

Phase 1 topic journey

The Science curriculum is sequenced to ensure students can build on familiar concepts becoming more granular over time. We build from macroscopic to microscopic to symbolic. By using concrete observable patterns as a starting point before moving into models that explain behaviour at the microscopic level we are able to ensure students have the strong foundational knowledge to build understanding and succeed. This is fundamental within the hierarchical nature of the Science curriculum. We have also considered how we make links to and build on prior learning to avoid misconceptions and incorrect links being made between knowledge, as well as ensuring we check pre-requisite knowledge from sequences of learning.

Movement

Building on understanding of organs and systems from KS2, with a focus on the skeletal system. Students can appreciate observable features of the human body and link to prior knowledge.

Particle model

Students will be able to group matter based on state from KS2, and in this topic we deepen understanding by zooming on the microscopic particle scale. This will allow students to build an abstract model to explain properties of states of matter.

Cells

Movement was finished exploring the link from organs to tissues to cells. This topic will push students into the microscopic level and explore cell structure, and link specialised cells back to the role of specialised organs in the body.

Speed and gravity

We use this topic as observable effects of forces, which they can link back to KS2. We are also able to start teaching mathematical content through calculations of speed and weight.

Separating mixtures

Students should already have concrete examples of methods of separation from KS2, and the aim of this topic is to build understanding on why these work reflecting back on the particle model of matter.

Energy stores and transfer

The notion of energy is an abstract concept as we only see its effects. However energy is a key concept across all of Science and lays foundations for understanding across many topics. We think about energy in this topic using stores with observable outcomes.

Earth structure

Students bring knowledge of different rock features with them from KS2. We dig deeper into further Earth structures, as well as the links between different rock types. There are additional cross curricular links with Geography.

Interdependence

The concept of energy links into this topic as we explore the transfer of energy through ecosystems. Students at KS2 look at organisms in the environment and we take this further by exploring the interactions between living and non-living parts of ecosystems.

Light

Behaviour of light builds on KS2, and we look at more abstract concepts such as refraction which requires development of mathematical skills started in speed and gravity.

Plant reproduction

We can consolidate knowledge from interdependence to look at the relationship between animals and plants in reproduction. This topic builds on KS2 knowledge looking more closely at flower structure and linking it to function.

Sound

This topic moves sound on from KS2 to looking at representational models, which have been built up in prior topics. We use prior knowledge from the particle model, and can build in comparative work by comparing the movement of sound and light.

Earth's resources & universe

This topic builds on Earth structure and KS2 by looking out further into the universe. We can also make links to interdependence by exploring human reliance on the Earth's resources. We use this topic to build evaluative skills comparing the impact of different materials.

Photosynthesis

We can revisit plant structure from KS2, and cell structure from earlier to focus on the chloroplasts and the role of photosynthesis. This also draws on knowledge from interdependence linking animal reliance on plants not just for food.

Elements and the periodic table

We build on the particle model by looking at other ways of grouping matter based on the make up of their particles. We are able to relate this to the periodic table as another way of grouping matter based on chemical composition.

Energy costs

This topic builds on knowledge of energy stores, linking them to ways to generate electricity. We build on mathematical skills introduced earlier and can also build on knowledge of using resources.

Human reproduction

This uses prior knowledge of organ systems, and adaptations of sperm and egg cells. We are also able to reflect back on plant reproduction to make comparisons.

Heating and cooling

Students will need to draw on prior learning about the particle model and the ability to use modelling to explain the different ways thermal energy dissipates. We link concrete, observable changes to abstract models to explain.

Acids and alkalis

We further build on grouping chemicals based on different properties in this topic. Students can use their knowledge of elements to compare the chemicals in acids and alkalis and use this as a platform to look at work equations in neutralisation.

Respiration

This follows photosynthesis to show the interdependence between animal and plant life. We can also continue to reflect back looking at the role of the circulatory system. We complete this separate to breathing to avoid misconceptions about the two processes being the same.

Climate

This topic builds from Earth and we can make links back to the impacts of different energy resources. This topic is preceded by photosynthesis and respiration so students have the prior knowledge to understand the carbon cycle.

Breathing

Links are made back to respiration, and to organ systems here. We can also make links back to adaptations of cells by looking at adaptations of structures in the respiratory system. We build from the chemical process and explore how the human body supports this.

Circuits

We build on observations from KS2 and look at current and voltage in more detail. We build on knowledge of atoms containing charged elements to explore the flow of charge in a wire. Students need a sound understanding of particle model prior to this, and should be more familiar with modelling for abstract principles.

