	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
Autumn Term 1	**Chapter 1: Looking at Cells** Looking at Cells The light microscope Looking at Cells in more detail	Required Practical: Using a light microscope to observe and record animal and plant cells Primitive Cells	Cell Division Cell Differentiation Cancer	Stem Cells Stem Cell Banks	Key Concept: Cell Development Cells at Work **Living without Oxygen**	Growing microorganism Testing new antibiotics	Required practical: investigating disinfectants Maths Skills: Size and Number **Assessment**	**Chapter 2: Photosynthesis** Explaining Photosynthesis Looking at Photosynthesis
Autumn Term 2	Investigation leaves **Required practical: Investigate the effect of light intensity on the rate of photo-synthesis using an aquatic organism**	Key concept: Diffusion in living systems Looking at stomata	Moving water Investigating transpiration	Moving sugar Maths Skill: Surface area to volume ratio **Assessment**	**Chapter 3: Moving and Changing materials** Explaining water movement Required practical: Investigate the effect of a range of	Required practical: Investigate the effect of Ph on the rate of reaction of amulase enzyme. Learning about the digestive system	Required practical: Use qualitative reagents to test for a range of carbohydrates liquids and proteins Looking at more exchange surfaces	

	such as pond weed **Increasing photo-synthesis**				concentra-tions of salt or sugar solutions on the mass of plant tissue Learning about active transport Key concept: Investigate the need for transport systems	Explaining digestion		
Spring Term 1	Learning about plants and minerals Investigating about how plants use minerals	Learning about the circulatory system Exploring the heart Studying Blood	**Chapter 4: Health Matters** Learning about Health Key Concept: Looking at Risk Factors	Exploring non communica ble diseases **Analysing and evaluating data** **Studying Pathogens**	Learning about viral diseases **Studying bacterial diseases** **Looking at fungal diseases**	Learning about malaria **Protecting the body**		

Spring Term 2	**Exploring White blood cells** Using antibiotics and painkillers	**Building immunity** Making new drugs	**Looking at plant diseases** Learning about plant defences	Maths Skills: Sampling and Scientific Data **Assessment**	**Chapter 5: Co-ordination and Control** Homeostasis The nervous System Reflex actions	**The Brain** Required Practical: Investigate Reaction Time		
Summer Term 1	The Eye Seeing in Focus Eye Defects	**Controlling Body Temp** The Endocrine System	**Controlling blood glucose** Diabetes Diabetes Recommendations	**Water balance** **The Kidneys**	Kidney Failure Dialysis or transplant			
Summer Term 2	**Human Reproduction** Key Concept: Systems Working Tracing human migration	**The structure of DNA** **Proteins** **Mutations**	Meiosis Asexual and sexual reproduction	Genetics Genetic crosses	Tracking gene disorders Gregor Mendel	Key Concept: Genetics is it simple – or is it? Maths Skill: Fractions, ratio, proportion and probability	**Assessment**	

Unit Name: **Chapter 1: Cell biology**	**Recommended Teaching Time: 20 hours**
Overview and Aims: An introduction to microscopes, light and electron. How do they work, what are their limitations? Experiment with light microscopes. Make observations and calculate magnification. Introduction to cells. Prokaryotic and Eukaryotic cells. Look at cell division and growth as well as cell organisation to make an organism (a living thing). Look at cell division (mitosis) cell differentiation (specialisms) and when cell division goes wrong (cancer). The role of stem cells and potential medical uses. We look at the fundamental process for using energy in living things – respiration, both aerobic and anaerobic. We look at bacteria and how to grow them.	
I can statements	**Critical Content, Key Words and Additional Notes.**
• I can describe the structure of eukaryotic cells. • I can explain how the main sub-cellular structures are related to their functions. • I can observe plant and animal cells with a light microscope. • I can understand the limitations of light microscopy. • I can identify the differences in the magnification and	

resolving power of light and electron microscopes. • I can explain how electron microscopy has increased our understanding of sub-cellular structures. I can apply knowledge to select techniques, instruments, apparatus and materials to observe cells. • I can make and record observations and measurements. • I can present observations and other data using appropriate methods. • I can describe and explain the differences between prokaryotic cells and eukaryotic cells. • I can explain how the main sub-cellular structures of		

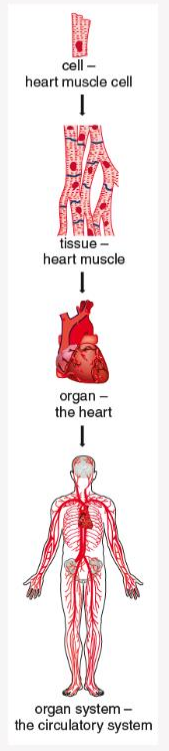
prokaryotic and eukaryotic cells are related to their functions. • I can describe the process of mitosis in growth, and mitosis as part of the cell cycle. • I can describe how the process of mitosis produces cells that are identical genetically to the parent cell. • I can explain the importance of cell differentiation. • I can describe how cells, tissues, organs and organ systems are organised to make up an organism. • I can understand size and scale in relation to cells, tissues, organs and body systems. • I can describe cancer as a condition resulting from changes in cells that lead to their uncontrolled growth, division and spread. • I can understand some of the risk factors that trigger cells to become cancerous. • I can describe the function of stem cells in embryonic and adult animals. • I can discuss potential benefits and risks associated with the use of stem cells in medicine. • I can describe the function of stem cells in embryonic and adult animals.		

• I can discuss potential benefits and risks associated with the use of stem cells in medicine. • I can discuss potential benefits and risks associated with the use of stem cells in medicine. • I can give examples of where mitosis is necessary to produce identical daughter cells. • I can understand the need for the reduction decision, meiosis. • I can describe the use and potential of cloned cells in biological research. • I can explain the need for energy. • I can describe aerobic respiration as an exothermic reaction. • I can describe the process of anaerobic respiration • I can compare the processes of aerobic and anaerobic respiration. • I can explain how the body removes lactic acid produced during anaerobic respiration. • I can describe the techniques used to produce uncontaminated cultures of microorganisms. • I can describe how bacteria reproduce by binary fission. • I can calculate the number of bacteria in a population. • I can use appropriate apparatus to investigate the effect of antibiotics on bacterial growth. • I can use microorganisms safely.		

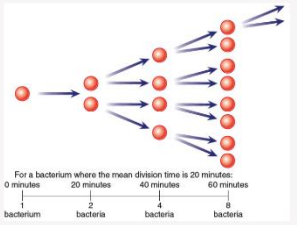
• I can apply sampling techniques to ensure that samples are representative. • I can carry out experiments with due regard to health and safety. • I can present and process data, identifying anomalous results. • I can evaluate methods and suggest further investigations. • I can make estimates for simple calculations, without using a calculator. • I can use ratio and proportion to calibrate a microscope. • I can recognise and use numbers in decimal and standard form.		

Lesson No (if applicable)	Question	Answer	Probable misconceptions (if applicable)
	1. I can describe the structure of eukaryotic cells.	Eukaryotic cells will have organelles inside the cell membrane: nucleus mitochondria and ribosomes	
	2. I can explain how the main sub-cellular structures are related to their functions.	Chloroplasts house chlorophyll. This green pigment is what makes photosynthesis possible. Plant cells have permanent vacuoles. These are used to support the plant and for storage. The nucleus directs the activities of the cell, the cell membrane controls the passage of substances into and out of the cell. Mitochondria are the site in the cell where energy is provided for all the cell's operations. Ribosomes are tiny factories that are constantly making any one of thousands of chemicals and compounds (e.g. amino acids) when directed to do so by the nucleus.	
	3. I can identify the differences in the magnification and resolving power of light and electron microscopes.	A Scanning Electron Microscope (SEM) uses electrons that bounce of the surface of the specimen to reveal the surface shape of structures such as very small organism and cells. It allows us to view sub-cellular structures in much greater detail than the light microscope.	

