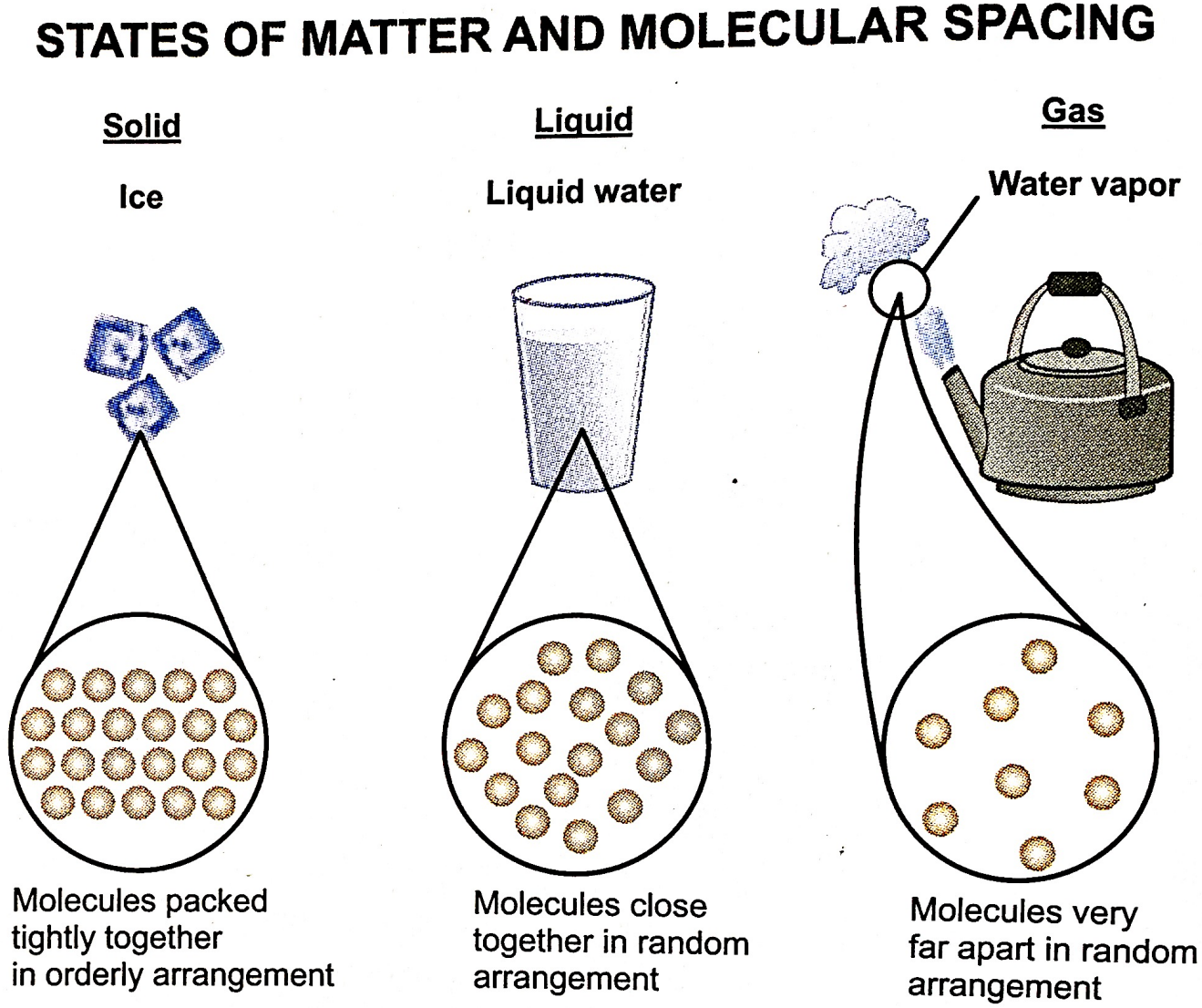
GED Science
Day 12

Essential Questions

- How can you describe a solid, a liquid, or a gas?
- What properties of solids, liquids, and gases make them different?
- How can matter change from state to state?

a When studying a complex visual, first read the title and headings to find out the main idea. In this example, the title and headings indicate that molecular spacing is important in defining states of matter.

b Pullout illustrations in this visual represent magnified views of water molecules. Use them to learn the relationship between a state of matter and the arrangement of particles in the matter.



Matter occurs in different states. The basic states of matter are solid, liquid, and gas. The amount of space between particles in a substance and the movements of those particles relate to the substance's state. The visual provides information about the spacing of molecules in different states of matter.

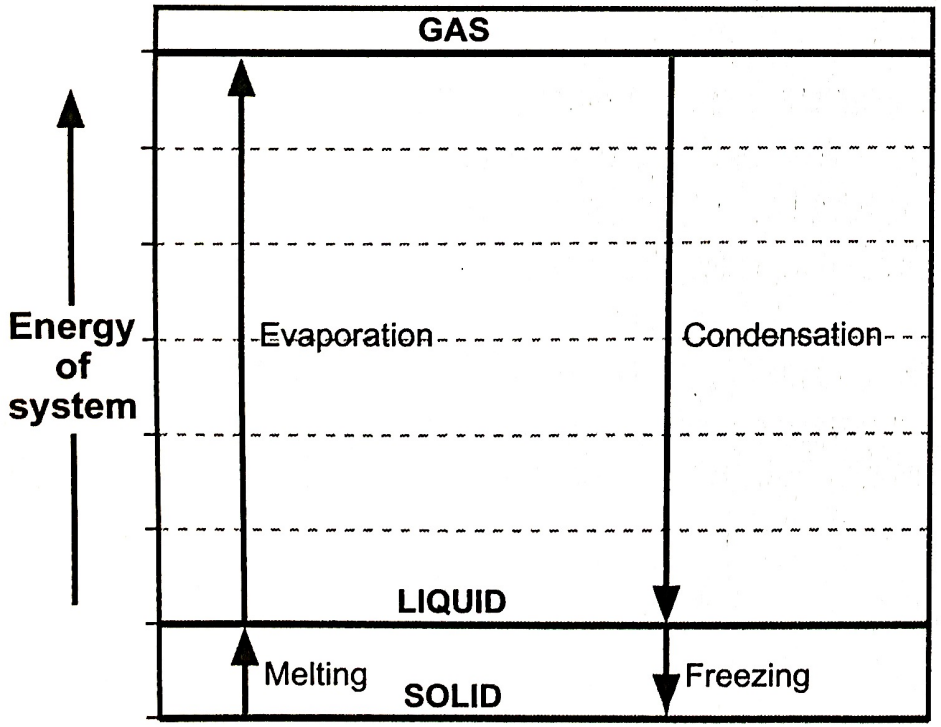
1. Based on the visual, how does the spacing of molecules compare in solids, liquids, and gases?