Metals and materials

This topic looks further into grouping materials and builds by exploring how we exploit the properties of materials for uses. We introduce the reactivity series linking to extraction, and this lends itself to the future chemical changes topic.

Electromagnetism

Students will recap KS2 knowledge of magnets, and build on this with fields using modelling to show the abstract concept. We are able to use prior learning from circuits to explore how electromagnets work using correct circuit diagrams.

Chemical changes

Students build on knowledge of particle model and revisit compounds. This topic builds on microscopic understanding of chemical reactions using particle diagrams and looks at the symbolic representation through word and symbol equations. This requires a sound understanding of many facets of the particle model before commencing.

Digestion

We go back and further build on organ system knowledge, and can compare adaptations to those previously seen in breathing. Students will be able to explore the links between breathing, digestion and respiration in this topic and bring them together as a whole.

Contact forces

Students can link observational knowledge from KS2 and we build more mathematical skills to predict the effects of forces. As forces themselves cannot be seen this abstract concept requires prior experience with scientific models to understand.

Variation and inheritance

This topic requires strong mathematical skills built up over the rest of the phase. We can link back to the role of the nucleus in cells and bring in familiar observations about relatedness and explore the principles of genetics in inheritance.

Waves

The representation of waves demands prior knowledge from sound, light and energy transfers. We also build complex abstract representations of these by looking at EM waves which needs the familiar grounding to link to.

Evolution

We make links back to adaptations, combining this with knowledge of inheritance to explain the variety of life on Earth.

Work

This topic builds on forces and requires strong mathematical and modelling ideas to interpret phenomena.

Phase 2 topic journey

B1 Cell biology

Builds on knowledge of cells, focusing on specialisation. Go into more depth in transport into cells, building on prior knowledge of diffusion with different mechanisms, and being able to explain when these happen.

C1 Atomic structure & periodic table

Sets the core foundational knowledge for all of chemistry, and links with other topics. We build on knowledge of atomic structure looking at how this links to properties in different groups.

B2 Organisation

Students use their understanding of specialised cells and adaptations to link to specialised organs and their roles. We also look at vital processes, such as digestion, that are linked to these organs.

P1 Energy

Start developing mathematical skills throughout this topic. Energy feeds into other topics which look more closely at different transfer pathways, such as electricity and forces.

C9 & 10 Atmosphere resources

We build on prior knowledge of atmosphere looking at the contribution of different organisms in the development. This unit is placed early due to the strong KS3 links and importance to the future of our students.

P3 Particle model of matter

We use ideas about energy transfers from P1 and link to KS3 particle model. This enables students to start making early links between their KS3 study and KS4 content.

P2 Electricity

Students will need to use knowledge from C1 to understand about charged particles. We build on mathematical skills from P1, and enhance by integrating knowledge into circuit diagrams. This is also an example of an energy transfer pathway from P1.

C2 Structure and bonding

This topic builds on C1 and is a bridge between what we know about materials from KS3 and explaining why materials have properties based on bonding types. This topic is later due to the challenge of modelling and the requirements for strong foundational knowledge from C1.

B3 Infection and response

Students need to understand cell and organ function before exploring the impact of what happens when things go wrong. We can make links back to enzymes and the importance of cell structures in this topic.

C3 Quantitative chemistry

Students will take the mathematical skills built in physics to apply them to chemistry. We need to ensure they have a strong foundation in the particle model to appreciate the scale of atoms. We link to maths through the use of standard form so need to ensure this has been covered previously.

B4 Bioenergetics

We retrieve knowledge about cellular structures from B1 and look more closely at the processes involved. We refer back to circulatory and respiratory systems from B2 and look at how they link to respiration and exercise.

P4 Atomic structure

Students pick up from C1 using atomic structure. Space is left between to offer a chance for retrieval practice of this core content which is needed to understand the properties of types of radiation and the effects on particles.

C4 & 5 Chemical changes and energy changes

These two topics are closely linked to taught together. We can make links back to B4 through energy changes as a concrete example. This topic needs a strong foundation in atomic structure, so follows on from bonding, structure and topics exploring the structure of matter.

B7 Ecology

This topic is placed in a summer term to allow practical opportunities. We also have the opportunity to retrieve key ideas from KS3 which already had strong KS2 foundations. Leaving a larger gap will enhance the effect of retrieval.

