

Name _____

Period _____

Regents Biology

Date _____

REVIEW 3: NUTRITION, RESPIRATION & PHOTOSY/NTHESES

NUTRITION AND METABOLISM

All living organisms need energy and nutrients. The energy is used for many purposes, such as

- synthesis → building more molecules
- growth → making new cells to grow larger
- repair → making new cells to mend injuries
- locomotion → moving around in the environment

The nutrients are also used for many purposes, such as

- raw materials → the building blocks that new molecules and cells are built from
- fuel → used to make energy in cell respiration

Animals have to eat food to both make energy and get nutrients. When animals take in food, it's called **ingestion**. When they breakdown the food, it's called **digestion**. When they take the food into their cells, it's called **absorption**. Since they have to eat other organisms, animals are called **heterotrophs**. *Hetero* means "others", *troph* means "feeding", so *heterotroph* means "feeding on others".

Some organisms can harvest the energy from the sun and use it to synthesize the molecules and cells of their bodies. These organisms are **plants**. The process that allow plants to capture the sun and use it for synthesis is **photosynthesis**. Because, in this way, plants make their own food, they are also called **autotrophs**. *Auto* means "self", *troph* means "feeding", so *autotroph* means "self-feeding". In photosynthesis, plants take in simple inorganic compounds (CO₂ & H₂O) and build organic nutrients such as sugars (C₆H₁₂O₆)

1. **Nutrition:** Organisms take in nutrients (food) for various activities including:

- _____
- _____
- _____
- _____

a. **Ingestion:** _____

b. **Digestion:** _____

- Nutrients must be broken down into smaller parts so that they can be _____ into the blood and cells of organisms.
- Starches are digested into _____
- Proteins are digested into _____

2. **Autotrophic Nutrition:**

- a. Organisms take inorganic materials (_____ & _____) and convert them into organic nutrients (_____).
- b. Auto = _____; troph = _____ so Autotroph = _____
- c. What process do autotrophs use to do this? _____
- d. Examples of organisms that do this: _____

3. **Heterotrophic Nutrition:**

- a. Organisms must _____ nutrients made by other organisms.
- b. Hetero = _____; troph = _____ so Heterotroph = _____
- c. Examples of organisms that do this: _____
- d. These organisms include:
 - Carnivores: _____
 - Herbivores: _____
 - Omnivores: _____
 - Decomposers: _____

PHOTOSYNTHESIS

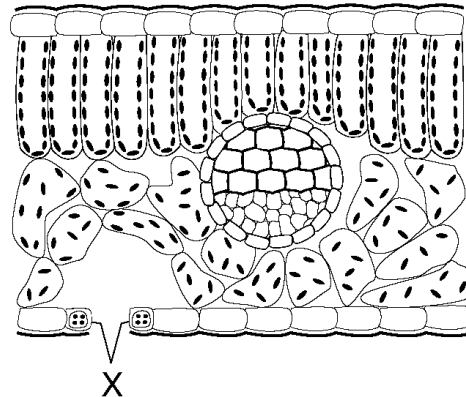
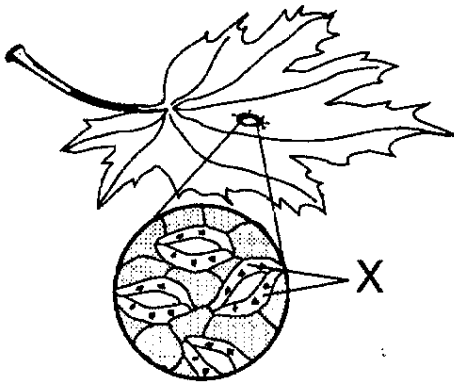
4. Write the formula for photosynthesis:

| | | | | | | | | | | |
|-------------------|-------|---|-------|---|-------|---|---|-------|---|-------|
| chemical formulas | _____ | + | _____ | + | _____ | → | + | _____ | + | _____ |
| words | _____ | + | _____ | + | _____ | → | + | _____ | + | _____ |

5. Photosynthesis is the process in which sun’s energy is trapped in the chemical bonds of sugar.

- a. Requires _____, _____, and _____.
- b. Makes _____ (_____) which is used as food in the plant.
- c. Waste product produced is _____.
- d. Benefits:
 - Provides food for all plants and animals → the whole food chain.
 - Provides _____ to breathe.
 - Removes _____ from atmosphere.
- e. Plant adaptations:
 - **Chloroplast:** Cell organelle that performs photosynthesis