	4. I can describe and explain the differences between prokaryotic cells and eukaryotic cells.	Prokaryotic cells are much smaller/eukaryotic much larger. prokaryotic cells have no nucleus – the DNA is free in the cytoplasm/eukaryotic cells have a nucleus	
	5. I can describe the process of mitosis in growth, and mitosis as part of the cell cycle.	Mitosis is a form of cell division used by the body for growth and repair. This process is occurring constantly inside your body.	
	6. I can describe how the process of mitosis produces cells that are identical genetically to the parent cell.	When a cell has sufficient energy and is directed to do so, the genetic material (DNA) in the nucleus lines up within along the middle of the cell. The DNA splits faithfully perfectly replicating itself. Spindles form at either end of the cell. These pull the now replicated DNA apart to either end of the cell. A new nucleus forms around each set of replicated DNA and a new cell membrane forms for both cells.	
	7. I can explain the importance of cell differentiation.	Cell differentiation is the process by which specialist cells are created within the body from stem cells. There are thousands of different types of cells performing thousands of different specialised tasks within the body. Without this specialism	

		the body would be a very simple organism.	
	8. I can describe how cells, tissues, organs and organ systems are organised to make up an organism.	 Individual cells can be placed together to work with identical cells. This is called a tissue. If different tissues work together to produce a specific process, we call this conglomeration of tissues an organ. The organ is an essential part of a bigger system, for example the respiration system or the communication system. These	

		systems are called organ systems. All the organ systems work together to make a living organism.	
	9. I can describe cancer as a condition resulting from changes in cells that lead to their uncontrolled growth, division and spread.	Cancer is when cells divide uncontrollably (and do not fulfil their normal function, and spread throughout the body)	
	10. I can describe the function of stem cells in embryonic and adult animals.	Stem cells are unspecialised cells found in embryos that can differentiate to become any type of cells. Stem cells can be found parts of the adult body (bone marrow). This where new blood cells are formed.	
	11. I can explain the need for energy.	There are a limitless number of process that the body performs constantly. All of these require energy. Energy is produced by a complex biochemical process called respiration. All living things respire.	
	12. I can describe aerobic respiration as an exothermic reaction.	Aerobic respiration is an exothermic reaction because exothermic means the reaction gives out heat. When (for example) your muscle work hard, they are the site of a lot of respiration. This makes them hot.	
	13. I can describe the process of anaerobic respiration	Respiration without oxygen is called anaerobic respiration.	

		$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$ (+energy released) glucose → lactic acid (+energy released)	
	14. I can compare the processes of aerobic and anaerobic respiration.	Reactants for aerobic respiration are glucose and oxygen. Reactants for anaerobic respiration are only glucose. Products for aerobic respiration are carbon dioxide and water. Products for anaerobic respiration are ethanol and carbon dioxide. Both reactions produce energy, but aerobic respiration produces more than anaerobic respiration.	
	15. I can describe how bacteria reproduce by binary fission.	When supplied with nutrients and a suitable temperature, bacteria will multiply. They d The process is called **binary fission**. This is not the same as mitosis in eukaryotic cells. prokaryotes with a single chromosome.: A live bacterium landing on the surface of agar will divide repeatedly to form a **colony**. millions of bacteria.  	

Unit Name: **Chapter 2: Photosynthesis**		**Recommended Teaching Time: 15 hours**
Overview and Aims: Identify the components of photosynthesis. Explain the role of photosynthesis and how the plant is designed to achieve these ends. Explain how photosynthesis can be optimised as well as plant food production. Consider the structure of a plant and the mechanisms for moving both water, nutrients and minerals around.		
I can statements		**Critical Content, Key Words and Additional Notes.**
• I can identify the raw materials and products of photosynthesis. • I can describe photosynthesis by an equation. • I can explain gas exchange in leaves. • I can explain the importance of photosynthesis. • I can explain how plants use the glucose they produce. • I can identify the internal structures of a leaf. • I can explain how the structure of a leaf is adapted for photosynthesis. • I can recall that chlorophyll pigments in chloroplasts absorb light energy for photosynthesis. • I can use scientific ideas to develop a hypothesis. • I can use the correct sampling techniques to ensure that readings are representative. • I can present results in a graph. • I can identify factors that affect the rate of photosynthesis. I can interpret data about the rate of photosynthesis.		

• I can explain the interaction of factors in limiting the rate of photosynthesis. • I can explain how factors that increase food production can be controlled. • I can evaluate the benefits of manipulating the environment to increase food production. • I can understand and use the inverse square law in the context of light intensity and photosynthesis. • I can describe the conditions needed for diffusion to occur. • I can calculate and compare surface area to volume ratios. • I can explain how materials pass in and out of cells. • I can describe transpiration in plants. • I can describe the structure and function of stomata. • I can explain the relationship between transpiration and leaf structure. • I can describe the structure and function of xylem and roots. • I can describe how xylem and roots are adapted to absorb water. • I can explain why plants in flooded or waterlogged soil die. • I can describe how transpiration is affected by different factors.		

• I can explain the movement of water in the xylem. • I can describe the movement of sugar in a plant as translocation. • I can explain how the structure of phloem is adapted to its function in the plant. • I can explain the movement of sugars around the plant. • I can be able to calculate surface area and volume. • I can be able to calculate surface area to volume ratio. • I can know how to apply ideas about surface area and volume.		

Lesson No (if applicable)	**Question**	**Answer**	

	1. I can identify the raw materials and products of photosynthesis.	The raw materials of photosynthesis is carbon dioxide and water, in the presence of sunlight and chlorophyll, can produce glucose and oxygen.	
	2. I can describe photosynthesis by an equation.	6CO2+6H20-> C6H12O6 +6O2	
	3. I can explain gaseous exchange in plants.	For photosynthesis a plant must take in Carbon Dioxide and expel the waste product Oxygen. In respiration a plant must take in Oxygen and expel the waste product Carbon Dioxide.	
	4. I can explain the importance of photosynthesis.	Photosynthesis is the foundation for life on Earth. Animals cannot make their own energy; they must get energy by eating plants or eating other animals. All the energy in animals is derived from the energy of the sun that plants have turned into usable energy by the process of photosynthesis.	
	5. I can explain how plants use the glucose they produce.	Although plants do not move they still have to grow, this requires energy, that they get from the glucose, plants need to produce chemicals, this requires energy, plants need to move minerals around, this requires energy (active transport) and plants need to respire, this process requires energy in order to release even more energy.	
	6. I can identify the internal structure of the leaf.	Leaves are flat with a water resistant coating on the upper side. Under a structural layer called the epidermis there are palisade mesophyll cells. Below these is a layer of spongey cells called the spongey mesophyll layer. The lower side of the leaf (lower epidermis) has controllable opening	

		called stomata. These are used to regulate the levels of gases and water in the leaf.	
	7. I can explain how the internal structure of the leaf is adapted for photosynthesis.	The top of the leaf is designed to be strong enough to keep the shape of the leaf, to allow sunlight through and to limit water evaporating away. The layer below are packed with chloroplasts and chlorophyll in order to catch the energy from the sun and turn it into usable energy (glucose). Below this is a layer with many gaps between the cells, resulting in a spongy feel that gives the name spongey mesophyll layer. The gaps are there to allow gases oxygen and carbon dioxide to be exchanged by the plant to facilitate photosynthesis and to a lesser degree respiration. The stomata regulate the gases coming in and out and the water vapour escaping from the plant.	
	8. I can recall that chlorophyll pigments in chloroplasts absorb light energy for photosynthesis.	Chlorophyll is the reason plants are green. This green pigment absorbs energy from the sun in the spectrums of both blue and red light which leaves only green light left to reflect- so that's why plants are green. Chlorophyll is the magical substance that can transform the energy in sunlight into usable energy.	
	9. I can identify factors that affect the rate of photosynthesis.	Factors affecting the rate of photosynthesis are firstly the raw materials. Without sunlight, water or carbon dioxide the process cannot occur at all. There is an optimum concentration for each of these. This means if more is added past a certain point, the rate of photosynthesis cannot	