   A. Gases have the least space between molecules.
   B. Liquids have the most space between molecules.
   C. Solids have the least space between molecules.
   D. The molecules are spaced equally in all states of matter.

CHANGES IN STATE

The moving particles in matter cause matter to have energy. When the energy of matter changes, the matter can undergo a change in state. A familiar example of matter changing state is water (a liquid) changing to ice (a solid) or water vapor (a gas). The diagram shows how changes in the amount of energy in a system of matter affect the state of the matter.

RELATIONSHIP BETWEEN ENERGY AND STATE



2. According to the diagram, to melt a solid into a liquid or to evaporate a liquid into a gas, must energy be added or released?

3. If enough energy is removed from a liquid, what change of state occurs?

4. The more energy in matter, the faster the particles within the matter move. Based on the diagram, in which state of matter do molecules move the fastest?

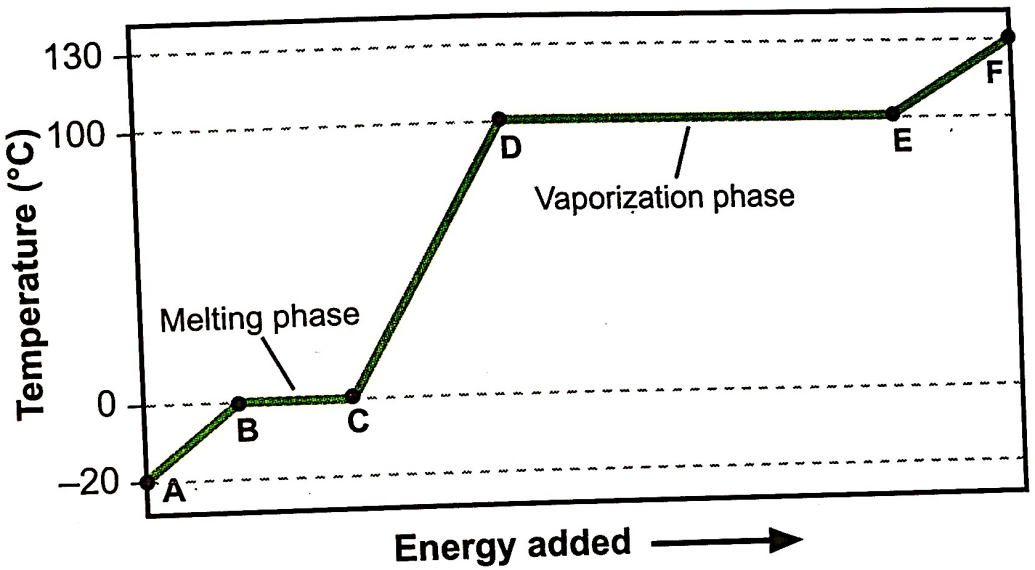
DIRECTIONS: Study the information and graph, read the question, and choose the **best** answer.

HEATING CURVES

In general, when heat is added to a solid, the solid can melt, becoming a liquid. When heat is added to a liquid, the liquid can boil, vaporizing into a gas.

A heating curve provides information about how the temperature of a substance changes as heat is added to it. The heating curve at the right indicates how the temperature of water, in degrees Celsius (°C), changes as energy is added to the water. A heating curve can be used to identify a substance's melting point or boiling point. Melting point is the temperature at which a substance melts. Boiling point is the temperature at which a substance boils.

HEATING CURVE FOR WATER



5. Melting and freezing points occur at the same temperature, so liquid water freezes to become ice at

A. –20°C.
B. 0°C.
C. 100°C.
D. 130°C.

SOLUTIONS

A solution is formed when at least one substance dissolves in another substance. A substance that dissolves is a solute. A substance in which a solute dissolves is a solvent.

For a mixture of substances to be a solution, it must be homogeneous. A mixture is homogeneous if the molecules of the substances making up the mixture are distributed evenly within it. Because a solution is a homogeneous mixture, all samples of a solution contain the same percentages of solute and solvent and, therefore, have the same properties. Air is a familiar example of a solution. Oxygen and other gases dissolve in nitrogen to form air. Any sample of air contains the same percentages of oxygen, nitrogen, and the other gases involved as any other sample of air.

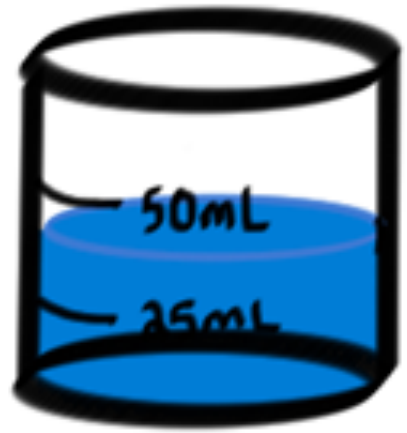
a Scientists analyze patterns in observations and data to make generalizations. You can predict outcomes by using established generalizations or by analyzing patterns yourself.

b The rules of solubility are generalizations that can be used to predict outcomes.

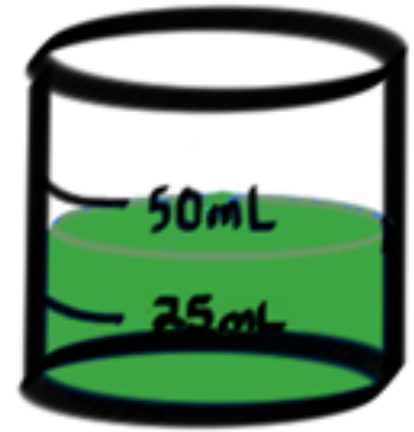
Some chemical compounds are more soluble, or susceptible to being dissolved, than others. The rules of solubility provide information about which compounds are soluble or insoluble in water. For example, compounds formed from the alkali metals, such as lithium, sodium, and potassium, are soluble. A substance is classified as soluble if more than 0.1 gram (g) of the substance dissolves in 100 milliliters (ml) of solvent.