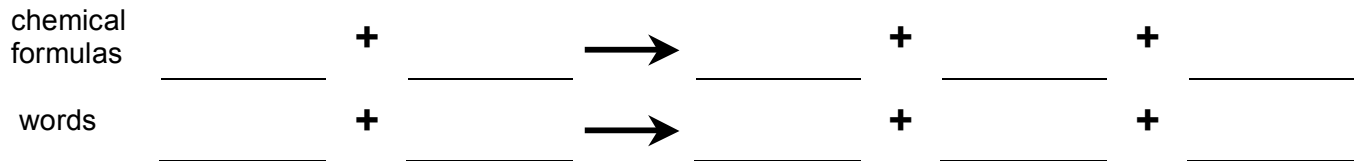
- Plant gas exchange:
 - **Stomates:** _____ under a leaf which let gases in and out
 - **Guard cells:** open and close stomates to prevent _____
- Transport:
 - **Xylem and Phloem:** “pipes” which transport water and food throughout the plant



Two different views of stomates and their guard cells (X).

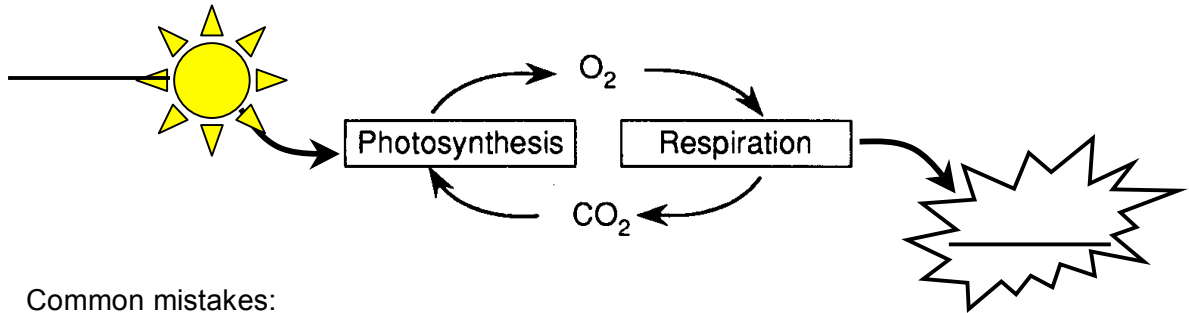
CELLULAR RESPIRATION

6. Write the formula for cellular respiration:



7. Cellular Respiration is the process that takes **energy** from sugar molecules and places it in molecules of _____.
- a. _____ is the **molecule** all life uses for **energy**.
 - No organism can get energy from sunlight or sugar without first putting the energy into **ATP**.
 - b. Requires _____ and _____.
 - c. Waste products produced are _____ and _____.
 - d. Most organisms carry out **aerobic respiration** (uses oxygen) in their **mitochondria**.
 - e. **Anaerobic respiration** does not require oxygen, but gives less ATP (energy) for each molecule of sugar.
 - When exercise causes human muscles to run out of oxygen, their cells will do **anaerobic respiration**. The waste product, **lactic acid**, causes muscles to “burn” so that you will **stop**.

8. **Photosynthesis and Cellular Respiration are opposite reactions!** They are also important in cycling oxygen, carbon, hydrogen and water through the environment



a. Common mistakes:

- “Plants use photosynthesis, animals use respiration.”

All organisms, including plants, use respiration to get their energy. Not all parts of a plant are photosynthetic (green).

- “Respiration is breathing.”

*Breathing is **not** respiration. Breathing exchanges the gases needed for cellular respiration. Inhaling and exhaling does not give you ATP.*

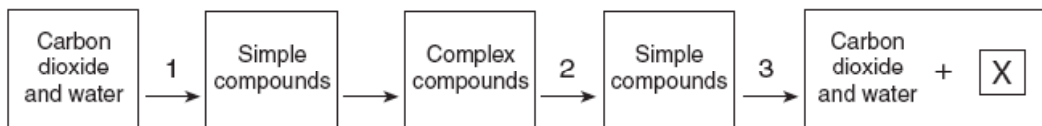
- “You need oxygen to breathe.”

This is backwards. Breathing is used to get oxygen which is used for respiration. Without oxygen, you have no respiration, no ATP, and no energy.

- “All living things need oxygen / need to breathe.”

Anaerobic organisms (bacteria) do not need oxygen, and do not have to breathe.