		increase any further. The last factor is temperature. Photosynthesis is more efficient in a tropical climate, although again, if the temperature increases too much photosynthesis will slow, then stop increasing in efficiency and ultimately the temperature becomes a disincentive to the rate of photosynthesis.	
	10. I can explain how factors that increase food production can be controlled	Modern commercial growers can choose to control every facet of the growing process. They may not have soil to grow the plants in, only carefully formulated nutrient gel. Temperature may be controlled to the nearest 0.1 °C. Blinds and vents can be used in greenhouses to take fullest advantage of the natural weather outside of the greenhouse. The floor may be covered in white plastic in order to reflect light back up into the plants, so no energy in the light is wasted. The glass of the greenhouse will be filled with special glass, designed to allow the most light through with maximum efficiency. Lighting systems are also used to ensure the optimum time is spent photosynthesising and the lights are turned off so the plant can fully absorb the glucose.	
	11. I can describe the conditions needed for diffusion to occur.	All that is needed for diffusion to occur is a concentration gradient and a semi-permeable membrane.	
	12. I can explain how materials pass in and out of cells.	Due to the Law of Equilibrium all things in the universe are trying to become even, this manifests itself in the law of diffusion as,	

		molecules in an area concentrated will seek to move to an area of lesser concentration. They do this by moving through cell membranes away from the concentrated area and into a less concentrated area, in another cell. This process will become equal when the concentration levels are the same on either side of the membrane.	
	13. I can calculate and compare the surface are to volume ratio.	Diffusion can only occur across a cell membrane. The greater the area of cell membrane, the greater the potential rate of diffusion. The reason cells are so small is because this is the best way to increase the surface area to volume ratio of the organic material and therefore optimise the conditions for efficient diffusion into and out of cells.	
	14. Explain how materials move into or out of cells.	Diffusion is a process that motivates substances to move from cell to cell, if there is a concentration gradient. Substances more from areas of high concentration to areas of lower concentration. Osmosis is the same as diffusion, but osmosis is a name reserved for the movement of water between cells, against a concentration gradient. Water will always move to dilute the most concentrated area. The final mechanism we must know is active transport. Diffusion is sometimes referred to as passive transport because no energy is required from the cells. With active transport minerals can be shunted across semi-permeable membranes against a concentration gradient by expending energy.	

	15. I can describe transpiration in plants.	Transpiration is the process by which water comes into the root hairs and then the roots of a plant by osmosis. Plants have tiny tubes that run the length of the plant. This is called xylem. Water molecules within the xylem are stuck to water molecules further up the tubing by attractive forces between hydrogen atoms. As the water at the top of the column evaporates from the leaves or is consumed in photosynthesis the water column automatically pulls up more water molecules within the xylem.	
	16. Describe the relationship between leaf structure and transpiration.	Leaves have stoma in. These holes with controllable openings allow water to evaporate most easily from the leave. As water evaporates from the leaf, so does more water get drawn up the xylem column.	
	17. I can describe the structure and function of xylem and roots.	The structure of the roots is augmented by the root hairs. Tine and very fine, the root hairs serve the purpose of enormously increasing the surface area of the root system. This allows for a much greater potential uptake of water and minerals because of this. Once water has entered the root hairs and then the root, it is moved on, typically by osmosis, until reaching the xylem system. Once in the xylem system it is transported visa these tiny tubes.	
	18. I can explain why plants die in waterlogged soil.	Plants do absorb an amount of the oxygen they need for respiration through their roots. Waterlogged soil has too little oxygen that the plant can access. The diffusion gradient can invert, and necessary minerals will leave the plant back into the waterlogged soil.	

	19. I can describe how the structure of phloem is adapted to function in the plant.	Phloem tubes have: • companion cells with a nucleus and many mitochondria, which provide the energy needed to move substances in the phloem • limited amounts of cytoplasm and no nucleus to allow efficient movement of substances • perforated sieve plates to allow the movement of substances through the • two-way flow of substances so that they are transported all over the plant Because the substances transported in phloem are required to travel against the transportation gradient often, the plant uses active transport as well as diffusion as a way of achieving its goals.	

Unit Name: **Chapter 3: Moving and changing materials**	**Recommended Teaching Time: 20 hours**
Overview and Aims: Explaining movement of water (osmosis) and other substances (diffusion and active transport), in plants and animals. Investigate the need and structure of a plant's transport system. Introduction to the human digestive system and enzymes. Explore the human circulatory system, the heart, function structure and common problems.	
I can statements • I can describe how water moves by osmosis in living tissues. • I can identify factors that affect the rate of osmosis. • I can explain what the term 'partially permeable membrane' means. • I can use scientific ideas to develop a hypothesis. • I can plan experiments to test a hypothesis. • I can draw conclusions from data and compare these with hypotheses made. • I can describe active transport. • I can explain how active transport is different from diffusion and osmosis. • I can explain why active transport is important. • I can describe how the size of an organism affects the rate of diffusion. • I can explain how changes in conditions affect the rate of diffusion. • I can explain the need for exchange surfaces and transport systems using surface area to volume ratio.	**Critical Content, Key Words and Additional Notes.**

• I can describe what enzymes are and how they work. • I can explain the lock-and-key theory. • I can use the collision theory to explain enzyme action. • I can describe how safety is managed, apparatus is used and accurate measurements are made. • I can explain how representative samples are taken. • I can make and record accurate observations. • I can draw and interpret a graph from secondary data using knowledge and observations. • I can identify and locate the organs in the digestive system and describe their functions. • I can describe how the products of digestion are absorbed into the body. • I can explain why the small intestine is an efficient exchange surface. • I can describe how physical digestion helps to increase the rate of chemical digestion. • I can name the sites of production and action of specific enzymes. • I can interpret data about digestive enzymes. • I can suggest appropriate apparatus for the procedures. • I can describe how safety is managed and apparatus is used. • I can describe how accurate measurements are made.	

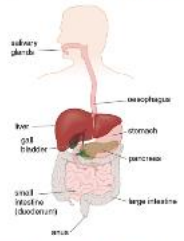
• I can interpret observations and make conclusions. • I can identify the structures responsible for gas exchange in fish, amphibians and insects. • I can describe the adaptations of different gas exchange surfaces. • I can explain the gas exchange surfaces in amphibians. • I can describe how mineral ions from the soil help plants to grow. • I can explain how root hair cells are adapted for efficient osmosis. • I can describe the function of different mineral ions in a plant. • I can describe why plants need different mineral ions. • I can explain the effects of mineral deficiencies on plant growth. • I can explain the importance of fertilisers. • I can identify the parts of the circulatory system. • I can describe the functions of the parts of the circulatory system. • I can explain how the structure of each part of the circulatory system relates to its function. • I can describe the structure and functions of the heart. • I can identify the functions and adaptations of the parts of the heart.	

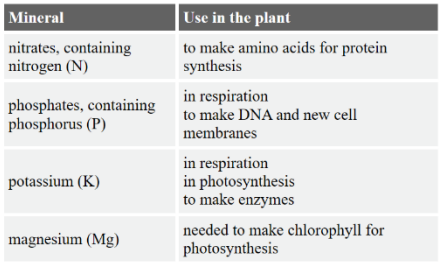
• I can explain the movement of blood around the heart. • I can identify the parts of the blood and their functions. • I can explain the adaptations of red blood cells. • I can explain how red blood cells and haemoglobin transport oxygen efficiently. • I can identify the parts of the human gas exchange system and know their functions. • I can explain how gas exchange occurs in humans. • I can explain the adaptations of the gas exchange surfaces. • I can identify the causes and symptoms of coronary heart disease and heart failure. • I can describe possible treatments of coronary heart disease. • I can evaluate the possible treatments of coronary heart disease. • I can extract and interpret information from tables, charts and graphs.	

