Science Year 10 – Summer Term 2021

	What? **When?** **Why?**			
	PHYSICS **P6 Radioactivity**	**BIOLOGY** **B6 Plant structures & Functions**	**PHYSICS** **P7&8 Energy, Forces & doing work**	**BIOLOGY** **B7 Animal Co-ordination & control**
Lesson 1 Learning intentions	**Atomic models** Describe an atom as a positively charged nucleus surrounded by negatively charged electrons, with the nuclear radius much smaller than that of the atom and with almost all of the mass in the nucleus. Recall the typical size (order of magnitude) of atoms and small molecules. Describe how and why the atomic model has changed over time including reference to the plum pudding model and Rutherford alpha particle scattering leading to the Bohr model	**Photosynthesis** Describe photosynthetic organisms as the main producers of food and therefore biomass. Describe photosynthesis in plants and algae as an endothermic reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen B6.9: Describe … the structure and function of the stomata.	**Work & Power** Identify the different ways that the energy of a system can be changed a) through work done by forces b) in electrical equipment c) in heating. Describe how to measure the work done by a force and understand that energy transferred (joule, J) is equal to work done (joule, J) Recall and use the equation: work done (joule, J) = force (newton, N) × distance moved in the direction of the force (metre, m) $E = F \times d$ Describe and calculate the changes in energy involved when	**Hormones** Describe where hormones are produced and how they are transported from endocrine glands to their target organs including the pituitary gland, thyroid gland, pancreas, adrenal glands, ovaries and testes.

			a system is changed by work done by forces. Define power as the rate at which energy is transferred and use examples to explain this definition. Recall and use the equation: power (watt, W) = work done (joule, J) ÷ time taken (second, s) $P = E/T$ Recall that one watt is equal to one joule per second, J/s Explain ways of reducing unwanted energy transfer through lubrication	
Lesson 2 Learning intentions	**<u>Inside atoms</u>** Describe the structure of nuclei of isotopes using the terms atomic (proton) number and mass (nucleon) number and using symbols in the format $^{12}_{6}C$ Recall that the nucleus of each element has a characteristic positive charge, but that elements differ in mass by having different numbers of neutrons.	**<u>Factors affecting photosynthesis</u>** Explain the effect of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis. **(H) Explain the interactions of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis.** **(H) Explain how the rate of photosynthesis is directly proportional to light intensity and inversely proportional to the distance from a light source,**	**<u>Objects affecting each other</u>** Describe, with examples, how objects can interact a) at a distance without contact, linking these to the gravitational, electrostatic and magnetic fields involved b) by contact, including normal contact force and friction c) producing pairs of forces which can be represented as vectors Explain the difference between vector and scalar quantities using examples	**<u>Hormonal control of metabolic rate (higher tier only)</u>** **(H) Explain that adrenalin can be controlled by a negative feedback mechanism and is produced by the adrenal glands to prepare the body for fight or flight, including:** **a) increased heart rate** **b) increased blood pressure** **c) increased blood flow to the muscles** **d) raised blood sugar levels by**

	Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons Recall that in an atom the number of protons equals the number of electrons and is therefore neutral	**including the use of the inverse square law calculation.**	Explain ways of reducing unwanted energy transfer through lubrication	**stimulating the liver to change glycogen into glucose** **(H) Explain how thyroxine controls metabolic rate as an example of negative feedback, including:** **a) low levels of thyroxine stimulates production of TRH in hypothalamus** **b) this causes release of TSH from the pituitary gland** **c) TSH acts on the thyroid to produce thyroxine** **d) when thyroxine levels are normal thyroxine inhibits the release of TRH and the production of TSH**
Lesson 3 Learning intentions	**<u>Electrons & orbits</u>** Recall that in each atom its electrons orbit the nucleus at different set distances from the nucleus. Explain that electrons change orbit when there is absorption or emission of electromagnetic radiation. Explain how atoms may form positive ions by losing outer electrons . Describe how and why the atomic model has changed over time including reference to the plum pudding model and Rutherford	**<u>Core Practical</u>** Core practical: Investigate the effect of light intensity on the rate of photosynthesis	**<u>Vector diagrams</u>** **(H) Use vector diagrams to illustrate resolution of forces, a net force, and equilibrium situations (scale drawings only)** **(H) Draw and use free body force diagrams** **(H) Explain examples of the forces acting on an isolated solid object or a system where several forces lead to a resultant force on an object and the special case of balanced forces when the resultant force is zero**	**<u>The menstrual cycle</u>** Describe the stages of the menstrual cycle including the roles of the hormones oestrogen and progesterone, in the control of the menstrual cycle. Explain how hormonal contraception influences the menstrual cycle and prevents pregnancy. Evaluate hormonal and barrier methods of contraception.

