Learning Cycle Year 1	Knowledge and Skills	Vocabulary & Reading	Checking of understanding	Rationale
Autumn Term	• Circulatory system and associated problems • Studying risks to health, correlation & causation • Carbohydrate and lipid structures • Blood cholesterol levels • Risk factors to health, reducing risk • Gas exchange surface, structure and function. • Membrane structure, transport across membranes • Monohybrid inheritance • Genetic screening • Protein structure and function. • Enzyme activity	Atherosclerosis Thrombosis Protein synthesis Transcription/translation Homozygous/heterozygous Genes and alleles Fluid mosaic model Genotype Phenotype	8 check point Socrative tests, to check specific terminology and knowledge as we progress through each topic. 2 written tests, to assess end of topic subject knowledge 1 mock exam, introducing the external examinations in Biology and the application of knowledge required. 4 Common practical assessment criteria experimental write ups to be completed on: Effect of caffeine on heart rate of Daphnia. Assessing the concentration of Vitamin C in food and drink. Assessing the effect of alcohol and temperature on cell membrane integrity. Assessing the effect of changing enzyme and	Our first topic starts out looking at the requirement for a heart and circulatory system in some organisms. We deliver this via the biological context of the causes and effect of cardiovascular disease, including chronic atherosclerosis and the acute effects of thrombosis. This allows us to teach heart anatomy and physiology content, whist being able to apply this knowledge to societal problems such as obesity. The causes of obesity are investigated by looking at energy budgets and the biochemistry of biological molecules that can contribute to ill health. These topics will directly be useful to our students who wish to follow careers in medical fields. We then move onto topic 2 which again looks at an illness to give a context to the

			substrate on metabolic reactions. Homework set as appropriate using SNAB activity sheets, these are marked by students in class to increase their self-awareness and the development of critical reviewing skills. The use of Past paper exam questions during the lesson to develop familiarity with exam technique.	knowledge. In this case we investigate the genetic and physiological causes of cystic fibrosis. This allows us to develop the students understanding of the key biological concepts of protein synthesis and transport across cell membranes. It also moves the students' biochemical knowledge on from carbohydrates and lipids by introducing protein and nucleic acid structures. Our 4 CPAC experiments allow our students to apply their knowledge to analyse results, whist developing their practical skills. This term also contains the Twycross Zoo visit, where we examine the role of the modern zoo. Although this topic comes later in the course, it gives students from different feeder schools the opportunity to really get to know each other.
Spring Term	• Ultrastructure of eukaryotic and prokaryotic cells • Stages of mitosis	Protein trafficking Ultrastructure Acrosome reaction Cortical reaction Chiasmata	4 check point Socrative tests 1 written test 1 Common practical assessment criteria	Our next topic investigates how external stimuli in our environments can affect and determine gene expression. This helps us to understand how an

	• Gamete structure, function and fertilisation • Role of meiosis in creating variation • Cellular organisation • Role of the nucleus and differential gene expression • Polygenic inheritance • Epigenetics • Stem cell research	Independent assortment Transcription factors Lac operon Epigenetics	experimental write ups to be completed on: Root tip squash Appropriate homework activities completed to cement knowledge and check for understanding. Past paper questions completed in class and marked using mark schemes, to begin to recognise command words and the key terminology required in answers.	unspecialised zygote can create an entire organism. While studying mitosis we introduce one of the important scientific discoveries of the last century, the first immortal human cell line known as Hela cells, and the story of Henrietta Lacks. We also look at how gene expression can be accomplished in prokaryotic organisms via the Lac operon in *E. coli* bacteria. To understand gene expression, we also need to understand cell biology and so this is why we teach this content now, rather than during the first term like many courses. We then take our knowledge of cell biology and protein synthesis and apply both to the idea of protein trafficking. This topic also allows us to discuss the developing branch of biology called epigenetics. At the end of the spring term we go on our 3 day residential trip to the Cranedale field studies centre in North Yorkshire. Whist away, the students cover work on biodiversity that will be

				introduced in the summer term as well as some year 13 content such as ecological sampling techniques.
Summer Term	• What is a species? • Adaptations to suit environment • Natural selection and evolution • Hardy-Weinberg equation • Comparative drug testing • Antimicrobial properties of plants • Classification • Measuring biodiversity • Structure of plant cells • Comparison of starch and cellulose • Structure and location of specialised cells in plant stem • Importance of water to plants • The role of the modern zoo • Seedbanks		4 check point Socrative tests 1 written test 4 Common practical assessment criteria experimental write ups to be completed on: Testing the tensile strength of plant fibres Investigating plant antimicrobial properties Assessing mineral ion use in plants Locating vascular bundles and calculating their diameter with a sage micrometre and eye piece graticule. Homework and past paper questions as appropriate	In the summer we review the causes of genetic mutation and move onto what they can lead to i.e. evolution via means of natural selection. This incredibly important concept draws together many ideas developed in the course so far. It allows us to understand where biodiversity comes from and this in turn allows us to focus on how and why we need to conserve this biodiversity. Including the influences of Jane Goodall as a woman in STEM, when introducing the role of the modern zoo. We also look at plant structures and the variety of ways that they can be utilised by humanity, especially to improve our ability to live in a sustainable fashion.