QUESTIONS



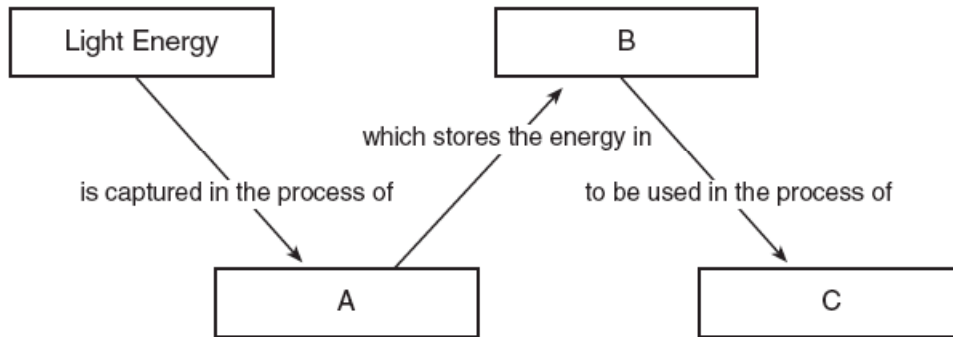
1. Identify *one* type of organism that carries out process 1. _____

2. Explain why process 2 is essential in humans.

3. Identify process 3. _____

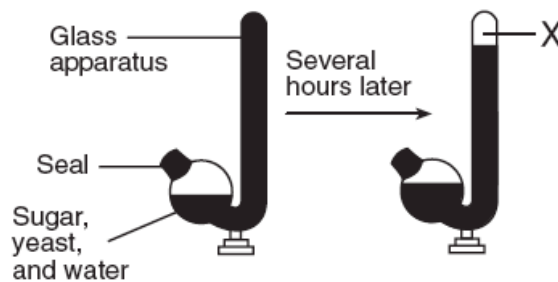
4. Identify molecule X. _____

5. Which order of metabolic processes converts nutrients consumed by an organism into cell parts?
- digestion → absorption → circulation → diffusion → synthesis
 - absorption → circulation → digestion → diffusion → synthesis
 - digestion → synthesis → diffusion → circulation → absorption
 - synthesis → absorption → digestion → diffusion → circulation
6. Which set of terms best identifies the letters in the diagram below?



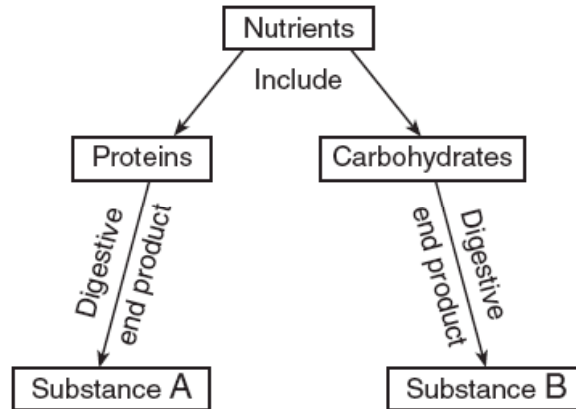
| | A | B | C |
|-----|----------------|---------------------|----------------|
| (1) | photosynthesis | inorganic molecules | decomposition |
| (2) | respiration | organic molecules | digestion |
| (3) | photosynthesis | organic molecules | respiration |
| (4) | respiration | inorganic molecules | photosynthesis |

7. An investigation was carried out and the results are shown below. Substance X resulted from a metabolic process that produces ATP in yeast (a single-celled fungus). Which statement best describes substance X?

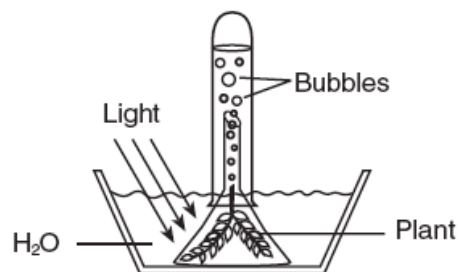


- It is oxygen released by protein synthesis.
- It is glucose that was produced in photosynthesis.
- It is starch that was produced during digestion.
- It is carbon dioxide released by respiration.

Question 16–17. Refer to the diagram below.



8. In an autotrophic organism, substance *B* functions as a
- source of energy
 - hormone
 - vitamin
 - biotic resource
9. In a heterotrophic organism, substance *A* could be used directly for
- a building block of starch
 - synthesis of enzymes
 - photosynthesis
 - a genetic code
10. The green aquatic plant represented in the diagram below was exposed to light for several hours. Which gas would most likely be found in the greatest amount in the bubbles?



- oxygen
 - carbon dioxide
 - ozone
 - nitrogen
11. The production of energy-rich ATP molecules is the direct result of
- recycling light energy to be used in the process of photosynthesis
 - releasing the stored energy of organic compounds by the process of respiration
 - breaking down starch by the process of digestion
 - copying coded information during the process of protein synthesis