SOLUTE + SOLVENT = SOLUTION

what's being dissolved



what's doing the dissolving



Types of solutions

Solute	Solvent	Example
Gas	Gas	Air (oxygen in nitrogen)
Gas	Liquid	Soda water (CO_2 in H_2O)
Solid	Liquid	Ocean water (salt in water)
Solid	Solid	Gold jewelry (copper in gold), brass, bronze, pewter, solder

1. Sodium chloride is a compound formed from the ionic bonding of sodium and chlorine. What outcome can be predicted when 0.5 g sodium chloride is mixed with 100 ml water?

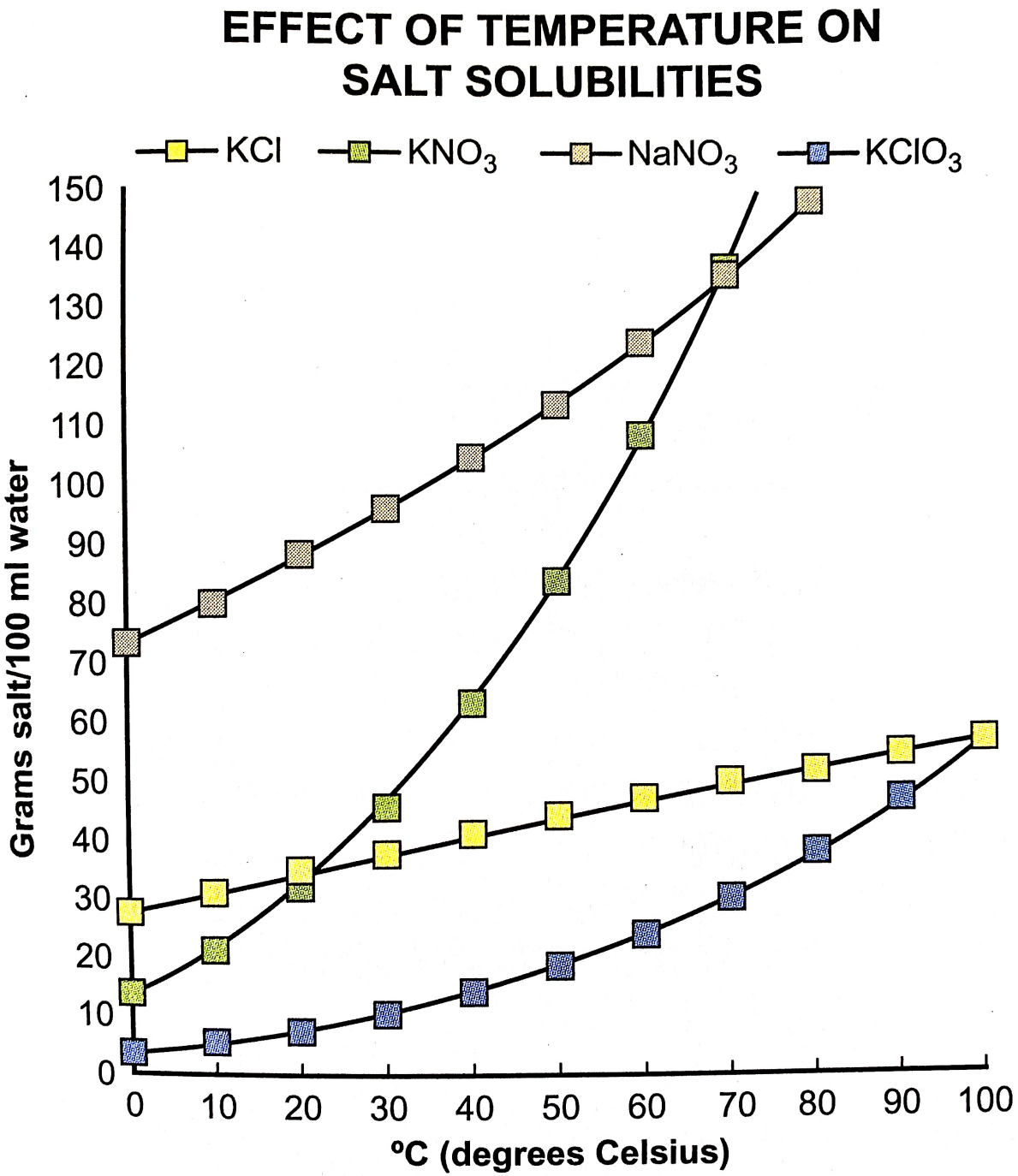
A. The substance that is produced will not be a solution.
B. A new chemical compound will be formed.
C. The sodium chloride will dissolve in the water to form a solution.
D. Different parts of the substance formed will have different properties.

