – light as an example of energy transfer by radiation.** | **Interdependence - Students need to understand that energy is transferred in feeding relationships. Also, that the Sun is the source of energy for most food chains / webs on Earth.** | **Voltage, resistance and electromagnets - One definition of voltage involves magnitude of energy transferred.** | **Types of reactions - Fuels are discussed as stored of chemical energy** |  |
| **Photosynthesis - plants transfer energy from light!****Elements & compounds – The symbol equation for photosynthesis is complex. Students need to understand what this represents. Similar for word equations.**  | **Heating and cooling – Thermal energy is transferred in 3 processes in this topic.** | **Respiration - Respiration is a fundamental process for transferring energy.** | **Climate - Global warming and the carbon cycle involve energy transfers.** | **Energy costs – energy transfers are explicitly referred to when calculating costs.** **Energy resources are covered.** |  |
| **Work - Work combines energy transfers and forces.** | **Chemical energy - Learning about energy changes during reactions. Knowledge of energy transfers required.** |  |  |  |  |
| **Breathing****(2 threshold concepts)** | **Cells, organisation & movement – Students require the levels of organisation in order to understand the mechanics of breathing and its importance.****Particle model & physical processes – diffusion is used to oxygenate the blood.** | **Respiration - The role of breathing in aerobic respiration is covered.** |  |  |  |  |  |
| **Digestion****(2 threshold concepts)** | **Cells, organisation & movement – Students identify adaptations of different organs and relate them to roles. Knowledge of organisation is essential.** **The relationship between different organisational levels will be required if the role of digestion is to be understood.** **Particle model & physical processes – Diffusion is used to absorb some nutrients.** | **Respiration - understanding of digestion required so students understand that glucose is derived from food.** | **Acids & alkalis - investigation relates to effectiveness of indigestion remedies.** |  |  |  |  |
| **Interdependence****(2 threshold concepts)** | **Variation - variation considers how variation helps a species in a changing environment. This can be linked to population sizes in terms of differences between species.****Energy transfers – Students need to understand that energy is transferred in feeding relationships. Also, that the Sun is the source of energy for most food chains / webs on Earth.** | **Evolution & inheritance – concept of populations being influenced by changing environments, new predators etc.**  | **Photosynthesis - The importance of photosynthesis can be appreciated if its impact on entire food webs is understood. The dependence of other organisms on photosynthesis is addressed in this topic.** | **Climate - The idea of cycles is introduced through food webs.** |  |  |  |
| **Reproduction (plant & human)****(2 threshold concepts)** | **Cells, organisation and movement - Knowledge of cells and organs required. Structure / function will be revisited in this context.****Variation – Students will need to link inherited variation and sexual reproduction.**  | **Evolution & inheritance – Inheritance gives the molecular explanation of variation. Reproduction explains how reproduction links this to inherited variation.****Reproduction is also the driving force of evolution via natural selection.** |  |  |  |  |  |
| **Respiration****(5 threshold concepts)** | **Breathing – The role of breathing in aerobic respiration is covered in this topic.** **Digestion – understanding of digestion required so students understand that glucose is derived from food.****Elements and compounds – word equations will be used. Understanding of what a chemical reaction is will be required to understand the process.****Energy transfers – Respiration is a fundamental process for transferring energy.** **Cells, organisation & movement – Respiration is a cellular level process that is essential to all organisational levels.** | **Climate - Key process in the carbon cycle.** |  |  |  |  |  |
| **Photosynthesis****(4 threshold concepts)** | **Energy transfers – plants transfer energy from light!****Elements & compounds – The symbol equation for photosynthesis is complex. Students need to understand what this represents. Similar for word equations.** **Particle model & physical processes – Extend task asks for knowledge of diffusion. Also, need to explain how plants obtain their resources.** **Interdependence – The importance of photosynthesis can be appreciated if its impact on entire food webs is understood. The dependence of other organisms on photosynthesis is addressed in this topic.****Cells, organisation & movement – Adaptations of plant organs will be discussed so organisation needs to be understood.** **The relationship between different organisational levels and life needs to be understood if photosynthesis is to be understood.**  | **Respiration – the relationship between photosynthesis and respiration.**  | **Climate - Key process in the carbon cycle.** |  |  |  |  |