Lesson No (if applicable)	**Question**	**Answer**	**Probable misconceptions (if applicable)**

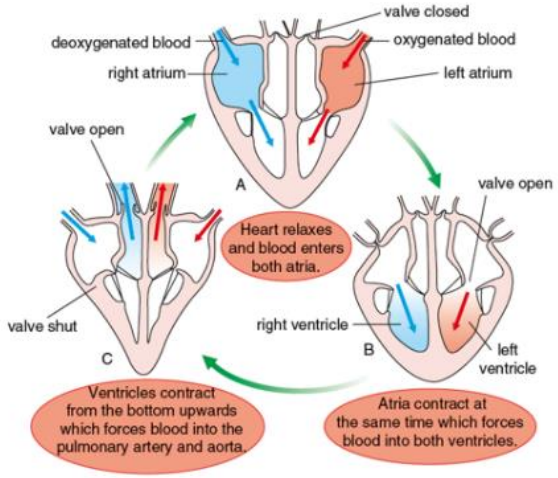
	1. I can describe how water moves by osmosis in living tissues.	Osmosis is a process where water moves to dilute a more concentrated solution. This occurs across a semi-permeable membrane (cell membrane). Extreme versions of this can make cells swell with so much water that they rupture, or so much water is drawn out of a cell that it shrivels up.	
	2. I can identify the factors that affect osmosis.	The concentration of the solution on the other side of the membrane affects osmosis.	
	3. I can describe active transport.	Usually materials move down a concentration gradient, diffusing from a most concentrated environment to a less concentrated one. With active transport a cell chooses to import a material against the prevailing concentration gradient. This requires energy. The rate of respiration goes up in a cell when it employs active transport.	
	4. I can describe how the size of an organism affects the rate of diffusion.	Because diffusion can only occur across a shared point of contact, if one has a small volume but a large surface area it is possible to diffuse much more material in a given time. This is why cells are small: to increase their surface area and rate of diffusion.	
	5. I can explain how the change in conditions	If the external conditions change, so will the rate of diffusion into or out of the cell.	

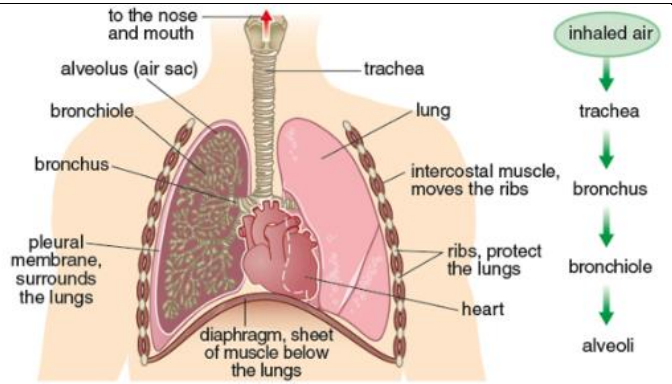
	can affect the rate of diffusion.		
	6. I can describe what enzymes are and how they work.	A catalyst is something that alters the rate of a chemical reaction without being used up itself. Some catalysts can speed up reactions many thousands of times. Enzymes are biological catalysts. Enzymes speed up countless reactions within our bodies all the time. Each different type of reaction requires a different type of catalyst.	
	7. I can describe the 'Lock and Key' theory.	The lock and key theory states that the order of amino acids that make up an enzyme provides a perfect fit for one type of substrate. The enzyme provides an 'energetically' cheaper pathway for the chemical reaction to occur than the usual –non-enzyme way. This means the reaction happens more quickly. Any chemical action the enzyme undertakes it receives back during the reaction and is therefore unchanged at the end and ready to go again with the next substrate it meets up with.	
	8. I can explain the collision theory of enzymes.	The collision theory states that reactions can only occur when there is contact between the reacting parties. This is still true with enzymes and the theories for why this increases the rate of the reactions are still unconfirmed. By adding the enzymes, there are numerically more sites for the reactants to collide and react with.	

	9. I can identify organs in the digestion system and describe their functions.	The digestive system is a long tube that runs from the mouth to the anus. It consists of several organs working together to digest and absorb food. Each organ is adapted to perform a different function.  Figure 3.16 The human digestive system Digestion is completed in the small intestine. The soluble food passes through the small intestine wall into the blood. This is called **absorption**. The blood transports the products of digestion to the body cells. **Part** / **Adaptation** / **Function** salivary gland — produces saliva — moistens food; has enzymes to digest food oesophagus — muscular walls — moves food to the stomach by **peristalsis** stomach — strong muscles; produces hydrochloric acid; produces enzymes — mix food; kills harmful microbes; provides optimum pH for stomach enzymes; digest food liver — produces bile (alkaline) — neutralises stomach acid; stores carbohydrates (as glycogen); emulsifies fats gall bladder — small bag-like structure — stores bile pancreas — produces enzymes — provides enzymes to digest food in the small intestine small intestine (duodenum) — produces enzymes; large surface area — digestion of food; absorption of soluble food large intestine — special cells to absorb fluids — absorbs water; solidifies waste anus — strong muscle — releases waste	
	10. I can identify organs responsible for gas exchange in fish, amphibians and insects.	Fish use gills for their gas exchange. Insects use a system of tiny holes running along an insect's body called spiracles. Amphibians use their skin.	
	11. I can describe the adaptations	Insect's spiracles feed to thin tubes called trachea. These end with a smear of water at the insect's cells. The water is necessary for the gases to diffuse into the cells.	

	of the different gas exchange surfaces.	Amphibians can have feathery external gills but often these disappear as the creature becomes adult. Amphibians use their wet skin and diffuse gases straight from the air through their skin. A fish's gills are placed behind the mouth, so water is constantly forced over them and out through the gill flaps. The oxygen is taken from the water by the gills.	
	12. I can describe how mineral ions from the soil help plants to grow.	 **Mineral** / **Use in the plant** nitrates, containing nitrogen (N) — to make amino acids for protein synthesis phosphates, containing phosphorus (P) — in respiration; to make DNA and new cell membranes potassium (K) — in respiration; in photosynthesis; to make enzymes magnesium (Mg) — needed to make chlorophyll for photosynthesis	
	13. I can explain the effects of mineral deficiency on plant growth.	If a plant does not have all the required minerals it will grow poorly. The plant will not be able to synthesis amino acids for growth or chlorophyll for photosynthesis.	
	14. I can explain the importance of fertilizer.	As plants grow, they draw nutrients from the soil. If these are not replenished, next year's crop will grow poorly. The purpose of fertilizer is to replace all these nutrients so the plants can grow well.	
	16. I can identify the parts of the circulatory system.	Humans have a double circulatory system. Blood is pumped to the lungs from the heart. The blood is oxygenated at the lungs. The blood then returns to the heart that pumps it again away and off around the rest of the body.	

	17. I can explain how the structure of each part of the circulatory system relates to its function.	The advantages of the double circulation system include: • blood pressure is higher, especially to the body • there is a higher blood flow to body tissues • oxygenated blood is separate from deoxygenated blood. Adaptations of the blood vessels include: • the thick elastic walls of arteries withstand the high pressure of the blood • capillary networks have a large exchange surface area • the thin permeable walls of capillaries mean that substances have only a short distance to diffuse • large lumen in the veins gives the least flow resistance • valves in the veins prevent the backfow of blood.	
	18. I can explain the movement of blood around the heart.	As the heart relaxes blood flows into both atria. The atria contract, forcing blood down into the ventricles. The ventricles squeeze closed from the bottom up forcing the blood into the pulmonary artery from the right ventricle (and onto the lungs) whilst the blood in the left ventricle closes and takes the blood to the Aorta and off around the body.	

			
	19. I can explain how haemoglobin transports oxygen efficiently.	Red blood cells are tiny. Approximately 5 million in 1mm3 of blood. They can get down tiny capillaries. They are biconcave in shape. This increases their surface area to volume ratio which means they can diffuse oxygen more efficiently. Red blood cells do not have a nucleus. This is so they can carry more oxygen. Red blood cells are filled with haemoglobin. This easily forms a compound called oxy-haemoglobin when the red blood cells go to the lungs. The red blood cells carry the oxygen till it is needed by a cell. The bonds are very weak, and the oxygen easily breaks apart to join the needy cell.	
	20. I can Identify the parts of the human gas exchange system in humans.		

		 Our lungs expand as we breath in, this pulls air down into the lungs, it passes through the nose or mouth , down the trachea, into the large bronchus tubes that lead into the lungs, down through smaller branched bronchioles and finally to the thin walled alveoli. The lungs are surrounded by a nest of fine capillaries. The oxygen can diffuse through the walls of the alveoli and into the red blood cells in the capillaries. At the same time these red blood cells are carrying carbon dioxide from respiring cells. At the lungs this carbon dioxide diffuses back through the walls of the capillaries and alveoli so it can be expelled at the next exhale.	
	21. I can identify the causes and symptoms of coronary heart disease and heart failure.	Coronary heart disease is where the heart receives a lessened volume of blood. This is because the arteries and veins of the body have become clogged with a fatty residue. This lessens the volume of blood and therefore oxygen reaching the heart. Several factors can contribute to a tendency towards coronary heart disease, genetics, poor diet, smoking and lack of exercise.	