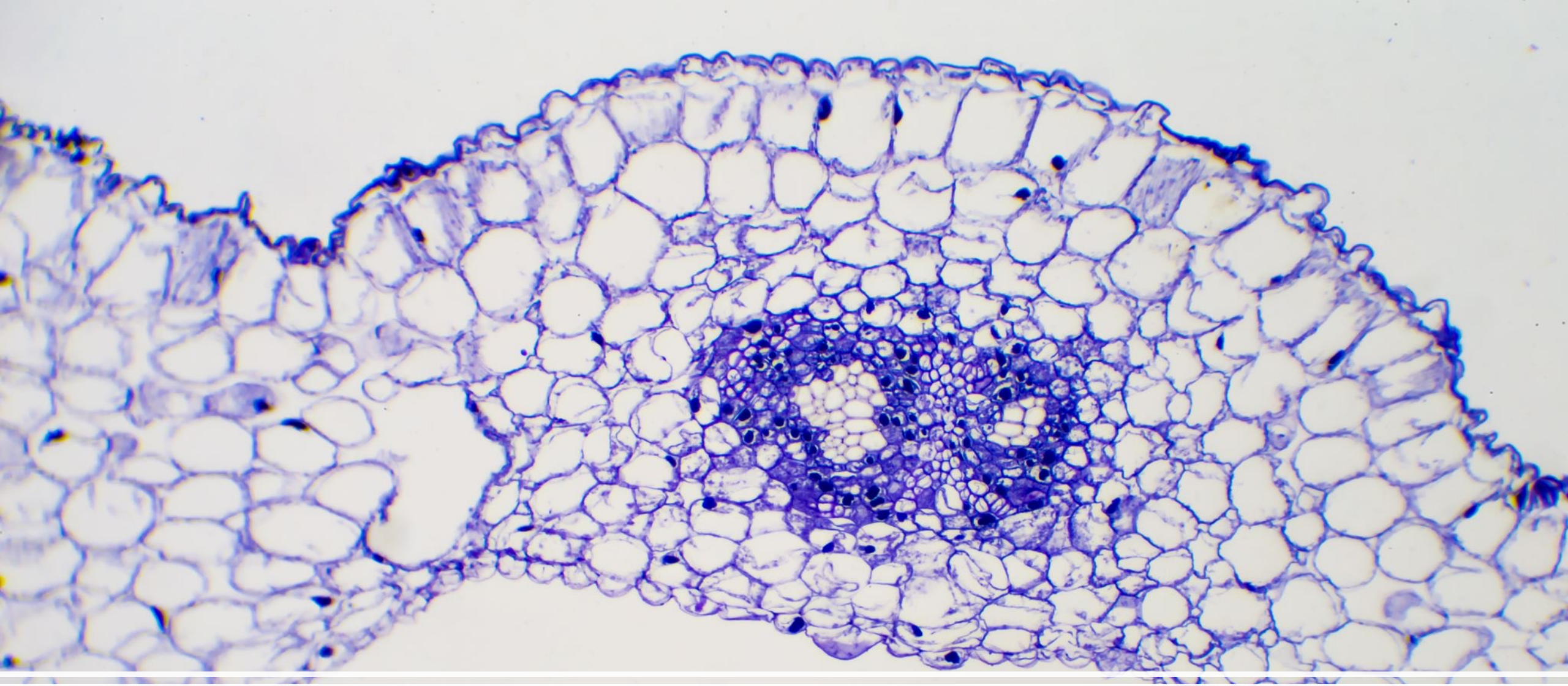
CONCENTRATION AND SATURATION

A solution can be described by its concentration, or relative amount of solute. A dilute solution contains a relatively smaller ratio of solute to solvent. A concentrated solution contains a relatively larger ratio of solute to solvent. As more solute is dissolved in a solvent, a solution becomes more concentrated. Eventually, no more solute will dissolve. Solubility is the amount of solute that can be dissolved in a given amount of solvent at a specific temperature. Saturation is the point at which no more solute can be dissolved at the current temperature.

2. A student dissolves 32 g sucrose (table sugar) in 750 ml water. He then adds 250 ml water to the solution. What outcome can be predicted?

A. The solution will be more concentrated.
B. The solution will be more dilute.
C. The solution will be saturated.
D. The concentration will remain unchanged.





Cellular Life

What Do Cells Do?

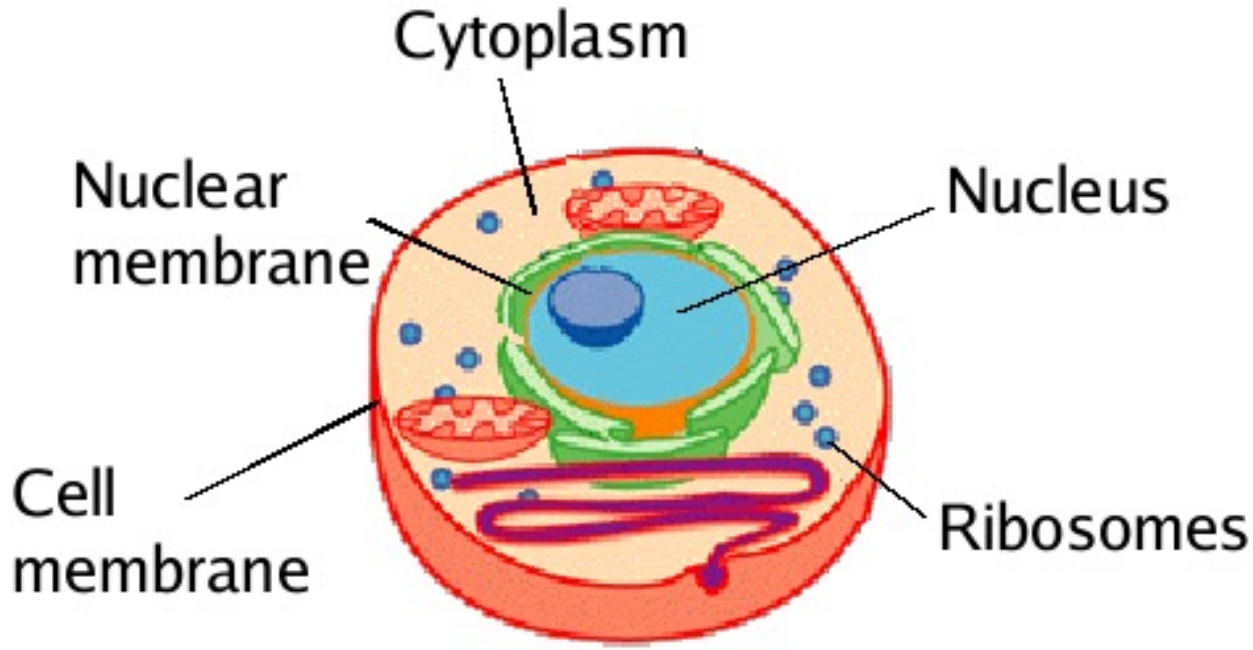
Plant Cells and Animal Cells

All living things are made of cells. All cells need food, water, and a way to eliminate wastes. A single cell is the smallest structure that carries out the activities necessary for life. Different structures in the cell do different things. One part gets food or water. Another part keeps the cell clean. Still other parts are in charge of reproduction. Like the parts of a factory, all parts of the cells must work together to run smoothly. An organism cannot survive without cells doing their work.

Animal cells and plants cells look different, but all cells have three parts: cell membrane, nucleus, and cytoplasm. The cell membrane is the outer covering of the cell. Water and food enter through the cell membrane, and wastes leave through it. Plant cells have an extra structure called the cell wall. The cell wall adds more support to a plant cell.

The nucleus is the control center for the cell. It directs all cell activities. The cytoplasm in animal and plant cells is a gel-like substance that surrounds all parts of the cell within the membrane. The cytoplasm contains the nucleus and the cell's organelles.

An organelle is a cell part with a particular job. Plants have special organelles called chloroplasts. Chloroplasts use energy from the Sun to combine water and carbon dioxide to make food for the cell.



Cell Transportation

The cell membrane holds matter inside but allows water, gases, and wastes to pass through it. In passive transport, matter moves into or out of the cell without using any of the cell's energy.

The simplest kind of passive transport is diffusion. Diffusion spreads substances through a gas or liquid. You can smell dinner across the room because food molecules diffuse through the air. Diffusion also transports many gases into and out of cells. Substances diffuse from areas with more matter to areas with less matter.

One special form of diffusion is called osmosis. Osmosis is the diffusion of water across a membrane. The membrane often stops many substances that are dissolved in the water. Osmosis keeps water inside cells.