B5 Inheritance, variation & evolution

We can make links back to mitosis from B1 as we compare with meiosis. This topic builds on students modelling skills with complex inheritance modelling, and builds on principles of evolution from KS3.

C6 Rate & extend of chemical change

We will refer back to the particle model to explain the effects of rate, and can relate back to B2 by linking enzymes and catalysts. This topic needs foundational knowledge of reactions as we will link back to specific examples of these throughout the topic.

B6 Homeostasis and response

Links are made back to B1 and nerve cell structure, the importance of proteins in the form of hormones and the role of the circulatory system. This topic brings together all the different systems focussing on how they coordinate responses.

P5 Forces

This is another example of an energy transfer pathway from P1, and requires strong mathematical foundations which are built throughout physics strands, hence this topic appearing later in the phase.

C7 Organic chemistry

We take knowledge from C1 separation methods, along with C1 structures and bonding and put these in the example of generating compounds from crude oil.

P6 Waves

Waves are quite an abstract concept so are left late. There is additional mathematical content to build on, and KS3 is enhanced by looking in more detail at the uses and dangers. This also links to ionising radiation explored in P4.

P7 Magnetism and electromagnetism

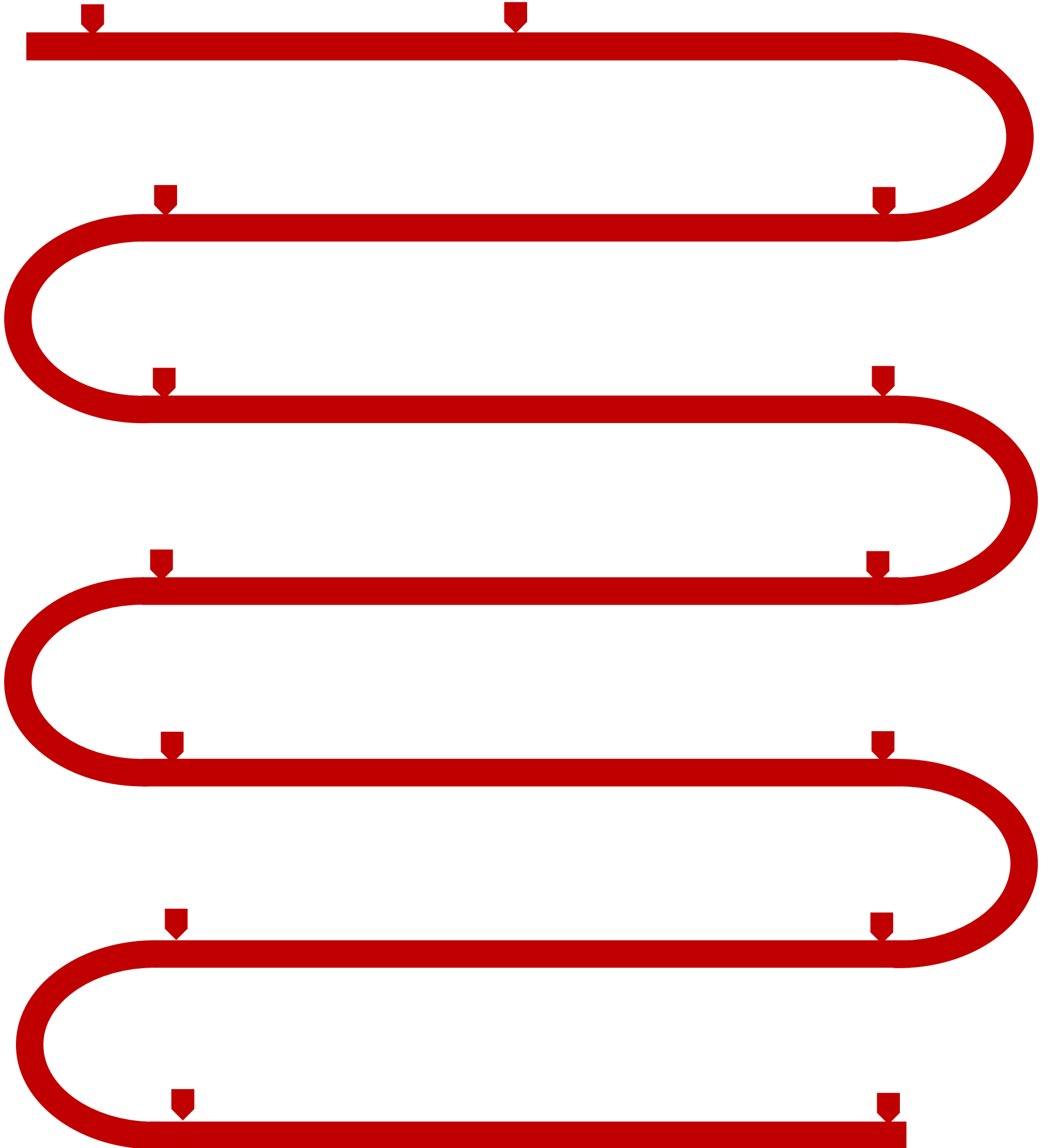
Students make links back to forces, and electricity to explain how electromagnets work. There are several principles in this topic building on abstract concepts that students will build into their prior models of understanding of forces.

