Essential Notes – for Checkpoint & Unit test

- Photosynthesis and Cellular Respiration

Photosynthesis: only takes place in organisms that have chlorophyll and/or chloroplasts which includes some bacteria, some protists and all plants.

A. **Light dependent reactions** (requires sunlight)
    a. Includes photosystem 1 and 2 (made of chlorophyll) and an electron transport chain
    b. Takes place in the thylakoid membrane of the chloroplast
    c. Takes in sunlight and water to release oxygen into the air and NADPH and ATP for the Calvin cycle.
B. **Calvin Cycle** (does not require light)
    a. Takes place in the stroma of the chloroplast
    b. Takes carbon dioxide from the air and uses a lot of ATP and NADPH from the light dependent reactions to create glucose.
    c. At the end of each cycle, carbon molecules are ready to combine with carbon dioxide to begin the cycle again.

Cellular Respiration – take place in all life (including bacteria, protists, plants and animals)

A. Anaerobic Processes (no oxygen needed or available)

Take place in the cytoplasm of the cell

1. **Glycolysis** – turns glucose (a product of photosynthesis and found in all plant products that we eat) into pyruvic acid (for the Krebs cycle) as well as NADH and ATP are formed.
2. **Alcoholic Fermentation** – follows glycolysis in yeast and other microorganisms, <u>if no oxygen present,</u> and turns pyruvic acid into carbon dioxide and alcohol
3. **Lactic Acid Fermentation** - follows glycolysis in both prokaryotes and eukaryotes (unicellular and multicellular), if <u>no oxygen present</u>, and turns pyruvic acid into lactic acid.

B. Aerobic Processes (oxygen needed and available)

1. **Krebs cycle** takes place in the matrix of the mitochondria and takes the pyruvic acid from glycolysis and creates 2 electron holding compounds (NADH and $FADH_2$), releases carbon dioxide and 1 energy holding compound (ATP). At the end of each cycle, a carbon molecule is made which can combine with pyruvic acid to form citric acid and start the cycle again.
2. **Electron transport** takes place in the inner membrane (cristae) of the mitochondria. The electrons from the Krebs cycle (found in NADH and $FADH_2$) are added to hydrogen ions and oxygen molecules to produce water and ATP.

Project: Comparison of Cellular Respiration and Photosynthesis

Purpose: To review the essential notes and determine the similarities and differences between photosynthesis and cellular respiration. If completed thoughtfully and correctly – this will be an excellent study exercise/tool.

Directions: Begin by using these notes only (for the additional similarities use your textbook and the internet) create a comparison chart like the one below on a large 11x17 piece of paper:

Photosynthesis	**Similarities between Photosynthesis and Cellular Respiration**	**Cellular Respiration**

Things to include:

- Terminology (listed below) in point form in the correct columns
- Arrows used to make connections
- Additional similarities added
- Colour, highlighting and underlining are used to enhance understanding
- Organized logically

Performance based assessment:

	Beginning	**Developing**	**Accomplished**	**Exemplary**
CONTENT (TERMINOLOGY)	Most of the terminology is missing or incorrectly used	More than half of the terminology are correctly used.	Almost all terminology is correctly used/placed, with some minor errors.	All terminology is correctly used and in the right columns
Chloroplast, mitochondria, type of life involved (plants vs animals etc.), matrix, inner membrane (cristae), intermembrane space, thylakoid membrane, stroma, photosystem 1 and 2 (made of chlorophyll), citric acid, pyruvic acid, carbon molecule, sunlight, oxygen, glucose, carbon dioxide, water, hydrogen ions, electrons, NADH, NADPH, FADH2, electron transport chain, Krebs cycle, glycolysis, alcoholic fermentation, lactic acid fermentation, light dependent reactions, Calvin cycle				
CONTENT (COMPARISON)	Many comparisons are incorrect or not included.	More than half of the process of cellular respiration and photosynthesis is correctly compared.	Almost all the process of cellular respiration and photosynthesis is correctly compared, with some minor errors.	Entire process of cellular respiration and photosynthesis is correctly compared
Similarities correctly identified, additional similarities added, links made between similarities and differences				
CLARITY	Lack of colour or highlighting Neither point form or arrows are used Although an attempt is made, it is difficult to understand most of the chart.	Colour is used but does not enhance connections or understanding Point form or arrows are used. Most of the chart is well organized with clear written communication, but some sections are not.	Colour is used to highlight key term/ideas and sometimes make connections. Points form and arrows are used. Entire chart is organized with logical connections made: A few details take effort to decipher, and so could not be used as a teaching tool.	Colour is used to enhance connections and understanding Effective use of point form and arrows Entire chart is effectively organized with logical connections made; chart could be used as a teaching tool.