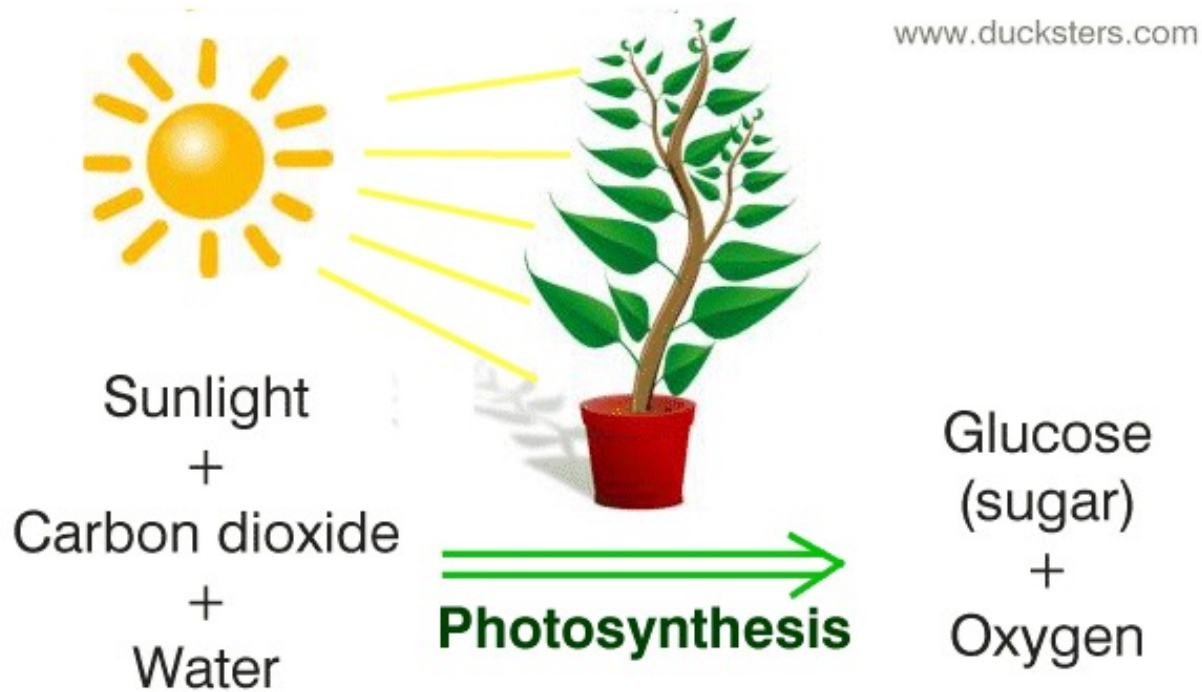
Sometimes a cell needs to move materials opposite to the way diffusion would move them. In active transport, substances move from areas with less matter to areas with more matter. The cell must use energy to do this.

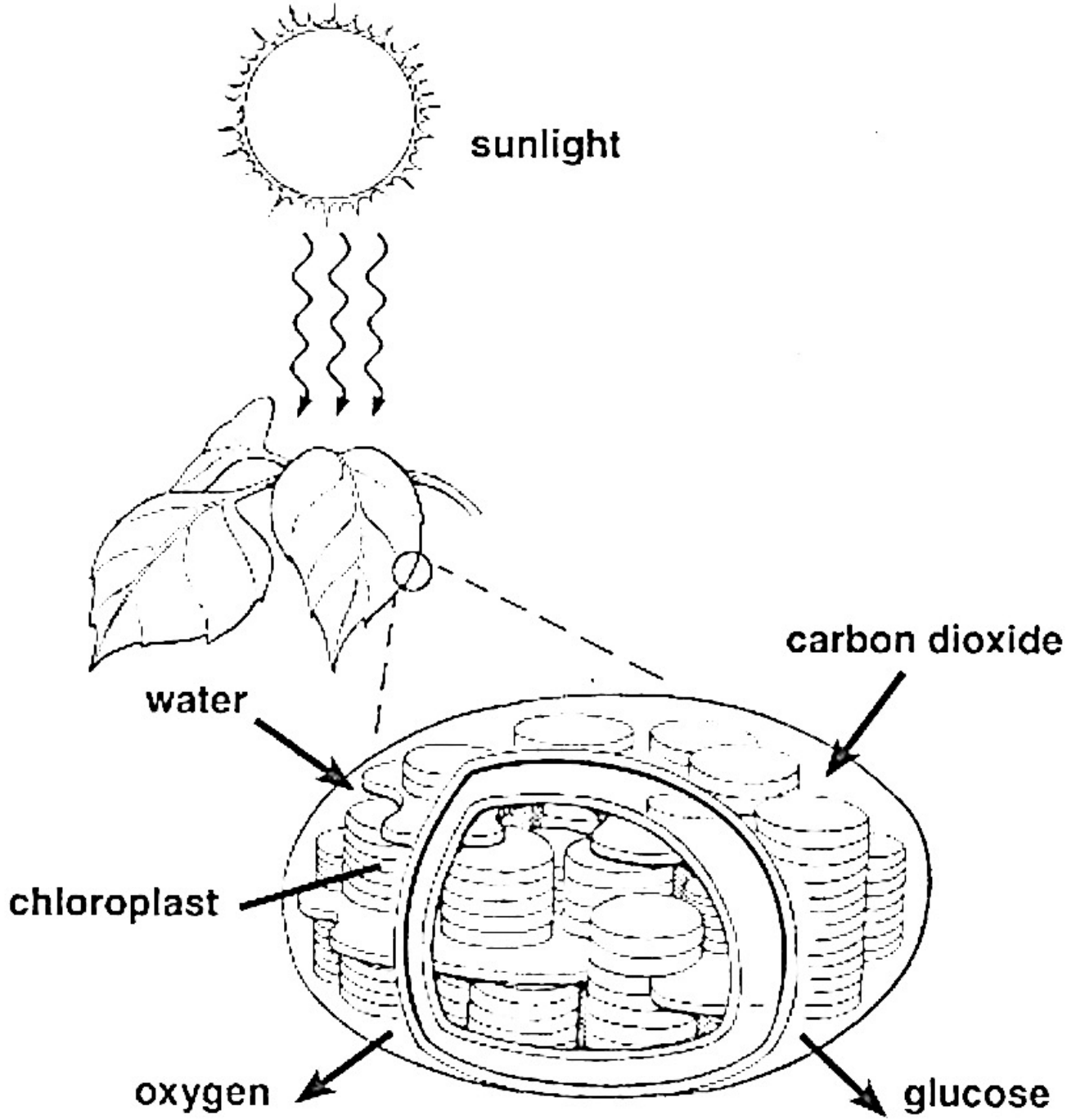
Large proteins in the cell membrane often help move materials in and out. The proteins act as tunnels that allow only certain materials to pass. Scientists study these proteins for clues to how the cell operates.