	alpha particle scattering leading to the Bohr model			
Lesson 4 Learning intentions	**<u>Background radiation</u>** Explain what is meant by background radiation. Describe the origins of background radiation from Earth and space. Describe methods for measuring and detecting radioactivity limited to photographic film and a Geiger–Müller tube.	**<u>Absorbing eater & mineral ions</u>** Explain how substances are transported into and out of cells, including by diffusion, osmosis and active transport. Explain how the structure of the root hair cells is adapted to absorb water and mineral ions		**<u>Hormonal Control of the menstrual cycle (higher tier only)</u>** **(H) Explain the interactions of oestrogen, progesterone, FSH and LH in the control of the menstrual cycle, including the repair and maintenance of the uterus wall, ovulation and menstruation.** **(H) Explain the use of hormones in Assisted Reproductive Technology (ART) including IVF and clomifene therapy.**
Lesson 5 Learning intentions	**<u>Types of radiation</u>** Recall the relative masses and relative electric charges of protons, neutrons, electrons and positrons. Recall that an alpha particle is equivalent to a helium nucleus, a beta particle is an electron emitted from the nucleus and a gamma ray is electromagnetic radiation. Compare alpha, beta and gamma radiations in terms of their abilities to penetrate and ionise. Recall that alpha, β– (beta minus), β+ (positron), gamma rays and neutron radiation are emitted	**<u>Transpiration & Translocation</u>** Explain how the structures of the xylem and phloem are adapted to their function in the plant, including: a) lignified dead cells in xylem transporting water and minerals through the plant b) living cells in phloem using energy to transport sucrose around the plant. Describe how water and mineral ions are transported through the plant by transpiration, including the structure and function of the stomata.		**<u>Control of blood glucose</u>** Explain the importance of maintaining a constant internal environment in response to internal and external change. Explain how the hormone insulin controls blood glucose concentration. **(H) Explain how blood glucose concentration is regulated by glucagon.** Explain the cause of type 1 diabetes and how it is controlled.

	from unstable nuclei in a random process. Recall that alpha, β– (beta minus), β+ (positron) and gamma rays are ionising radiations.	Describe how sucrose is transported around the plant by translocation Explain the effect of environmental factors on the rate of water uptake by a plant, to include light intensity, air movement and temperature. Demonstrate an understanding of rate calculations for transpiration		
Lesson 6 Learning intentions	**<u>Radioactive decay</u>** Describe the process of β^- decay (a neutron becomes a proton plus an electron) Describe the process of β^+ decay (a proton becomes a neutron plus a positron) Explain the effects on the atomic (proton) number and mass (nucleon) number of radioactive decays (α, β, γ and neutron emission) Recall that nuclei that have undergone radioactive decay often undergo nuclear rearrangement with a loss of energy as gamma radiation. Use given data to balance nuclear equations in terms of mass and charge.			**<u>Type 2 diabetes</u>** Explain the cause of type 2 diabetes and how it is controlled. Evaluate the correlation between body mass and type 2 diabetes including BMI and waist:hip calculations using the BMI equation: $\text{BMI} = \frac{\text{weight (kg)}}{(\text{height (m)})^2}$

Lesson 7 Learning intentions	**Half-Life** Describe how the activity of a radioactive source decreases over a period of time. Recall that the unit of activity of a radioactive isotope is the Becquerel, Bq. Explain that the half-life of a radioactive isotope is the time taken for half the undecayed nuclei to decay or the activity of a source to decay by half. Explain that it cannot be predicted when a particular nucleus will decay but half-life enables the activity of a very large number of nuclei to be predicted during the decay process. Use the concept of half-life to carry out simple calculations on the decay of a radioactive isotope, including graphical representations			
Lesson 8 Learning intentions	**Dangers of radioactivity** Describe the dangers of ionising radiation in terms of tissue damage and possible mutations and relate this to the precautions needed. Explain the precautions taken to ensure the safety of people			

	exposed to radiation, including limiting the dose for patients and the risks to medical personnel. Describe the differences between contamination and irradiation effects and compare the hazards associated with these two.			