Unit Name: **Chapter 4: Health matters**		**Recommended Teaching Time: 20 hours**
Overview and Aims: Introduction to learning about health and ill health. Communicable and non-communicable diseases, studying four types of pathogens in some detail. The body's defence systems, immunity and medication. Look at some diseases and defences in plants.		
I can statements		**Critical Content, Key Words and Additional Notes.**
• I can recall the difference between health and disease. • I can explain how some diseases interact. • I can evaluate data about lifestyle and health. • I can recall the causes of some non-communicable diseases. • I can describe the impact of lifestyle on non-communicable diseases. • I can explain the impact of lifestyle on non-communicable diseases. • I can identify risk factors for cancer. • I can explain the differences between types of tumours. • I can explain the impact of non-communicable diseases • I can translate information between graphical and numerical forms. • I can use scatter diagrams to identify correlations. • I can evaluate the strength of evidence. **(HT)** • I can recall the definition of a pathogen.		

• I can explain how communicable diseases can be controlled. • I can distinguish between epidemics and pandemics. • I can describe the symptoms of some viral diseases. • I can describe the transmission and control of some viral diseases. • I can explain how some viral diseases are spread. • I can describe the symptoms of some bacterial diseases. I can explain how some bacterial diseases can be controlled. • I can compare and contrast bacterial and viral diseases. • I can recall the name and symptoms of a fungal disease. • I can describe the transmission and treatment of rose black spot. • I can explain how rose black spot affects the growth of the plant. **(HT)** • I can recall that malaria is a protist disease. • I can describe the lifecycle of the malarial vector. • I can describe how the body protects itself from pathogens. • I can explain how the body protects itself from pathogens. • I can explain how communicable diseases can be spread.		

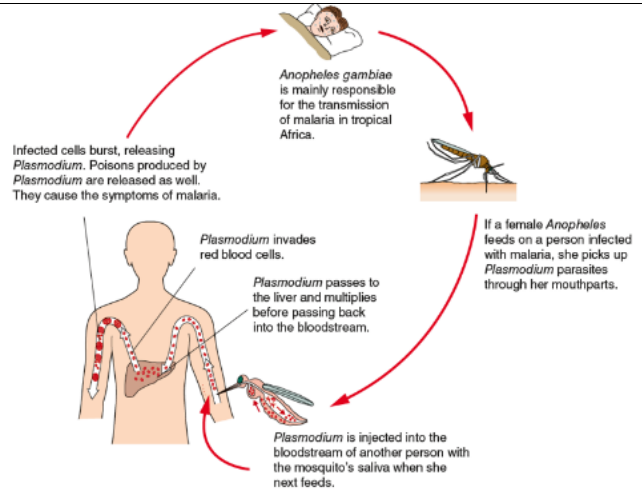
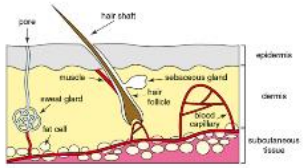
• I can describe phagocytosis. • I can explain how antibody production can lead to immunity. • I can explain the specificity of immune system responses • I can describe the uses of antibiotics and painkillers. • I can explain how antibiotics and painkillers can be used to treat diseases. • I can explain the limitations of antibiotics. • I can recall how vaccinations prevent infection. • I can explain how mass vaccination programmes reduce the spread of a disease. • I can evaluate the global use of vaccination. **(HT)** • I can recall some traditional drugs and their origins. • I can describe how new drugs are developed. • I can explain why 'double-blind' trials are conducted. • I can describe uses of monoclonal antibodies. • I can explain how monoclonal antibodies are produced. • I can evaluate the use of monoclonal antibodies. • I can recall the causes of plant diseases. • I can describe the symptoms and identification methods of some plant diseases. • I can explain the use of monoclonal antibodies in identifying plant pathogens. **(HT)**		

• I can recall some physical plant defence responses. • I can explain how plant defence systems help them survive. • I can understand why sampling is used in science. I can explain different sampling techniques. I can extract and interpret information from graphs.		

Lesson No (if applicable)	Question	Answer	Probable misconceptions (if applicable)
	1. I can recall the difference between health and disease.	Health is wellbeing, be that physical or mental. Disease is a disorder that affects part or all of an organism	
	2. I can explain that some diseases interact.	Different types of disease may interact; for example, viruses living in cells can cause cancers. Cervical cancer is linked to infection with human papilloma virus (HPV), which causes genital warts. Being overweight is strongly related to having high blood pressure. Having high blood pressure damages the body's arteries in the long term, making the walls thick and stiff, rather than flexible and elastic.	
	3. I can recall the causes of some non-communicable diseases.	Non communicable diseases may have their genesis in genetics, or poor diet or lifestyle.	
	4. I can identify risk factors for cancer.	It is thought smoking, obesity, some common viruses, over exposure to ultraviolet light, age and some genetic elements contribute to the chances of contracting cancer.	
	5. I can explain the differences between types of tumours.	Benign tumours grow slowly, they stay together and do not spread. Malignant tumours grow quickly, can break up and spread around the body, infecting other parts.	

	6. I can recall the definition of a pathogen.	Pathogens are micro-organisms that can cause disease.	
	8. I can explain how communicable diseases can be controlled.	The four main ways of stopping the spread of communicable diseases are: Basic hygiene. My washing hands and surfaces that pathogens may settle on, they can be killed or removed. Vaccinations. Vaccinations are a way of pre-preparing a population so their immune systems are ready for a disease should if occur. Isolating individuals so they cannot spread the pathogen. Destroying vector (carriers) eg mosquito.	
	9. I can distinguish between an epidemic and a pandemic.	An epidemic is a disease that is actively spreading. A pandemic strictly refers to the wide geographical spread of the disease. Epi is Greek meaning on or over. Demic refers to the people. The prefix pan means all. So, a pandemic derives from 'all the people' epidemic come from the idea that the disease is 'coming over' or 'covering' the people.	
	10. I can describe the symptoms of some viral decision.	Symptoms of some viral conditions might be rashes, spots or a fever.	
	11. I can describe how bacterial diseases may be controlled.	Bacterial conditions may be controlled by antibiotics.	
	12. I can describe the symptoms	Bacterial diseases are made by bacteria entering the body and producing toxins. These toxins poison the	

	of a bacterial disease.	body. The resulting symptoms might be fever, vomiting or diarrhea.	
	13. I can compare and contrast viral and bacterial diseases.	Bacterial diseases caused by living bacterial cells that release toxins and are easy to control by using antibiotics. Some bacteria are useful. Bacteria are larger than viruses Viral diseases caused by virus organism that live inside host cell and destroying them; Antibiotics cannot affect them so; vaccination is the preferred form of medication (if a vaccine exists).	
	14. I can recall the name and symptoms of a fungal disease.	Black Rose Spot. This fungal disease means black or purple spots appear on the leaves and stems of the plant. As the fungus spreads the leaves drop off the plant.	
	15. I can recall the transmission of Black Rose Spot fungus.	The fungus creates spores. These are released into the wind. Should they land on any other plant surface they can quickly infect the next plant.	
	16. I can recall Malaria is a protist.	Malaria is a disease brought by a protist. This is a single celled organism called plasmodium. Plasmodium needs humans to complete its life cycle.	