Using Energy

All living things need energy to survive. Plants use a process called photosynthesis to make food. This process takes place in chloroplasts and uses green pigment called chlorophyll to capture energy from sunlight.

During photosynthesis, chemical reactions join water with carbon dioxide. The byproducts are oxygen, which is released into the air, and glucose, or sugar, which the plant uses for food.




sunlight
carbon dioxide
water
chloroplast
oxygen
glucose

Plants and animals use organelles called mitochondria to break down sugars. Cells can use sugars as energy. Mitochondria perform cell respiration, the reverse reaction of photosynthesis. Glucose is combined with oxygen to form water and carbon dioxide. Energy is released. Mitochondria store this energy to be used later.

Cell Division

A human body is made of trillions of cells, but it began as just one cell. Cells can copy themselves through a process called cell division. New organisms begin when cells from two parents combine to form a new cell. The single cell divides into two cells. The two cells divide into four cells, and so on. As cells divide, they become different from each other. Early on, the cells organize themselves into three groups called germ layers. One layer will form the skin and nerves. Another layer becomes the lining of the digestive tract. The third layer produces all other body parts.

Bacteria and other single-celled organisms can also copy themselves. This copying results in new individuals. When conditions favor division, a bacterial colony can double very quickly.

What Do Cells Do?

Fill in the blanks.

1. The smallest structure that carries out all of the activities necessary for life is a(n) _____.

2. In both plant and animal cells, the _____ is the control center.

3. During the process of _____, substances are spread through a gas or a liquid.

4. _____ is a specialized form of diffusion, and diffusion is a type of passive transport.

5. During active transport, substances move from regions of _____ concentration to regions of _____ concentration.

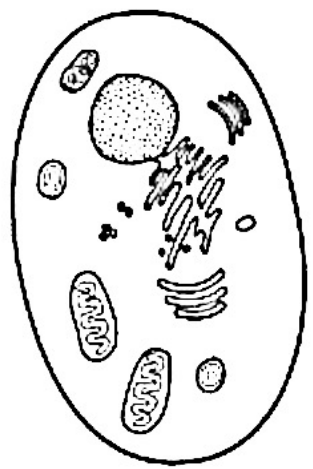
6. The byproducts of photosynthesis are oxygen, which is released into the air, and a molecule called _____, a type of sugar.

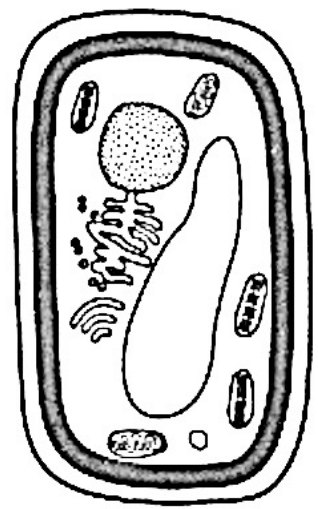
7. Cells copy themselves in a process called _____.

8. Photosynthesis takes place in _____, which use energy from sunlight to make food in plants.

9. _____ perform a process the opposite of photosynthesis to help plants use energy as food.

animal cell





plant cell

10. Main Idea What do cells need to stay alive?

_____

_____

11. Vocabulary Use the terms *chloroplast* and *organelle* in a sentence that describes cell function.

_____

_____

12. Reading Skill: Draw Conclusions Could a cell survive without its mitochondria if all the other organelles were present?

_____

13. **Critical Thinking: Analyze** What are the parts of a cell? How do cell parts work together to keep the cell alive?

14. **Inquiry Skill: Use Models** Why is a drop of food coloring in water a good model for the process of diffusion?

15. **Test Prep** To make food, plants use a process called

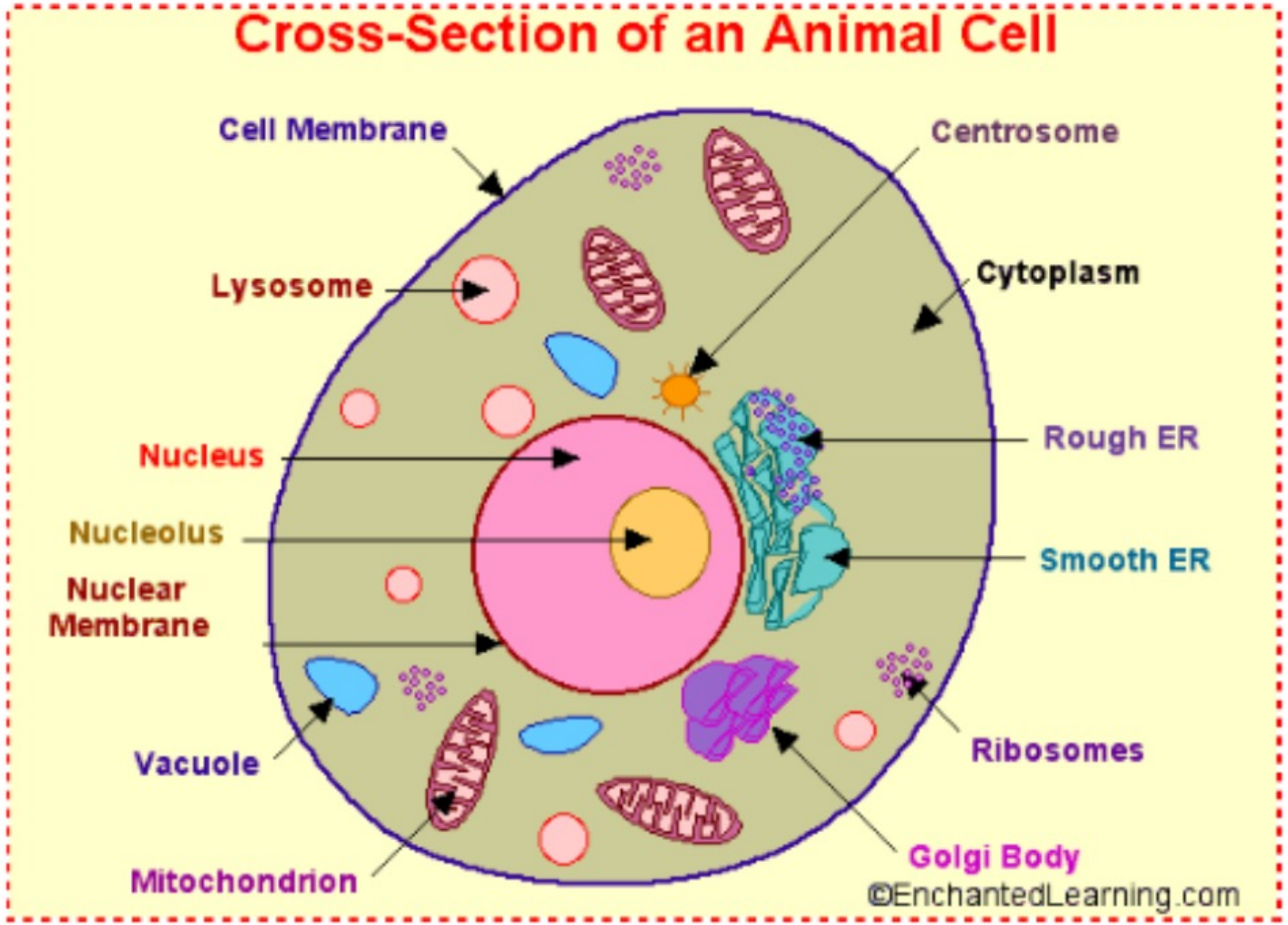
A photosynthesis.

