

## Particles

- In KS2, pupils should be taught to: Compare and group materials together, according to whether they are solids, liquids or gases. Observe that some materials change state when they are heated or cooled. Use terms such as evaporate and condense correctly. They should arrive with knowledge of how mixtures might be separated, including through filtering, sieving and evaporating.

## Energy

- Students should now have knowledge of internal energy and understand that levels of energy are linked to movement of particles. This is a good starting point to begin looking at how energy can be stored in a system and quantified. Understanding that melting a set mass of ice produces the same mass of water can allow discussion of the conservation of energy.

## Cells

- In previous years, this has been taught first and many students have struggled with retaining the information. This may, in part, be due to poor literacy skills and little practice is using new scientific terms consistently and correctly. Knowledge of diffusion (taught in particles) will be needed when teaching about the movement of substances into/out of a cell.

## Reproduction

- Students will now build on their prior knowledge of the function of the sperm and egg cell (ovum). Cell division and the process of mitosis is used to explain the growth of a foetus/embryo. Students will be introduced to genetics and inheritance. RSE is also covered here.

## Chemical Reactions

- Students begin to conceptualise atoms and are introduced to the pH scale, acids, alkalis and neutralisation. Some prior knowledge of particles in solutions is needed to understand concentration. Conservation of mass/energy is reapplied to balancing chemical equations.

## Forces

- Students will now explore the relationship between energy and forces. Here they will build on the idea of balance, speed and motion as well as applying knowledge of energy stores to the effect of forces. Numeracy skills/equation recall and use is further developed from the energy topic.

### Atoms and the Periodic Table

- In Y7 students have built on KS2 knowledge and learnt how to link the properties of the periodic table to the particle model. They have been introduced to naming compounds in the Y7 chemical reactions topic. Now they will learn about atomic structure, elements, compounds and mixtures. Learn how to write simple chemical equations and be able to explain conservation of mass.

### Electricity and magnetism

- In KS2 they learn what electricity is and that it requires a power source, along with some basic components. In Y7 students will have learnt about the 8 different energy stores and how energy can be transferred from one store to another. Now they will learn about series and parallel circuits and the relationship of  $V=IR$ . They learn about magnets and magnetic fields and then link this to factors that increase the strength of electromagnets and how this affects the field lines..

### Waves

- Students will build on their previous knowledge of energy transfers, specifically the pathway of light and sound, and forces gained from year 7. They will learn about light and sound waves, how we see, hear, perceive colour and determine the speed of sound. Students will also use knowledge from the previous topic of Electricity and magnetism to explain how moving coil speakers and headphones work. Many of these ideas feature in KS4 waves.

### Digestion

- Digestion links to Y7 cells and chemical reactions. In the previous year they will have learnt about basic animal cells and how they group together to form tissues, organs and organ systems and neutralisation reactions. We will now look in more depth into the parts of the digestive system and their functions, testing for macronutrients, diet and enzymes. This will prepare them for the KS4 topic of organisation.

### Ecology

- From their knowledge gained from Cells (adaptations to functions), Reproduction (selective breeding and adaptations) and energy (energy transfers), they will apply this to food webs, adaptations of organisms and biodiversity. This will give them a good basis for the KS4 topic Ecology.

### Earth and Materials

- In Y7 students learn about convection currents, changes of state, renewable and non renewable energy and pressure. Knowledge gained from this will be applied to learn about the structure of the Earth, the rock cycle and the effects of greenhouse gases on climate change. This will prepare them for the KS4 chemistry of the atmosphere topic.

### Forces

- Students draw on and combine their prior knowledge of forces from Year 7 and 8. Students start to consider the differences between scalar and vector quantities. Prior learning of weight, gravity, mass and, resultant forces are developed in the context of elasticity (Hooke's Law) and moments.

### Matter

- Drawing on their knowledge of states of matter and particle motion, students link this to density and pressure. Students also refine their understanding of the random movement of particles through the role of Brownian motion in diffusion.

### Reactivity

- Students consolidate their prior knowledge of the reactions of acids with alkalis and metal compounds. Developing their understanding of the structure of the atom, students consider the structure and mass of molecules and practice their ability to represent these through molecular formulae. Students are able to use word equations to represent these reactions.

### Biosystems

- Students will consolidate their prior learning of organisational hierarchy from the cells topic in year 7 with students recalling the function of the different organ systems. They will be introduced to antagonistic muscle pairings and will investigate the forces exerted by different muscles involved in movement. Students will develop their understanding of the respiratory system and the impacts of drugs and exercise on the respiratory system and other linked systems.

### Energetics

- Students will revisit areas from the reactivity topic in year 7 and will be introduced to the idea of rates and factors that affect the rates of a chemical reaction. The unit then covers different types of reactions, such as endothermic, exothermic, combustion as a type of oxidation reaction and thermal decomposition. This unit covers some of the foundation knowledge needed to support students in KS4 in both the energy changes unit and rates unit.

### Photosynthesis

- Students will recall their prior knowledge on the structure and function of plant cells. The unit starts with exploring the structure and function of roots, with emphasis on its adaptations. Students then progress on to the process of photosynthesis and its importance. This unit provides the foundation for work in KS4 focusing on the limiting factors in photosynthesis, energy transfer through an ecosystem and the mineral requirements of plants.