	17. I can describe the life cycle of the malaria protist.	 The Malaria protist has a complicated life cycle that requires it to infect both humans and mosquitos for it to be completed.	
	18. I can describe how the body protects itself from pathogens.	• Your skin acts as a barrier and produces antimicrobial secretions via glands in the skin.  Figure 4.31 Structure of the skin • The nose traps particles that may contain pathogens. • Your trachea and bronchi secrete mucus, which traps pathogens. • The stomach produces acid, which kills the majority of pathogens that enter via the mouth. • Platelets (cell fragments in your blood) start the clotting process at wound sites. Clots dry to form scabs, which seal the wound. The body has many defence mechanisms, built to guard the parts of the body where the outside might most easily get inside. The body also has a panoply of defences in the blood.	
	19. I can explain how antibody production	Antibodies are pathogen specific. Once the body has experienced a type of pathogen, the body will quickly recognise the reappearance of that pathogen and the body	

	can lead to immunity.	can then mass produce antibodies that will perfectly attack that type of antigen. The antibodies will map exactly the protein structure on the outside of the pathogen and lock into and destroy this pathogen.	
	20. I can describe the use of antibiotics and painkillers.	Antibiotics work against bacteria. Antibiotics identify the bacteria as not belonging to the host and disrupt the biochemistry of the single celled bacteria. Because the biochemistry of the bacteria is substantially different from the biochemistry of the cells of the host. Painkillers do not kill the bacteria, but they interfere with the hosts pain receptor system so the host is less aware of their pain whilst the antibiotics are dealing with the cause of the pain (the poison producing bacteria).	
	21. I can describe the limitations of antibiotics.	There is a great problem in the world now, that of the increase in numbers of antibiotic resistant bacteria. Antibiotics kill bacteria, although they may not affect some types of bacteria because they are not a good biochemical match. If antibiotics are not taken as part of a full course, some of the bacteria may have mutated to have slightly more resistance to the antibiotic. If the full course is not taken, that extra bit of resistance might be enough for the bacteria to survive. If there are further mutations resulting in greater resistance there spawns a population increasingly resistant to antibiotics.	
	22. I can describe phagocytosis.	Phagocytosis is a behaviour by certain types of white blood cells called phagocytes. These white blood cells seem to follow a chemical trail of invaders into the body. Once the phagocyte catches up with the pathogen it will seek to engulf the invader and digest it.	
	23. I can explain how vaccination	Vaccination is a process whereby some dead or inert form of a virus is injected into a person. The person's immune system will identify the very specific arrangement of perhaps, a	

	programmes can reduce the spread of disease.	protein on the outside of the virus/pathogen. When the dangerous form of the virus invades the body, there will already be a blueprint for an effective antibody, so these can be quickly massed produced before the virus can get hold and do more serious damage. When enough people in a population have this immunity built into them either through infection or the safer vaccination route - a herd immunity will have been formed. This means that the virus will not be able to spread as there are too few hosts for it to breed in. As a result, the virus becomes inactive (or effectively dead).	

Unit Name: **Chapter 5: Coordination and control**	**Recommended Teaching Time: 30 hours**
Overview and Aims: Introduction to homeostasis, the nervous and endocrine systems. How both systems work, their similarities and their differences. Focus on the organs: the eye and the kidney. Investigate the control systems for water and glucose levels within the body. Human reproduction and the role of hormones.	
I can statements • I can explain the importance of homeostasis in regulating internal conditions in the body. • I can recall that these control systems involve nervous or chemical responses. • I can describe how control systems involve receptors, coordination centres and effectors. • I can explain how the nervous system is adapted to its functions. • I can describe the structure of the central nervous system and the nerves • I can explain the importance of reflex actions. • I can describe the path of a reflex arc. • I can explain how the structures in the reflex arc relate to their function. • I can recall that the brain controls complex behaviour using billions of interconnected neurons. • I can identify the three main regions of the brain and describe their functions.	**Critical Content, Key Words and Additional Notes.**

• I can describe how the regions of the brain are mapped. **(HT)** • I can select appropriate apparatus and techniques for the measurement of biological processes. • I can carry out physiological experiments safely. • I can use appropriate techniques in problem-solving contexts. • I can relate the structures of the eye to their functions. • I can explain how the eye is adapted to seeing in colour and in dim light. • I can relate the structures of the eye to their functions. • I can understand how the eye is able to focus on near or distant objects. • I can understand that, in myopia and hyperopia, the eye cannot focus light rays on the retina. • I can demonstrate how techniques are used to correct eye defects. • I can understand the mechanisms by which body temperature is controlled when too hot or cold. • I can explain how body temperature can be controlled in a specific context. **(HT)** • I can recall that the endocrine system is made up of glands that secrete hormones into the blood. • I can know the location of the major endocrine glands.	

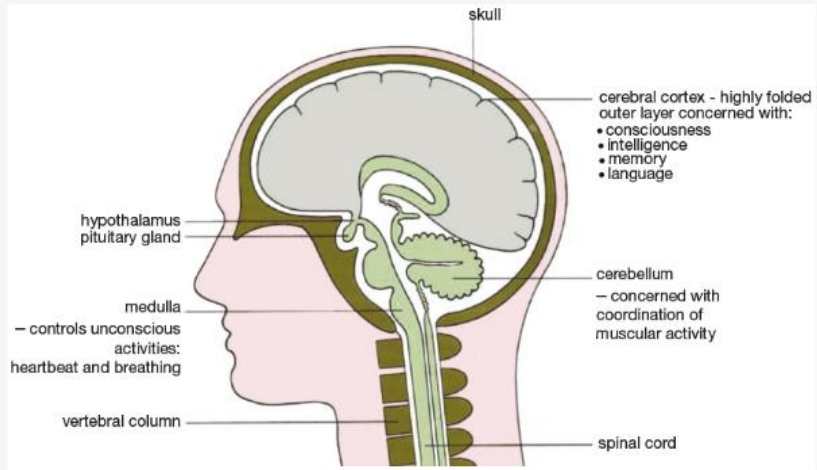
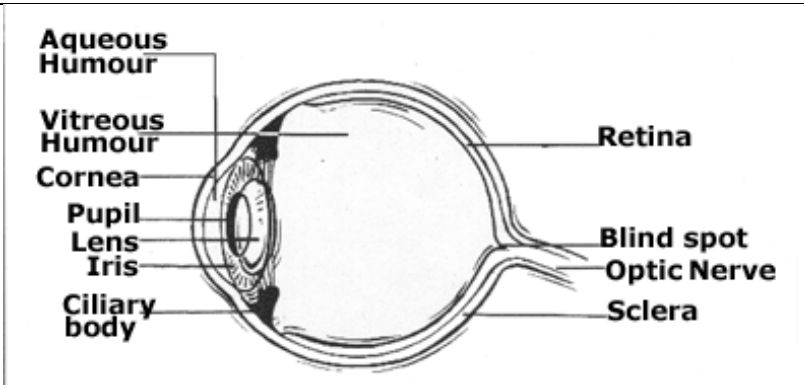
• I can understand why the pituitary gland is the 'master gland'. • I can recall that blood glucose is monitored and controlled by the pancreas. • I can understand how insulin controls blood glucose levels. • I can understand how insulin works with another hormone – glucagon – to control blood sugar levels. **(HT)** • I can understand the causes of Type 1 and Type 2 diabetes. • I can compare Type 1 and Type 2 diabetes. • I can evaluate information on the relationship between obesity and diabetes and make appropriate recommendations. • I can recall the ways in which the body loses water. • I can explain why cells do not function efficiently if they lose or gain too much water. • I can explain how excess protein is converted to urea for excretion. **(HT)** • I can recall that excess water, ions and urea are removed from the body by the kidneys in urine. • I can describe how the kidneys produce urine. • I can explain how the hormone ADH regulates the amount of water in the urine, and therefore, in the body.	

• I can explain the role of thyroxine in the body. • I can understand the principles of negative feedback, as applied to thyroxine. • I can recall that people who suffer from kidney failure can be treated by dialysis or kidney transplant. • I can understand the principles of dialysis. • I can evaluate the advantages and disadvantages of treating organ failure using a mechanical device or transplant. • I can recall that people who suffer from kidney failure can be treated by dialysis or kidney transplant. • I can evaluate the advantages and disadvantages of treating organ failure using a mechanical device or transplant. • I can describe the roles of hormones in sexual reproduction. • I can explain how hormones interact in the menstrual cycle. **(HT)** • I can explain the use of hormones in technologies to treat infertility. • I can describe the technique of in-vitro fertilisation. • I can evaluate the scientific, emotional, social and ethical issues of in-vitro fertilisation. • I can describe the technique of in-vitro fertilisation.	

