

Key Stage 4 Overview – OCR 21st Century Science Year 9

	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6
Year 9	<p>University Challenge: B1 You and your genes</p> <p>Context in school: The inheritance of detailed information from each generation to the next is a fundamental story in science. For each of us, inheritance also raises questions about our own development. In this module, students learn basic concepts of inheritance: genes as units of inheritance, the interplay between genes and environment and sexual reproduction as a source of variation.</p> <p>Skills:</p> <ul style="list-style-type: none"> • clone plant materials • model fertilisation to illustrate the random nature of allele distribution in sex • role play to discuss the ethics of genetic testing • internet research project to investigate regulation associated with genetic information • activity to decide if permission should be granted for embryo selection • decision-making activity to consider different viewpoints about using embryonic stem cells. 	<p>University challenge: P1</p> <p>Context in school: There are two key science ideas in this chapter – the first considers the uses of electromagnetic radiation and the possible health risks of radiation, both in nature and from technological devices, which are becoming of increasing concern. The second part of the chapter considers a wave model for light and sound.</p> <p>Skills:</p> <ul style="list-style-type: none"> • have observed waves on water, spring, and strings • know the meaning of the terms longitudinal, transverse, superposition, and frequency, in the context of waves • know that sound waves are longitudinal and need a medium to travel through and that sound travels at different speeds in solids, in water, and in air • know that sound is produced when objects vibrate and that sound waves are detected by the vibrations they cause • know that light travels at a very high speed and can pass through a vacuum • know some of the similarities and differences between light waves and waves in matter • be able to use a ray model of light to describe and explain reflection in mirrors, refraction and dispersion by glass and the action of convex lenses • know that light incident on a surface may be absorbed, scattered, or reflected, and that light transfers energy from a source to an absorber, where it may cause a chemical or electrical effect. 	<p>University challenge: C1 and C2</p> <p>Context in school: This chapter features a central theme of modern chemistry: it traces the development of ideas about the structure of the atom and the arrangement of elements in the modern Periodic Table. Both stories show how scientific theories develop as new evidence is made available that either supports or contradicts current ideas. Atomic structure is used to help explain the behaviour of the elements. Trends and patterns shown by the physical and chemical properties in groups and in the transition metals are studied.</p> <p>Skills:</p> <ul style="list-style-type: none"> • understand chemical reactions as the rearrangement of atoms • be able to represent chemical reactions using formulae and using equations • know some displacement reactions • know what catalysts do • be aware of the principles underpinning the Mendeleev Periodic Table • know some ideas about the Periodic Table: periods and groups; metals and non-metals • know how some patterns in reactions can be predicted with reference to the Periodic Table • know some properties of metals and non-metals. 	<p>University challenge: B2 – Keeping Healthy</p> <p>Context: This module illustrates these principles through prevention of infectious diseases and heart disease. Students learn about the immune system, and how vaccines work to prevent infection. They also learn about the increase of ‘superbugs’, and how correct use of antibiotics can help to reduce their prevalence. The module explores how new drugs are developed, including the stages of testing for safety and effectiveness. Students also consider the causes of heart disease, and how individuals can minimise this risk. They also learn about maintaining a constant internal environment, illustrated through how our body keeps a healthy water balance.</p> <p>Skills</p> <ul style="list-style-type: none"> • develop a sense of scale in the context of microorganisms • carry out calculations using experimental data, including finding the mean and the range • plot, draw and interpret graphs and charts from students’ own and secondary data • extract information from charts, graphs and tables including data from epidemiological studies • use ideas about correlation in the context of health risk factors • use ideas about probability in the context of risk. 	<p>University challenge: P2</p> <p>Context: Energy supply is one of the major issues that society must address in the immediate future. Citizens are faced with complex choices and a variety of messages from energy supply companies, environmental groups, the media, scientists and politicians. Some maintain that renewable resources are capable of meeting our future needs, some advocate nuclear power, and some argue that drastic lifestyle changes are required. Decisions about energy use, whether at a personal or a national level, need to be informed by a quantitative understanding of the situation, and this is an underlying theme of the chapter.</p> <p>Skills:</p> <ul style="list-style-type: none"> • have compared energy uses and costs in domestic contexts, including calculations using a variety of units • have considered a variety of processes that involve transferring energy, including heating, changing motion, burning fuels and changing position in a field. 	<p>University challenge: C3</p> <p>Context: Our way of life depends on a wide range of products made from natural resources. The Earth’s crust provides us with metal ores and crude oil and our use of these impacts on the natural environment. Chemistry is fundamental to an understanding of the scale and significance of this human activity.</p> <p>Skills:</p> <ul style="list-style-type: none"> • know the differences between atoms, elements and compounds • be familiar with the use of chemical symbols and formulae for elements and compounds • be familiar with the use of formulae and equations to represent chemical reactions • understand chemical reactions as the rearrangement of atoms • know about reactions of acids with metals to produce a salt plus hydrogen • know some displacement reactions • know the order of metals and carbon in the reactivity series • know that carbon is used to obtain metals from metal oxides.