C8 Chemical analysis

This topic links ideas from across reactions and particle model, and shows the importance of chemistry in everyday life.

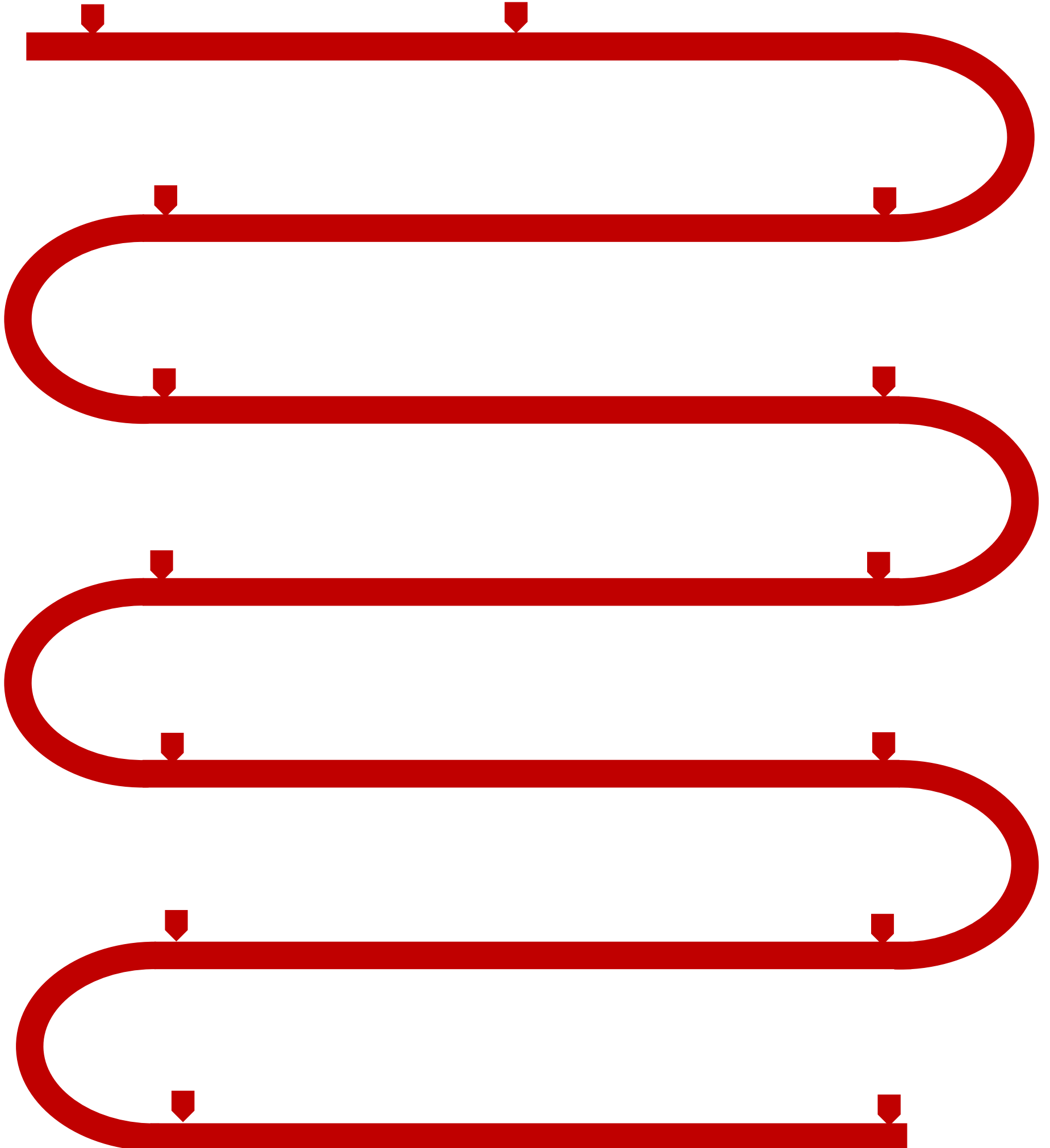