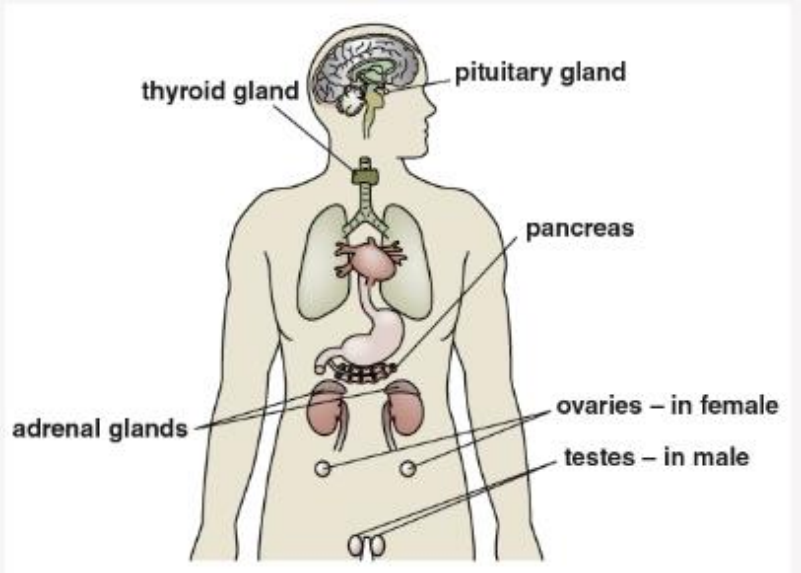
• I can evaluate the scientific, emotional, social and ethical issues of in-vitro fertilisation. • I can describe the effects of adrenaline. • I can understand that automatic control systems may involve nervous responses and chemical responses. • I can understand that combinations of hormones work to produce a response. • I can understand that fertility can be controlled by different hormonal and non-hormonal methods of contraception. • I can evaluate the different methods of contraception. • I can recall that plants produce hormones to coordinate and control growth, and responses to light and gravity. • I can describe how unequal distributions of auxins cause unequal growth rates in plant shoots and roots. • I can explain how auxins coordinate and control responses to light and gravity. **(HT)** • I can explain that auxins act on 'stem cells' in plants called meristems. • I can describe some applications of auxins. **(HT)** • I can describe how an experiment is planned for a specific purpose.	

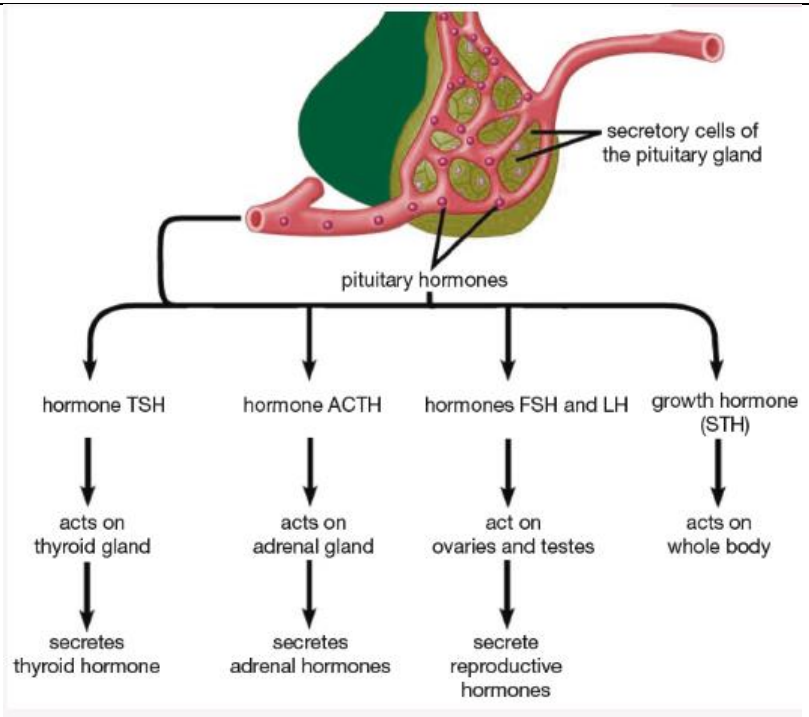
• I can make and record observations and translate data from one form to another. • I can interpret observations and other data, identifying patterns and trends, make inferences and draw conclusions. • I can recall that gibberellins are important in seed germination, and ethene in cell division and ripening of fruit. • I can explain the application of the plant hormones ethane and gibberellins. • I am able to calculate means and ranges of data. • I can understand how to estimate uncertainty from a set of measurements.	

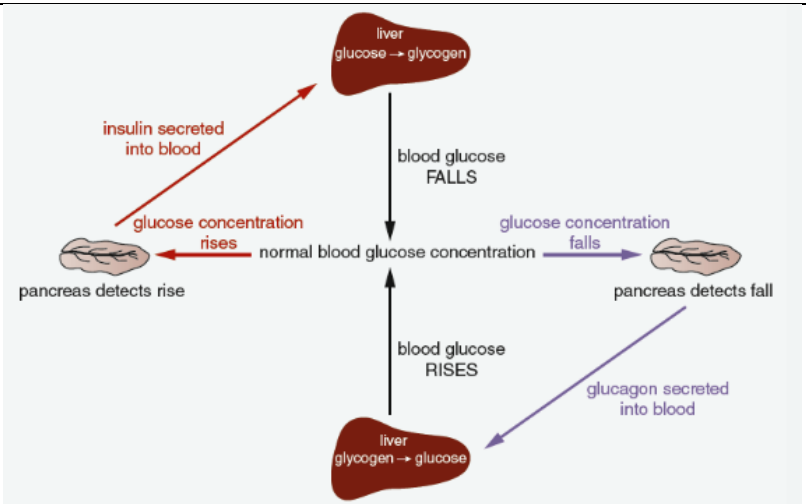
Lesson No (if applicable)	Question	Answer	Probable misconceptions (if applicable)
	1) I can explain the importance of homeostasis in regulating internal conditions in the body.	The normal body temperature is 37 °C, the optimum temperature for enzymes and all other brain functions. The human brain is very sensitive to changes in temperature.	
	2) I can recall that these control systems involve nervous or chemical responses.	The body's control systems involved in homeostasis are automatic- these systems are: The nervous system- electrical impulses for communication. The endocrine system – chemical molecules for communication.	
	3) I can describe how control systems involve receptors, coordination centres and effectors.	The receptors are cells that monitor and register the outside world. The co-ordination centre receives a message from the receptor. This will be the brain, spinal cord or a gland. This issues a message to the effector. The effector is the body's response so a muscle that contracts or the gland that secretes a hormone to restore balance.	
	4) I can describe the structure of the central nervous system and nerves.	The central nervous system is there to give us information about our surroundings and coordinate our behaviour. The brain sits at the head and the spinal cord is an extension of this. All other nerves come off this and feed back to this central nervous system.	
	5) I can explain the importance of reflex actions.	The reflex action is the bodies response to clear and present danger. The body doesn't need to think, the reflex arc is an automatic (the blinking of the eyes in bright light, the closing of the pupil in bright light, the withdrawing of the hand from a hot surface etc). This is a primal response.	

	6) I can identify the three main regions of the brain and describe their functions.	The brain is composed of billions of nerve cells, or neurones.  The cerebral cortex is the largest part of the brain. The Cerebellum is the ridged part tucked away at the bottom of the cerebral Cortex and the Medulla Oblongata runs down from the centre of the brain towards the spinal cord.	
	7) I can relate the structures of the eye to their functions.	 1) The pupil is a hole in the iris through which light passes. 2) The iris is the coloured disc of muscle that allows the pupil to increase or decrease.	