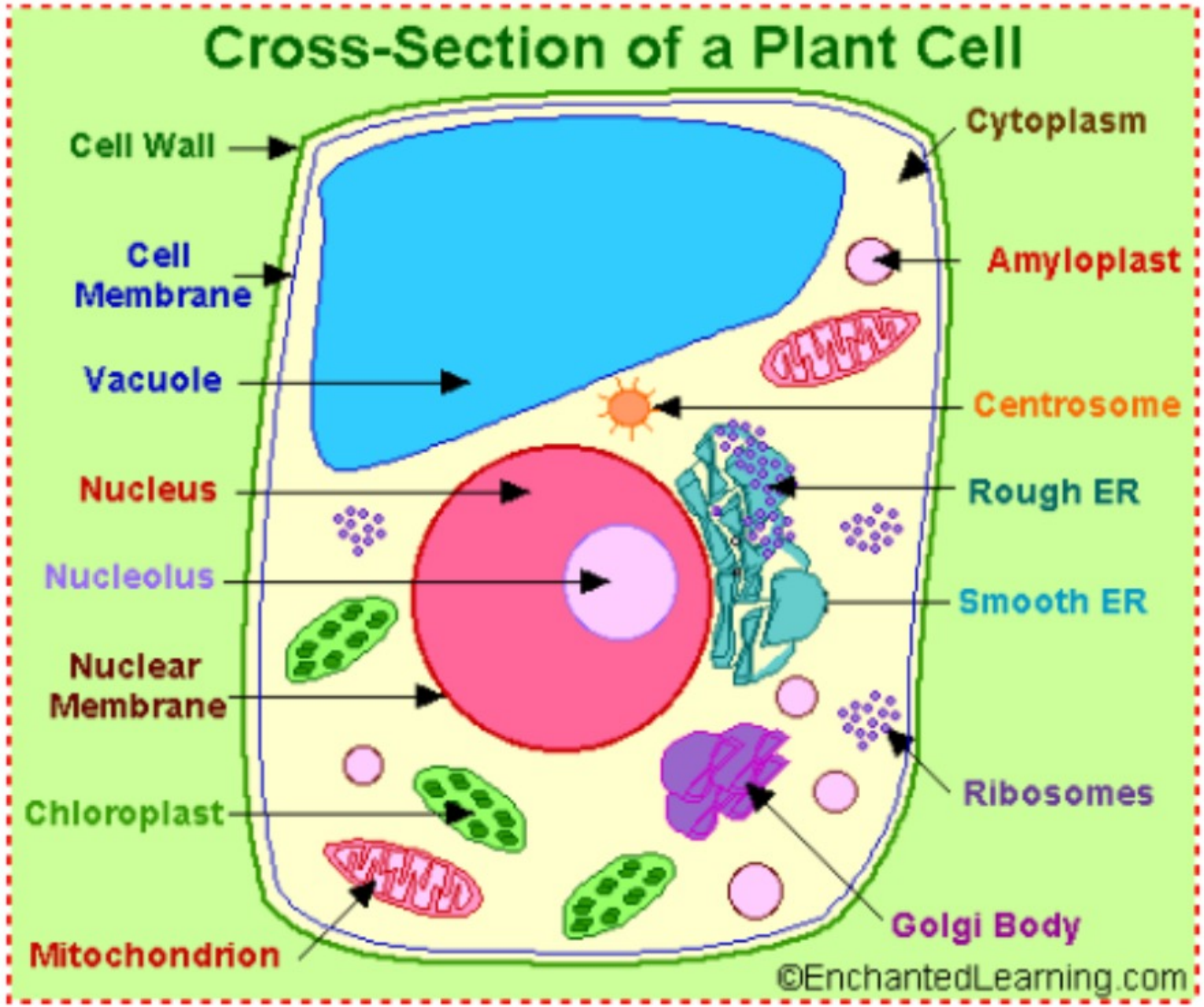
B cell division.

C passive transport.

D mitochondria.

