Anoka-Hennepin Secondary Curriculum Unit Plan

Department:	Science	Course:	IB Biology 11 SL (H)	Unit Title:	Chemistry of Life	Grade Level(s):	11
Assessed Trimester:		Pacing:		Date Created:		Last Revision Date:	9/2/2014

Course Understandings: *Students will understand that:*

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DESIRED RESULTS (Stage 1) - WHAT WE WANT STUDENT TO KNOW AND BE ABLE TO DO?

Established Goals

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Transfer

Students will be able to independently use their learning to: (product, high order reasoning)

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Meaning

Unit Understanding(s):	Essential Question(s):
Students will understand that: ● Students will understand the chemical elements that make up plants and animals ● Students will describe how life processes in a cell are driven by physical and chemical interactions (as in DNA transcription and protein translation) which help to define life.	**Students will keep considering:** ●

Acquisition

Knowledge - Students will:	Skills - Students will:
● The chemical elements in living things are carbon, hydrogen, oxygen and nitrogen ● Organic substances are found in living organisms and are compounds containing carbon. Inorganic substances are all others. ● How carbohydrates, lipids and proteins are used for energy and in energy storage. ● That enzymes make it easier for a reaction to take place. ● Will understand the lock and key model of an enzyme ● The structure and function of DNA and RNA ● The difference between replication, transcription and translation and their role in protein synthesis ● How pyruvate is used in anaerobic and aerobic respiration ● The role of chlorophyll in photosynthesis and what other pigments are involved. ● How photosynthesis and respiration work together for all living organisms to exist **Reasoning - Students will:** ●	● State that the most frequently occurring chemical elements in living things are carbon, hydrogen, oxygen and nitrogen ● State that a variety of other elements are needed by living organisms, including sulfur, calcium, phosphorus, iron and sodium ● Draw and label a diagram showing the structure of water molecules to show their polarity and hydrogen bond formation ● Outline the thermal, cohesive and solvent properties of water ● Explain the relationship between the properties of water and its uses in living organisms as a coolant, medium for metabolic reactions and transport medium. ● Distinguish between organic and inorganic compounds ● Identify amino acids, glucose, ribose and fatty acids from diagrams showing their structure ● List three examples each of monosaccharides, disaccharides and polysaccharides. ● State one function of glucose, lactose and glycogen in animals and of fructose, sucrose and cellulose in plants ● Outline the role of condensation and hydrolysis in the relationships between monosaccharides, disaccharides and polysaccharides: between fatty acids, glycerol and triglycerides and between amino acids and polypeptides

	• State three functions of lipids • Compare the use of carbohydrates and lipids in energy storage • Outline DNA nucleotide structure in terms of sugar, base and phosphate • State the names of the four bases in DNA • Outline how DNA nucleotides are linked together by covalent bonds into a single strand • Explain how a DNA double helix is forms using complementary base pairing and hydrogen bonds • Draw and label a simple diagram of the molecular structure of DNA • Explain DNA replicat5ion in terms of unwinding the double helix and separation of the strands by helicase, followed by formation of the new complementary strands by DNA polymerase • State that DNA replication is semi-conservative • Compare the structure of RNA and DNA • Outline DNA transcription in terms of the formation of an RNA strand complementary to the DNA strand by RNA polymerase • Describe the genetic code in terms of codons composed of triplets of bases • Explain the process of translation, leading to polypeptide formation • Define enzyme and active site and explain the enzyme=substrate specificity • Explain the effects of temperature, pH and substrate concentration on enzyme activity • Define denaturation • Explain the use of lactase in the production of lactose-free milk • Define cell respiration • State that in cell respiration, glucose in the cytoplasm is broken down by glycolysis into pyruvate, with a small yield of ATP • Explain that during anaerobic cell respiration, pyruvate can be converted in the cytoplasm into lacate, or ethanol and carbon dioxide, with no further yield of ATP • Explain that during aerobic cell r4espriation, pyruvate can be broken down in the mitochondrian into carbon dioxide and water with a large yield of ATP • State that photosynthesis involves the conversion of light energy into chemical energy • State that light from the sun is composed of a range of wavelengths • State that chlorophyll is the main photosynthetic pigment • Outline the difference sin absorption of red, blue, and green light by chlorophyll • State that light energy is used to produce ATP and to split water molecules to form oxygen and hydrogen • State that ATP and hydrogen are used to fix carbon dioxide to make organic molecules • Explain that the rate of photosynthesis can be measured directly by the production of oxygen or the uptake of carbon dioxide or indirectly by an increase in biomass • Outline the effects of temperature, light intensity and carbon dioxide concentration on the rate of photosynthesis

Common Misunderstandings	**Essential new vocabulary**
•	• Elements • Atoms • Molecules • Ions • Polar • Hydrogen bonds • Organic • Inorganic • Condensation (dehydration) • Hydrolysis reaction • Lipids

	• Monosaccharides • Polysaccharides • Proteins • Enzyme • Active site • Lock and Key Model • Denaturation • DNA • DNA polymerase • Transcription • Translation