Phase 3 A level Chemistry

Topic
Why



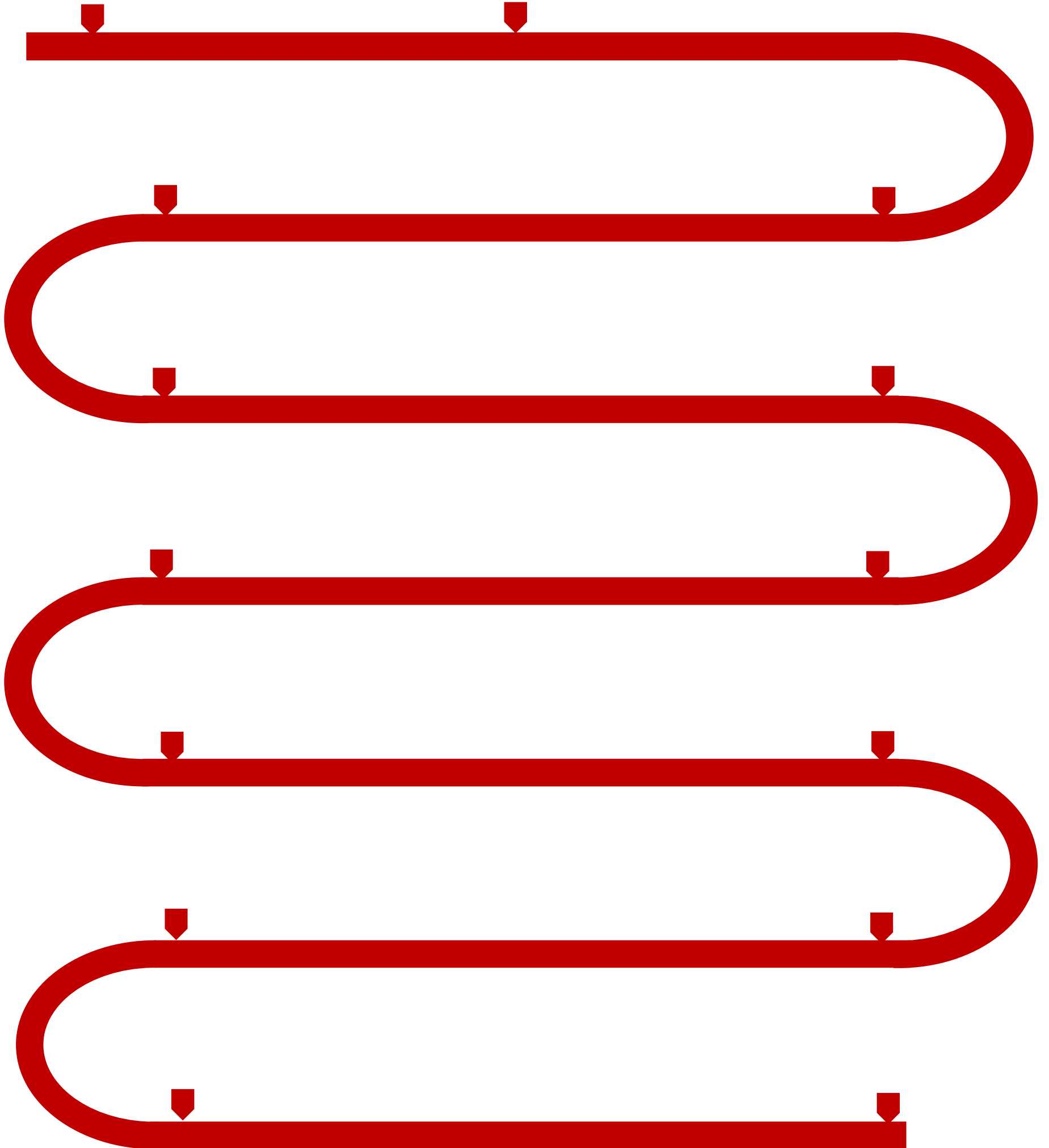
Phase 3 A level Biology

Topic
Why



Phase 3 A level Physics

Topic
Why



Topic
Why