Cross-Section of an Animal Cell




Cross-Section of a Plant Cell
Cell Wall
Cell Membrane
Vacuole
Nucleus
Nucleolus
Nuclear Membrane
Chloroplast
Mitochondrion
Cytoplasm
Amyloplast
Centrosome
Rough ER
Smooth ER
Ribosomes
Golgi Body
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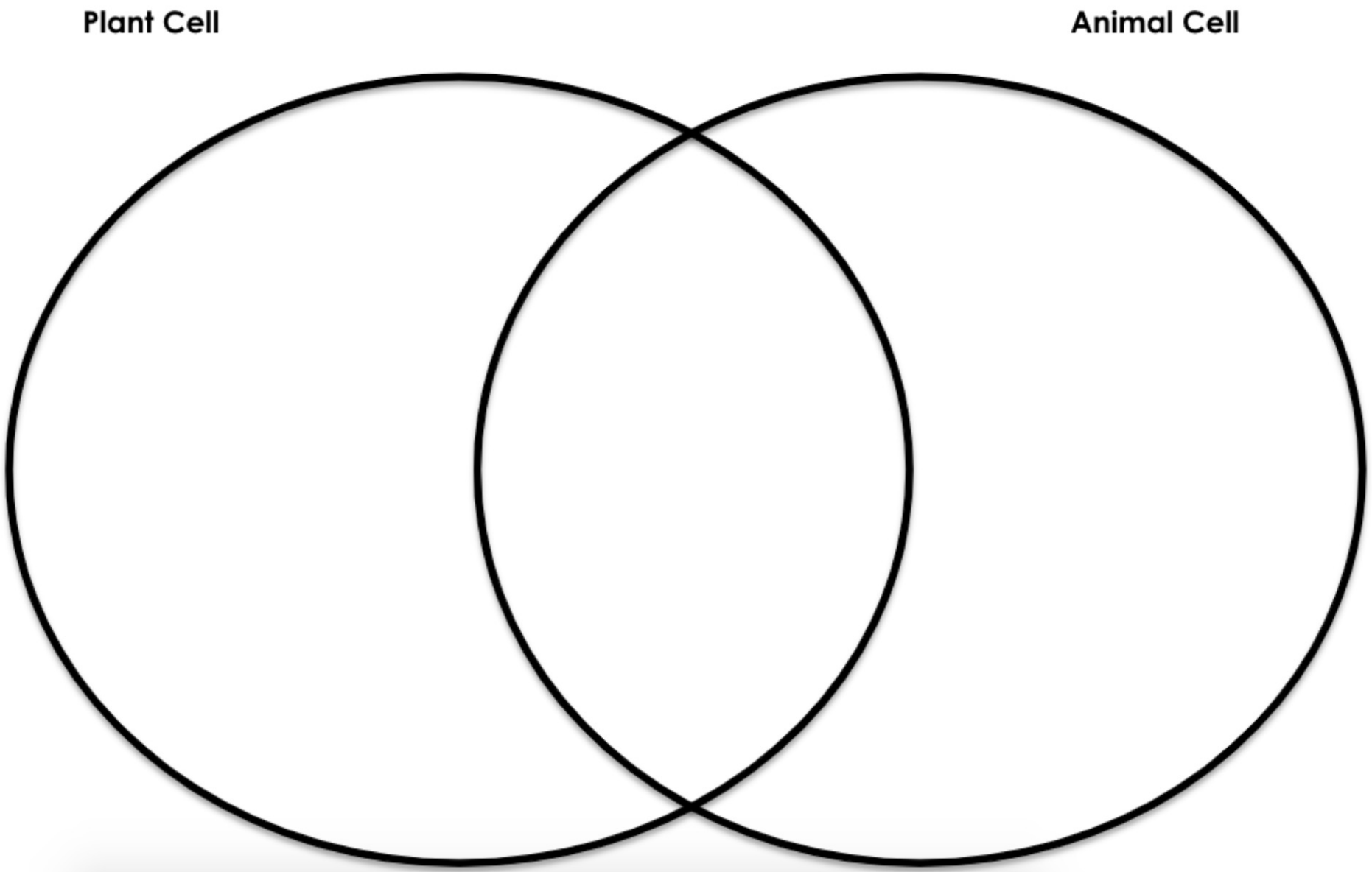
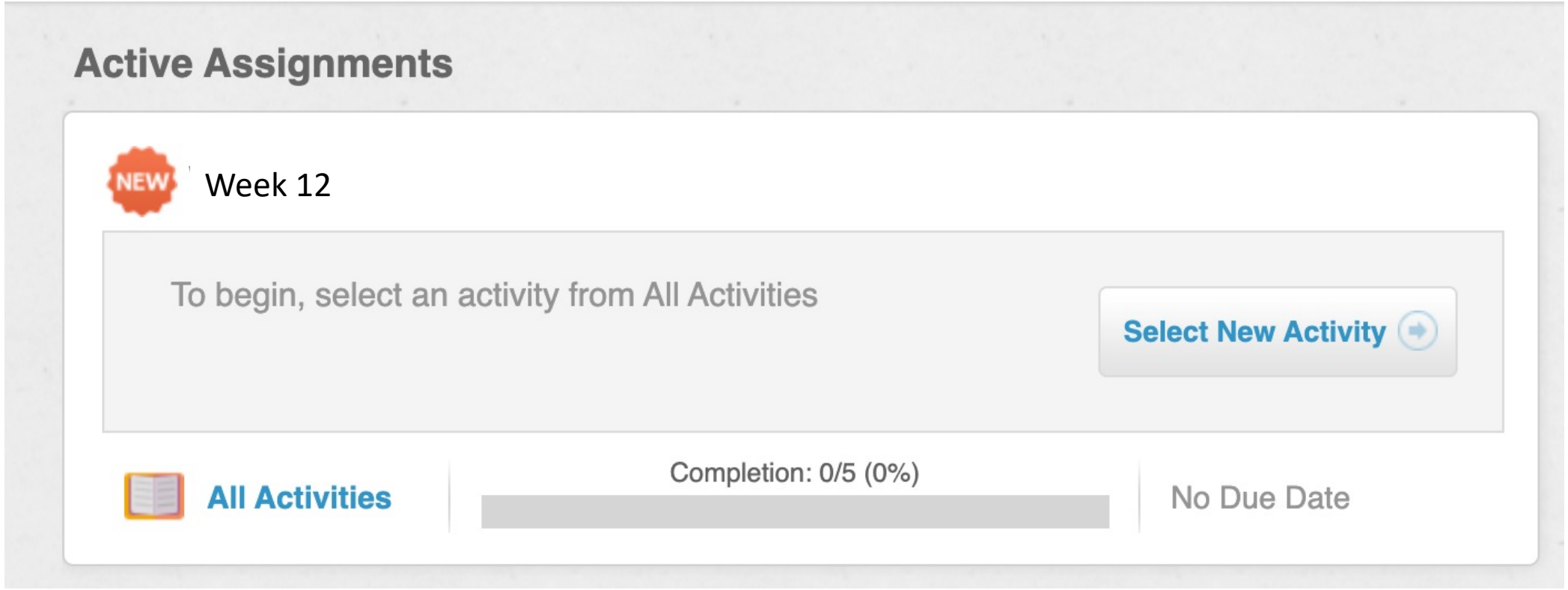
Compare and Contrast



Homework!


Active Assignments
NEW
Week 12
To begin, select an activity from All Activities
Select New Activity
All Activities
Completion: 0/5 (0%)
No Due Date