| **Variation****(1 threshold concept)** | **Cells. Organisation and movement – the nucleus as the source of variation.** | **Interdependence – variation considers how variation helps a species in a changing environment. This can be linked to population sizes in terms of differences between species.** | **Inheritance and evolution –** 1. **inherited variation caused by the contents of the nucleus**
2. **Role of variation in avoiding extinction**
 | **Reproduction (plant & human) - Students will need to link inherited variation and sexual reproduction.**  |  |  |  |
| **Evolution & inheritance****(4 threshold concepts)** | **Cells. Organisation and movement – The inheritance part of the topic looks at genetic material and its role in inheritance.** **Variation –** 1. **Inherited variation caused by the contents of the nucleus**
2. **Role of variation in avoiding extinction**

**Reproduction (plant & human) - Inheritance gives the molecular explanation of variation. Reproduction explains how reproduction links this to inherited variation. Reproduction is also the driving force of evolution via natural selection.****Interdependence - concept of populations being influenced by changing environments, new predators etc.** |  |  |  |  |  |  |
| **Separating mixtures****(1 threshold concept)** | **Particle model & physical processes – mixtures are separated based on physical properties. Physical properties of individual substances do not change when substances are mixed.** |  |  |  |  |  |  |
| **Periodic Table****(3 threshold concepts)** | **Particle model & physical processes - patterns in physical properties in the PT require knowledge of physical properties.****Elements and compounds – trends in chemical reactivity are covered.****Metals and non-metals - trends in reactivity are covered. Reactivity series is developed in this topic.** |  |  |  |  |  |  |
| **Metals and non-metals****(2 threshold concepts)** | **Particle model & physical processes – properties of physical properties of metals and non-metals covered.****Elements and compounds – knowledge of chemical reactivity required for reactivity series.****Using particle diagrams to represent reactions.** | **Periodic Table – trends in reactivity are covered. Reactivity series is developed in this topic.**  | **Acids & alkalis – concept of reactivity used to estimate pH from results of reactions.**  | **Earth resources - Knowledge of reactivity series required to inform extraction method of metals.** |  |  |  |
| **Acids & alkalis****(3 threshold concepts)** | **Metals and non-metals – relating reactivity to experimental outcomes required.****Elements and compounds – Involves chemical reactions.** **Digestion – investigation relates to effectiveness of indigestion remedies.** |  |  |  |  |  |  |
| **Chemical energy****(3 threshold concepts)** | **Elements and compounds – This topic links chemical reactions to energy changes. Knowledge of chemical reactions is therefore required.** **Energy transfers – Learning about energy changes during reactions. Knowledge of energy transfers required.** **Types of reaction - combustion and thermal decomposition give energy changes.** |  |  |  |  |  |  |
| **Types of reaction****(3 threshold concepts)** | **Elements & compounds – this topic builds on the understanding of chemical reactions developed in other topics.** **Particle model and physical changes – the difference between chemical and physical processes will be revisited.** **Students need to understand the particle model in order to understand chemical changes and why mass is conserved during reactions.****Energy Transfers – Fuels are discussed as stored of chemical energy** | **Chemical energy – combustion and thermal decomposition give energy changes.** |  |  |  |  |  |
| **Earth structure****(2 threshold concepts)** | **Particle model and physical changes – The Rock Cycle is rooted in physical changes. Students will need to compare these to everyday physical changes.****Elements & compounds – This topic builds on the understanding of chemical reactions developed in other topics.**  |  |  |  |  |  |  |
| **Universe** | **Fields – Gravity as the force leading to relative motion of planets, stars etc.** **Heating and cooling - Radiation is central to understanding seasons etc.** |  |  |  |  |  |  |
| **Climate****(7 threshold concepts)** | **Photosynthesis – Key process in the carbon cycle.****Respiration – Key process in the carbon cycle.****Elements & compounds – Students need to understand chemical reactions in order to understand the cycling of carbon and other elements through compounds.****Interdependence – The idea of cycles is introduced through food webs.** **Particle model & physical processes – Physical and chemical processes take place so the particle model is required. Physical processes are linked to climate change etc.** **Energy transfers – Global warming and the carbon cycle involve energy transfers.** **Heating & cooling – Knowledge of radiation and insulators are required.**  | **Energy costs – Energy resources need linking to global warming via the Greenhouse Effect. The advantages and disadvantages of different energy resources will be discussed in this context.** |  |  |  |  |  |
| **Earth resources****(2 threshold concepts)** | **Elements and compounds- Extraction of metals requires understanding of chemical reactions including displacement.****Metals and non-metals – Knowledge of reactivity series required to inform extraction method of metals.**  |  |  |  |  |  |  |