Learning Cycle Year 2	Knowledge and Skills	Vocabulary & Reading	Checking of understanding	Rationale
Autumn term	• Ecosystems and ecology. Distribution and abundance of organisms. Succession and energy flow. • Climate change – evidence and its impact. • Ecology – ecosystems, distribution of organisms in a habitat. • Succession • The effect of temperature on living things • Controversy surrounding climate change • Evolution by natural selection – molecular evidence. • Speciation • Photosynthesis • Energy flow in the ecosystem, including C cycle. • Bacteria and viruses. • Barriers and Non specific immunity. • DNA profiling –PCR and electrophoresis	Community Population Niche Succession Chemiosmosis Photophosphorylation Photolysis Carbon fixation Gel electrophoresis PCR	8 check point Socrative tests 2 written tests 1 mock exam all content delivered to this point. 5 Common practical assessment criteria experimental write ups to be completed on: Ecological sampling. The Hill reaction. The effect of temperature on enzyme activity. The effect of temperature on brine shrimp hatch rate. PCR and Electrophoresis. Homework and past paper questions as appropriate.	The year 13 studies start off with our ecological sampling techniques. Students need to understand how to implement a valid ecological study. This is vey important as we move through the current climate crisis. Biologist need to know how we can record these changes to our ecosystems. The theory of climate change is studied, but more importantly, how will this affect our organisms? We investigate the effects of temperature on enzymes and then apply this to the changing distribution of organisms. The importance of understanding the role of photosynthesis and its regulation of carbon dioxide is integral to this topic. In the second half of the autumn term, we move onto investigating the biology that surrounds the context of forensic science. This includes

	• Forensics
	  • The specific immune response.
	  • TB and HIV
	  • Protein synthesis
	• Types of immunity
	• Antibiotics
	• Evolutionary race
				the creation of genetic finger prints, which can also be used to investigate evolutionary relationships, a technique developed locally in Leicestershire. Time of death of a mammal is considered using a variety of methodologies. The last topic in this term revolves around immunity which builds upon knowledge developed in year 12, especially cell membrane structure and function. The HIV and TB pandemics are covered, with references also made to Covid 19 to bring a more current context to the issues.

Spring term	• Joints and movement • Muscle structure and movement • Slow and fast twitch muscle • Aerobic and anaerobic respiration. • ETC and chemiosmosis. • Homeostasis • Exercise – too much, too little. • Performance enhancing drugs.	Antagonistic Sarcomeres Actin Myosin Tropomyosin Sliding filament theory Negative feedback Gene expression Glycolysis Link reaction Krebs cycle Oxidative phosphorylation	4 check point Socrative tests 1 written test 2 Common practical assessment criteria experimental write ups to be completed on: Assessing oxygen consumption using a respirometer. Investigating breathing with a spirometer. SNAB activities as appropriate	Topic 7 has a mammalian anatomy and physiological feel to the content. This unit work well with those students who have taken an A level in PE as it looks at the respiratory system in detail. The context of exercise is also used to develop an understanding of homeostasis in terms of blood pH and thermoregulation. Knowledge developed in light dependent photosynthesis is built upon by revisiting

	• Control of heartbeat and cardiac output. • Control of ventilation rate.		Introduction of longer written questions to complete from past papers	chemiosmosis, but this time it is applied to cellular respiration. This topic is the most useful for our potential physiotherapy students as it also investigates the physiology of muscle contraction.
Summer term	• Organisation of the nervous system. • Reflex arcs, the action potential and conduction of an impulse • Synapses • Detecting stimuli – plant and animal sensitivity. • The brain – regions and imaging • Visual development –use of animals • Learning – nature or nurture. • Neurotransmitters and drugs • Human genome project and GM organisms.	Autonomic Sympathetic Parasympathetic Somatic Neurotransmitter Habituation Cerebral cortex Cerebellum Medulla oblongata Hypothalamus	4 check point Socrative tests 1 written test 2 mock exams: Paper 2 Topics 1-4 plus 7 and 8 Paper 3 All topics Common practical assessment criteria experimental write ups to be completed on: Habituation of a snail to a stimulus	Our final topic looks at the mammalian nervous system and builds upon our muscle anatomy knowledge by explaining how a nervous impulse initiates a muscle contraction. Knowledge on cell membranes developed in year 12 is vital to the understanding of this concept. We also include details of how nature and nurture can be investigated which links to issues that our psychology students cover. To end the course, we look into how genetic engineering of organisms is possible, drawing together knowledge on DNA and its function developed over the 2 years.