**Michigan Curriculum:** ***HSCE***

**Objectives:**

* After attending lecture and studying the assigned material, the student will:
  + ***B2.4f*** Recognize that both living and nonliving things are composed of compounds, which are themselves made up of elements joined by energy-containing bonds, such as those in ATP.
  + ***B2.5A*** Recognize macromolecules such as lipids contain high energy bonds.
  + ***B2.5C*** Describe how energy is transferred and transformed from the Sun to energy-rich molecules during photosynthesis.
  + ***B3.1A*** Describe how organisms acquire energy directly or indirectly from sunlight.
  + ***B3.1B*** Describe the energy conversions that occur during photosynthesis and respiration.
  + ***B3.1C*** Recognize the equations for photosynthesis and respiration and identify the reactants and products for both.

*Multiple Choice - Circle the correct answer (19 points)*

1. What uses high-energy electrons from the Krebs cycle to convert ADP into ATP?
   1. Electron transport chain
   2. Polymerase chain reaction
   3. NADP+
   4. Lysosomes
2. Lipids store
   1. Water
   2. Energy
   3. DNA
   4. Waste
3. Which of the following absorb light energy in photosystem II?
   1. ATP in the cytoplasm
   2. Electrons in pigments
   3. Water in chloroplasts
   4. Hydrogen ions (H+) in the thylakoid membrane
4. Which cell organelles convert light energy to chemical energy?
   1. Mitochondria
   2. Chloroplasts
   3. Golgi bodies
   4. Lysosomes
5. Transporting high-energy electrons to where a cell needs them for chemical reactions that build other molecules, such as glucose, is the role of
   1. ATP
   2. Thylakoids
   3. NADP+
   4. chlorophyll
6. During cellular respiration, cells break down sugars to produce energy. What is a waste product of this process?
   1. Ammonia (NH3)
   2. Carbon dioxide (CO2)
   3. Glucose (C6H12O6)
   4. Oxygen (O2)
7. What is the cell’s main chemical compound used to store and release energy?
   1. ADP
   2. NADP
   3. NADPH
   4. ATP
8. How is energy released from a molecule of ATP?
   1. By breaking the bond between the second and third phosphate groups
   2. By breaking the bond between the second and third carbon of the sugar group
   3. By breaking the bond between adenine and the sugar group
   4. By breaking the bond between the sugar group and the phosphate group
9. When the bonds of a carbohydrate are broken during glycolysis
   1. Hydrolysis occurs.
   2. Carbon is destroyed.
   3. Energy is released.
   4. A protein is formed.
10. Which of the following occurs during the Calvin cycle?
    1. Pigments absorb light
    2. Carbon dioxide and 5-carbon molecules are converted into high-energy sugars
    3. High-energy electrons move down the electron transport chain.
    4. ATP is produced
11. Hydrogen ions are important in the light-dependent reactions of photosynthesis because they produce a difference in charge across the thylakoid membrane that allows
    1. The production of ATP
    2. Release of water molecules
    3. Light to enter the chloroplast
    4. The Krebs cycle to begin
12. The energy supply for most food webs comes from
    1. Consumers
    2. Decomposers
    3. The sun
    4. The breakdown of ATP
13. Which statement about photosynthesis is correct?
    1. Plants get the energy they need for photosynthesis from water.
    2. Plants get the energy the need for photosynthesis from the soil.
    3. Plants get the energy they need for photosynthesis from sunlight.
    4. Plants do not require energy to perform photosynthesis.
14. Energy is released from ATP during cellular respiration. Where does the energy come from?
    1. It is stored in the ATP molecule
    2. It is created by nuclear reactions.
    3. It is created when oxygen atoms combined.
    4. It is transferred across cell membranes.
15. In which process do producers use carbon from carbon dioxide to produce other carbon-containing molecules?
    1. The nitrogen cycle
    2. Photosynthesis
    3. Precipitation
    4. The water cycle
16. Water is an example of
    1. An element
    2. A compound
    3. An atom
    4. An ion
17. In photosynthesis, plants use carbon (C) hydrogen (H), and oxygen (O) to form organic compounds. In what form do plants use these elements?
    1. Glucose (C6H12O6)
    2. Carbon dioxide (CO2) and water (H2O)
    3. Carbon monoxide (CO)
    4. Elemental forms (C, H, and O)
18. The raw materials of photosynthesis are
    1. Sugar and water
    2. Sugar and oxygen
    3. Carbon dioxide and water
    4. Carbon dioxide and oxygen
19. The function of chlorophyll in photosynthesis is to
    1. Act as an enzyme to synthesize glucose from carbon dioxide.
    2. Split water molecules into hydrogen and oxygen gas.
    3. Absorb light and provide high energy electrons for the electron transport chain.
    4. Synthesize ATP from ADP and P

*Short Answer (6 points)*

1. In your own words, explain the process of photosynthesis. In your response include a diagram of the process, the written chemical equation of photosynthesis, and any additional images that will explain photosynthesis. Please feel free to use the entire space provided below, and the back if needed.