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3.1 Photosynthesis and Cell Respiration

Lesson	Syllabus Details	Readings	Notes
Lesson 1 -2	Content Objective: Explain how photosynthesis generates glucose from carbon dioxide, water, and light. Language Objective: Create a labeled diagram of the light independent, light dependent reaction and the Calvin Cycle. ● Light-dependent reactions take place in the intermembrane space of the thylakoids ● Light –independent reactions take place in the stroma ● Reduced NADP and ATP are produced in the light-dependent reactions ● Absorption of light by photosystems generates excited electrons ● Photolysis of water generates electrons for use in the light-independent reactions ● Transfer of excited electrons occurs between carriers in thylakoid membranes ● Excited electrons from Photosystem II are used to contribute to generate a proton gradient ● Electron transport chain in thylakoids generates ATP using the proton gradient ● Excited electrons from Photosystem I are used to reduce NADP ● In the light-independent reaction a carboxylase catalyses the carboxylation of ribulose-bisphosphate ● Glycerate 3-phosphate is reduced to triose phosphate using a reduced NADP and ATP ● Triose phosphate is used to regenerate RuBP and produce carbohydrates ● Ribulose bisphosphate is reformed using ATP ● Application: Calvin's experiment to elucidate the carboxylation of RuBP. ● Application: Electron tomography used to produce images of active mitochondria.		

Lesson 3	Content Objective: To explore how chromatography works and how it can be used. Language Objective: To describe how the Rf value is calculated and use it to determine a pigment. ● Separation of photosynthetic pigments by chromatography ● Drawing an absorption spectrum for chlorophyll and an action spectrum for photosynthesis ● Visible light has a range of wavelengths with violet the shortest wavelength and red the longest ● Chlorophyll absorbs red and blue light most effectively and reflects green light more than other colours		
Lesson 4-5	Content Objective: To explain how glycolysis, the Krebs cycle and the electron transport chain results in the production of ATP. Language Objective: Using the whiteboards, describe the process of glycolysis, krebs cycle the the electron transport chain. ● Cell respiration is the controlled release of energy from organic compounds to produce ATP ● ATP from cell respiration is immediately available as a source of energy in the cell ● Anaerobic cell respiration gives a small yield of ATP from glucose ● Aerobic cell respiration requires oxygen and gives a large yield of ATP from glucose ● Photosynthesis is the production of carbon compounds in cells using light energy ● Oxygen is produced in photosynthesis from the photolysis of water ● Energy is needed to produce carbohydrates and other carbon compounds from carbon dioxide		
Lesson 6	**Content Objective**: To explain how the structure of the chloroplasts and mitochondria support cell respiration and photosynthesis and how these two organelles can explain the origins of eukaryotic cells.		

	Language Objective: Create a labelled diagram of chloroplasts and mitochondria to show structure and function. • The origin of eukaryotic cells can be explained by the endosymbiotic theory (1.6) • Annotation of a diagram to indicate the adaptations of a chloroplast to its function • Annotations of a diagram of mitochondrion to indicate the adaptations to its function • Electron tomography used to produce images of active mitochondria • The structure of the mitochondrion is adapted to the function.		

3.2

Lesson	Syllabus Details	Readings	Notes

3.3

Lesson	Syllabus Details	Readings	Notes

Lesson	Syllabus Details	Readings	Notes
Lesson 1 and 2	Lesson 1: ● Most ecosystems rely on a supply of energy from sunlight ● Light energy is converted to chemical energy in carbon compounds by photosynthesis ● Chemical energy in carbon compounds flows through food chains by means of feeding ● Energy released from carbon compounds by respiration is used in living organisms and converted to heat ● Living organisms cannot convert heat to other forms of energy ● Heat is lost from ecosystems ● Energy losses between trophic levels restrict the length of food chains and the biomass of higher trophic levels ● Quantitative representations of energy flow using pyramids of energy Lesson 2: ● Autotrophs obtain inorganic nutrients from the abiotic environment ● The supply of inorganic nutrients is maintained by nutrient recycling ● Classifying species as autotrophs, consumers, detrivores or saprotrophs from a knowledge of their mode of nutrition ● Consumers are heterotrophs that feed on living organisms by ingestion ● Detrivores are heterotrophs that obtain organic nutrients from detritus by internal digestion ● Saprotrophs are heterotrophs that obtain organic nutrients from dead organisms by	Lesson 1 Pearsons: 184 - 190 Oxford: 56-57 Lesson 2 Pearsons: 181-183 Oxford: 58	Lesson 1 and 2 Notes