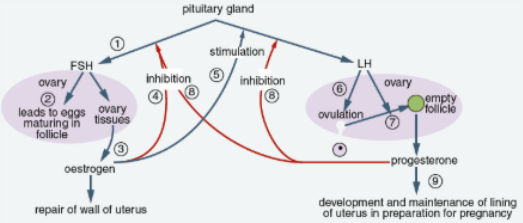
		3) The lens is used to focus the incoming light onto the retina at the back of the eye. 4) The retina is made of light sensitive cells. When light touches them, they send an electrical impulse to the optic nerve. 5) The optic nerve is the cord of nerve cells that convey the electrical signals from the eye to the brain where they are deciphered and formed into images. 6) The Sclera is a thick protective coating that coats the eye. 7) The Cornea is a transparent part of the sclera, that lets light into the eye whilst protecting the eye. 8)The suspensory ligaments and the ciliary muscles hold the lens in place, and it is these muscle that relax and contract, changing the shape of the lens to keep all images in focus.	
	8) I can explain how the eye is adapted to seeing in colour and in dim light.	The eye has two types of light receptive cells at the rear of the eye, rods and cones. The cones see colour. The eye can see in dim light because the iris opens up the pupil to allow more light in. The rod cells are 1000 times more sensitive to light than the cones.	
	9) I can understand the mechanisms by which body temperature is controlled when too hot or cold.	The body has a thermoregulatory centre in the brain. This monitors the temperature of the blood that passed through it but also receives messages from temperature receptors in the skin. If the body's temperature is too high blood vessels in the skin dilate (become wider). This allows for a greater volume of blood to reach the outer extremity of the body. From hear it is easier for heat in the body to escape to outside the body. The loss of this heat cools the body. The skin sweats. The water of sweat absorbs the heat from the body, causing it to evaporate. The heat is lost from the body by this mechanism. If the body is too cold, the blood vessels at the surface constrict so heat is retained in the body. Sweating is reduced or stopped.	

		Skeletal muscles contract and relax rapidly. This is shivering and generates heat in the muscles. The hairs on your skin stand up. This is an attempt to trap a layer of air next to your body. This is to insulate the body and slow down heat loss.	
	10) I can recall that the endocrine system is made up of glands that secrete hormones into the blood.	These are the names and positions of the major glands in the human body. Some are gender specific. Some of these glands produce enzymes as well as hormones. Like the nervous system the endocrine system's messages work on effectors, but apart from adrenalin, the effects are not instantaneous but rather slower acting. In the case of some hormones the effects may be very long lasting as the hormones trigger puberty or promote growth.  	
	11) I can understand why the pituitary gland is the 'master gland'.	The pituitary gland not only triggers effectors but it also sends hormones to other glands that provoke them to start secreting.	

			
	12) I can understand how insulin controls blood glucose levels.	When insulin is released by the pancreas it signals to the body that the body's cells should absorb glucose. Glucose is needed in all cells to fuel respiration etc. There is another hormone involved in controlling blood sugar levels. This is glucagon. Excess glucose is stored in the liver as glycogen. When blood sugar levels are too low, glucagon is released which promoted the liver to convert glycogen into glucose.	

			
	13) I can understand the causes of Type 1 and Type 2 diabetes.	Type one diabetes is only 10% of diabetes sufferers. The body does not produce enough insulin, sometimes the pancreas cannot produce insulin, so glucose is not absorbed into cells. Glucose is wasted as it is passed out of the body in urine. The body needs glucose, so it gets this from fat and protein in the body. The patient will lose weight, resulting in blindness, loss of extremities, organ damage and eventually death. TYPE 2 diabetes is when the body's cells become desensitised to glucose levels, do not send messages to the pancreas and so insulin is not produced. There seems to be a strong link between Type 2 diabetes and obesity. The modern western lifestyle of high sugar, high fat, low exercise has led many people to become obese.	
	• 14) I can explain why cells do not function efficiently if they lose or gain too much water.	Our bodies have a low tolerance for abnormal levels of water in the body. A good water balance must be maintained for the chemical reactions that constantly take place in our cells to occur efficiently. We lose most of our water through our urine. We lose water as it is breathed out from the lungs, as water vapour. We sweat and lose a	

		large volume of water everyday through this method as well as a small amount in our faeces. The body starts to show signs of dehydration if one loses as little as 2% of your body mass in water. This would cause you to feel very thirsty. At 5% loss your body fails to function properly and as little as 10% loss of body weight through dehydration could be life threatening. Even when dehydrated the body must urinate. This is to remove harmful waste products (amino acids). These are broken down in the liver through a process called deamination. The amino acids are turned into toxic ammonia and then the less toxic urea. Urea is withdrawn by the kidneys.	
	15) I can describe how the kidneys produce urine.	The kidneys are bean shaped organs through which the blood passes. Useful commodities are filtered out and reintroduced to the body or marked for expulsion. The blood enters the kidneys where smaller dissolved molecules are filtered out into the tubules. Larger molecules such as proteins continue in the blood stream. Smaller items such as ions, water, urea and glucose enter the tubules where some of them are retained by the body. This process is called selective reabsorption. Unnecessary waster products continue onto the bladder. The level of water being reabsorbed is controlled by a hormone called anti-diuretic hormone or ADH. This hormone is released from the pituitary gland. It causes the walls of the tubules to reabsorb more water. The level of ADH released is controlled by the amount of water in the blood that passes through the pituitary gland. These two factors balance each other out. It is called negative feedback.	
	16) I can describe the roles of hormones in sexual reproduction.	Secondary sexual reproductive hormones develop in our bodies. We start to produce these hormones at puberty. Oestrogen is produced in the ovaries. Over 28 days an egg matures and is released. This is ovulation.	

		The main male sex hormone is testosterone. This is produced in the testes and as well as promoting muscle growth testosterone promotes the production of sperm. The menstruation cycle is controlled by 4 main hormones.  Figure 5.54 The roles of the hormones as the cycle progresses are: **1** FSH is secreted by the pituitary gland. **2** FSH causes the eggs to mature in the ovaries. **3** FSH stimulates the ovaries to produce oestrogen. **4 & 5** Oestrogen inhibits further release of FSH and stimulates release of LH. **6** LH triggers ovulation – the release of the mature egg from the ovary – and … **7** … leads to the secretion of progesterone by the empty **follicle** that contained the egg. **8** Progesterone inhibits the release of LH and FSH. **9** Progesterone maintains the lining of the uterus during the second half of the menstrual cycle, in readiness for receiving a fertilised egg.	
	17) I can describe the technique of in-vitro fertilisation.	If a couple cannot conceive naturally, under certain circumstances they can receive IVF –In vitro fertilisation –literally fertilisation in glass or a test tube baby. 1.The woman is given hormones Female Stimulating Hormone (FSH) and Luteinising Hormone (LH). These stimulate eggs to be produced and released. 2. The eggs are collected. 3.The eggs are mixed with the father's sperm for 16-20 hours.	

		4. The mix of fluids in monitored under a microscope and any embryos are withdrawn after 5 days. 5. Usually 1 or 2 are selected and reintroduced to the mother's uterus (womb) to grow.	
	18) I can understand that automatic control systems may involve nervous responses and chemical responses.	Both the endocrine and nervous systems often work together. Adrenalin is often called the 'fight' or 'flight' hormone. Adrenaline increases the blood supply to the brain (so you can think), to your muscles (so you can run), as well as cutting down the blood supply to systems that are non-essential at that time (like digestion). Nervous connections to and from the brain link with the adrenal gland that secretes adrenalin. Adrenalin then enters the body's systems and promotes various behaviour around the body. The body is a very complex machine that is driven by a whole interplay of chemical and electrical messages.	
	19) I can recall that plants produce hormones to coordinate and control growth, and responses to light and gravity.	Like animals, plants respond to stimuli and plants produce hormones. If a plant responds to a stimulus, this is called a tropism. If a plant is attracted to something it is called a positive tropism, if it acts in opposition to the stimulus this is called a negative tropism. If a plant grows towards the light it exhibits a positive phototropism. If a shoot grows away from gravity, it is said to exhibit negative gravitropism. The hormones the plants deploy are called auxins. If a plant is positively phototrophic the auxins provoke the cells on the opposite side from the light stimulus to divide and elongate. This causes the plant to grow over towards the light.	
	20) I can explain that auxins act on 'stem cells' in plants called meristems.	Meristems are the equivalent of embryonic stem cells in animals. These cells can grow into whatever type of differentiate cell the plant needs. Auxins direct the cells to become what the plant needs.	