| **Speed****(0 threshold concept)** | **None** | **Particle model & physical processes - diffusion is covered. The rate of diffusion is an important concept moving forward. Speed is a specific example of a rate. The rate of diffusion could equally be called the speed of diffusion as both refer to distance covered per unit time.** | **Forces – Forces causing changes in speed, direction and shape are covered.**  | **Energy transfers – energy of an object depends on its speed, temperature or height.** | **Sound – to understand the terms ‘speed of light / sound’ and its meaning.** |  |  |
| **Fields (gravity & magnetism)****(1 threshold concept)** | **Forces – provides foundation work on Forces that is built on here.** | **Voltage, resistance and electromagnets – the basics of magnetic fields are required for electromagnetism.****One definition of voltage is that of an electrical push.** | **Current - required to understand field around charged objects.** | **Universe - Gravity as the force leading to relative motion of planets, stars etc.** |  |  |  |
| **Pressure****(2 threshold concepts)** | **Particle model & physical processes – Pressure in fluids is explained using the particle model.****Forces – Pressure is force per unit area. Therefore, the concept of forces must be understood.**  |  |  |  |  |  |  |
| **Voltage, resistance and electromagnets****(2 threshold concepts)** | **Fields (gravity & magnetism) - the basics of magnetic fields are required for electromagnetism.****Above & Forces - One definition of voltage is that of an electrical push.****Current - understanding of current facilitates understanding of p.d. resistance and electromagnetism.** | **Wave effects - The way in which audio equipment converts sound to a.c. is covered and so requires knowledge of voltage and magnetic fields.** |  |  |  |  |  |
| **Current****(2 threshold concepts)** | **Fields – required to understand field around charged objects.****Particle model & physical processes – current is a flow of particles called electrons (negative particles).**  | **Wave Effects - The way in which audio equipment converts sound to a.c. is covered and so requires knowledge of current.** | **Voltage, resistance and electromagnets – understanding of current facilitates understanding of p.d. resistance and electromagnetism.** |  |  |  |  |
| **Energy costs****(2 threshold concepts)** | **Energy transfers – energy transfers are explicitly referred to when calculating costs.** **Energy resources are covered.****Climate – Energy resources need linking to global warming via the Greenhouse Effect. The advantages and disadvantages of different energy resources will be discussed in this context.** **Topics related to electricity have not been included as detailed knowledge is not required to understand this topic. However, appreciation of the uses of electricity is required.**  |  |  |  |  |  |  |
| **Work****(2 threshold concepts)** | **Forces – Work combines energy transfers and forces.****Energy - Work combines energy transfers and forces.** |  |  |  |  |  |  |
| **Heating & cooling****(3 threshold concepts)** | **Wave properties & light - Radiation can only be understood if tranverse waves are understood.****Particle model & physical process – Conduction and convection require an understanding of the particle model.****Energy transfers - Thermal energy is transferred in 3 processes in this topic.** | **Climate - Knowledge of radiation and insulators are required.** | **Universe – Radiation is central to understanding seasons etc.**  |  |  |  |  |
| **Sound****(3 threshold concepts)** | **Particle model & physical processes – required to understand vibrations in context, why sound can’t travel through a vacuum, why sound travels faster through denser materials etc.****Speed - to understand the terms ‘speed of light / sound’ and its meaning.****Energy transfers – essential to deep understanding of what a wave represents.** | **Wave properties & light – reflection of sound (echoes) is taught in Sound (concrete example of reflection). This is built on using reflection of light.**  | **Wave effects – Ultrasound and its uses are covered so sound must be mastered first.**  |  |  |  |  |
| **Wave effects****(4 threshold concepts)** | **Sound - Ultrasound and its uses are covered so sound must be mastered first.****Wave properties & light – UV is covered as are relating damage done to living cells to frequency.****Current – The way in which audio equipment converts sound to a.c. is covered and so requires knowledge of current.****Voltage, resistance and electromagnets - The way in which audio equipment converts sound to a.c. is covered and so requires knowledge of voltage and magnetic fields.** |  |  |  |  |  |  |
| **Wave properties & light****(2 threshold concepts)** | **Energy transfers – essential to deep understanding of what a wave represents.****Sound – the sound topic introduces waves and what they represent. This topic builds on this.**  | **Wave effects - UV is covered as are relating damage done to living cells to frequency.** | **Heating & cooling – Radiation can only be understood if tranverse waves are understood.**  |  |  |  |  |