	external digestion		
Lesson 3	• Skill: Testing for association between two species using the chi-squared test with data obtained by quadrat sampling.	Pearsons: P. 178-180 Oxford: p.55	Lesson 3 Notes
Lesson 4 and 5 - Carbon Cycle	Lesson 4 • Skill: Construct a diagram of the carbon cycle. • Autotrophs convert carbon dioxide into carbohydrates and other carbon compounds • In aquatic ecosystems carbon is present as dissolved carbon dioxide and hydrogen carbonate ions • Carbon dioxide diffuses from the atmosphere or water into autotrophs • Carbon dioxide is produced by respiration and diffuse out of organisms into water or the atmosphere • Animals such as reef-building corals and Mollusca have hard parts that are composed of calcium carbonate and can become fossilized in limestone Lesson 5 • Peat forms when organic matter is not fully decomposed because of acidic and/or anaerobic conditions in waterlogged soils • Carbon dioxide is produced by combustion of biomass and fossilized organic matter • Partially decomposed organic matter from past geological eras was converted either into coal or into oil and gas that accumulate in porous rocks • Application: Estimation of carbon fluxes due to processes in the carbon cycle. • Methane is produced from organic matter in anaerobic conditions by methanogenic archaeans and some diffuses into the atmosphere or accumulates in the ground • Methane is oxidized to carbon dioxide and water in the atmosphere	Pearsons: p191-200 Oxford: p.58 - 59	Lesson 4 and 5 Notes

Lesson 6 - Greenhouse Effect and Carbon Dioxide	• The impact of a gas depends on its ability to absorb longwave radiation as well as on its concentration in the atmosphere. • The warmed Earth emits longer wavelength radiation (heat). • Longer wave radiation is absorbed by greenhouse gases that retain the heat in the atmosphere. • Global temperatures and climate patterns are influenced by concentrations of greenhouse gases. • Application: Correlations between global temperatures and carbon dioxide concentrations on Earth. • Application: Analysis of data from air monitoring stations to explain annual fluctuations. • Carbon dioxide and water vapour are the most significant greenhouse gases. • Other gases including methane and nitrogen oxides have less impact.	Pearsons: p.204-213 Oxford: p.60-61	Lesson 6 Notes
Lesson 7 - Effects of Climate Change	• There is a correlation between rising atmospheric concentrations of carbon dioxide since the start of the industrial revolution 200 years ago and average global temperatures. • Recent increases in atmospheric carbon dioxide are largely due to increases in the combustion of fossilized organic matter. • Application: Threats to coral reefs from increasing concentrations of dissolved carbon dioxide.	Pearsons: P.203 - 210 Oxford: p.61	Lesson 7 Notes
Lesson 8 and 9 - Test			
Lessons 10 -12 and summer	Science of Classification • The binomial system of names for species is universal among biologists and has been agreed and developed at a series of congresses • When species are discovered they are given scientific names using the binomial system • Taxonomists classify species using a hierarchy of taxa • The principal taxa for classifying eukaryotes are kingdom, phylum, class, order, family and genus and species • In a natural classification, the genus and accompanying higher taxa consist of all the species that have evolved from one common ancestral species • Natural classifications help in identification of species and allow the prediction of characteristics shared by species within a group.	Pearsons: P.239 - 256 Oxford: p.67-69	Lesson 10-12 Notes

	<u>Classification of Organisms</u> ● All organisms are classified into three domains ● Classification of one plant and one animal species from domain to species level ● Recognition features of bryophyte, filicinophyta, coniferophyta, and angiospermophyta ● Recognition features of porifera, cnidarian pletyhelmintha, annelida, Mollusca, arthropda and chordata ● Recognition of features of birds, mammals, amphibians, reptiles and fish ● Construction of dichotomous keys for use in identifying specimens ● Taxonomists sometimes reclassify groups of species when new evidence shows that a previous taxon contains species that have evolved from different ancestral species. <u>Mesocosms</u> ● Skill: Setting up sealed mesocosms to try to establish sustainability. (Practical 5)		

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