

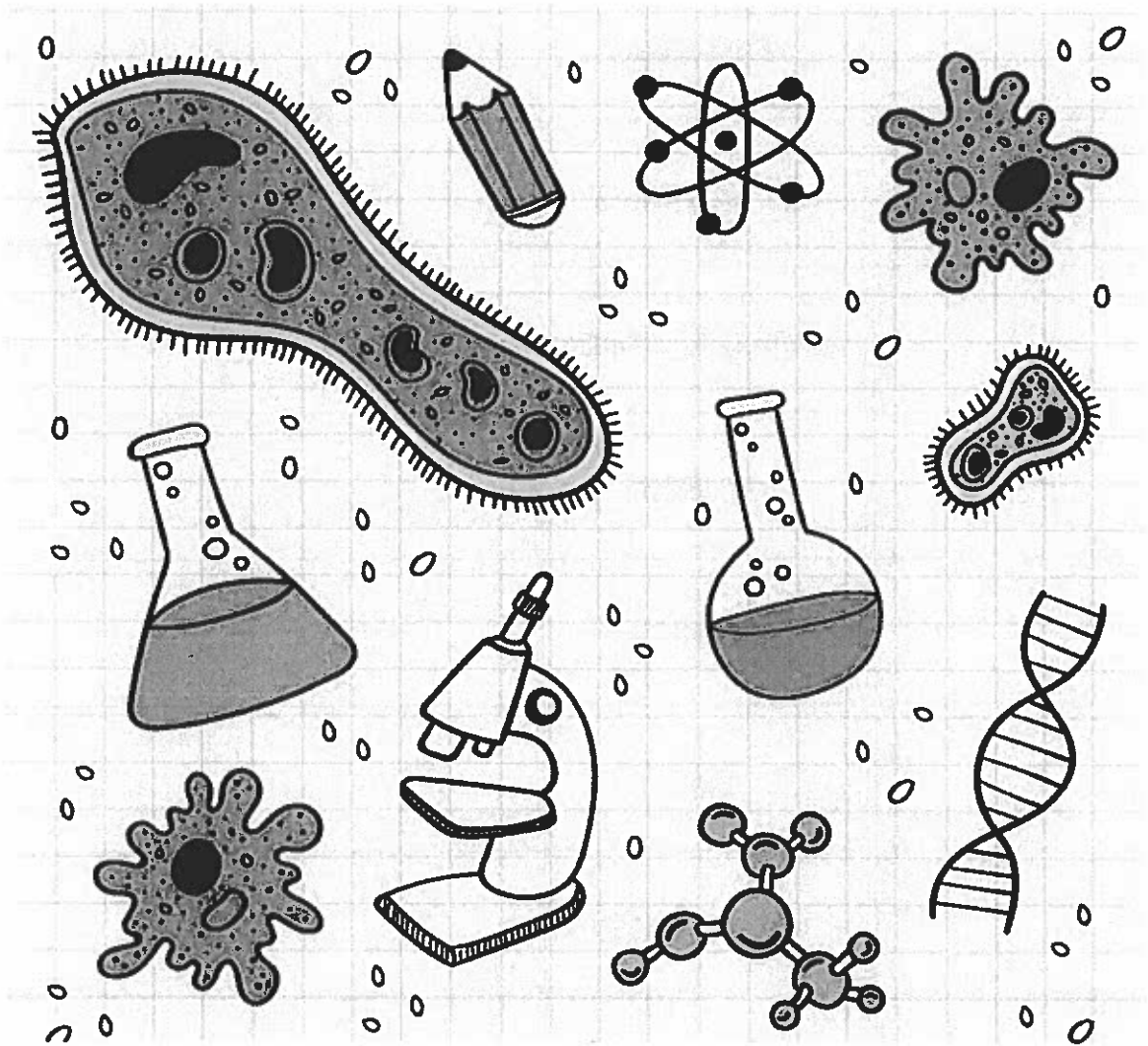
Science

Grade 7

Science

Group 7

7th Grade Science Study & Review Guide:



LEVELS OF ORGANIZATION

Directions: Draw a picture and provide a definition for each of the levels of organization.

PICTURE/EXAMPLES	WORD	DEFINITION
	Ecosystem	
	community	
	population	
	species	
	organism	
	organ system	
	organ	
	tissue	
	cell	
	organelle	
	Molecule	
	Atom	

1. How are each of the levels dependent on each other?

2. Which levels of organization are *living* and which are *nonliving*? Explain your answer.

EXAMPLE QUESTIONS:

_____ 1. A science class is planning a field trip to a local farm that has a large pond. Which of the following lists the order of biological organization from the smallest to largest that the students can expect to find at the pond?

- A. Organism, community, population, ecosystem
- B. Organism, population, community, ecosystem
- C. Population, organism, community, ecosystem
- D. Population, organism, ecosystem, community

_____ 2. The table shows some observations made by four students during a field trip to a nature area.

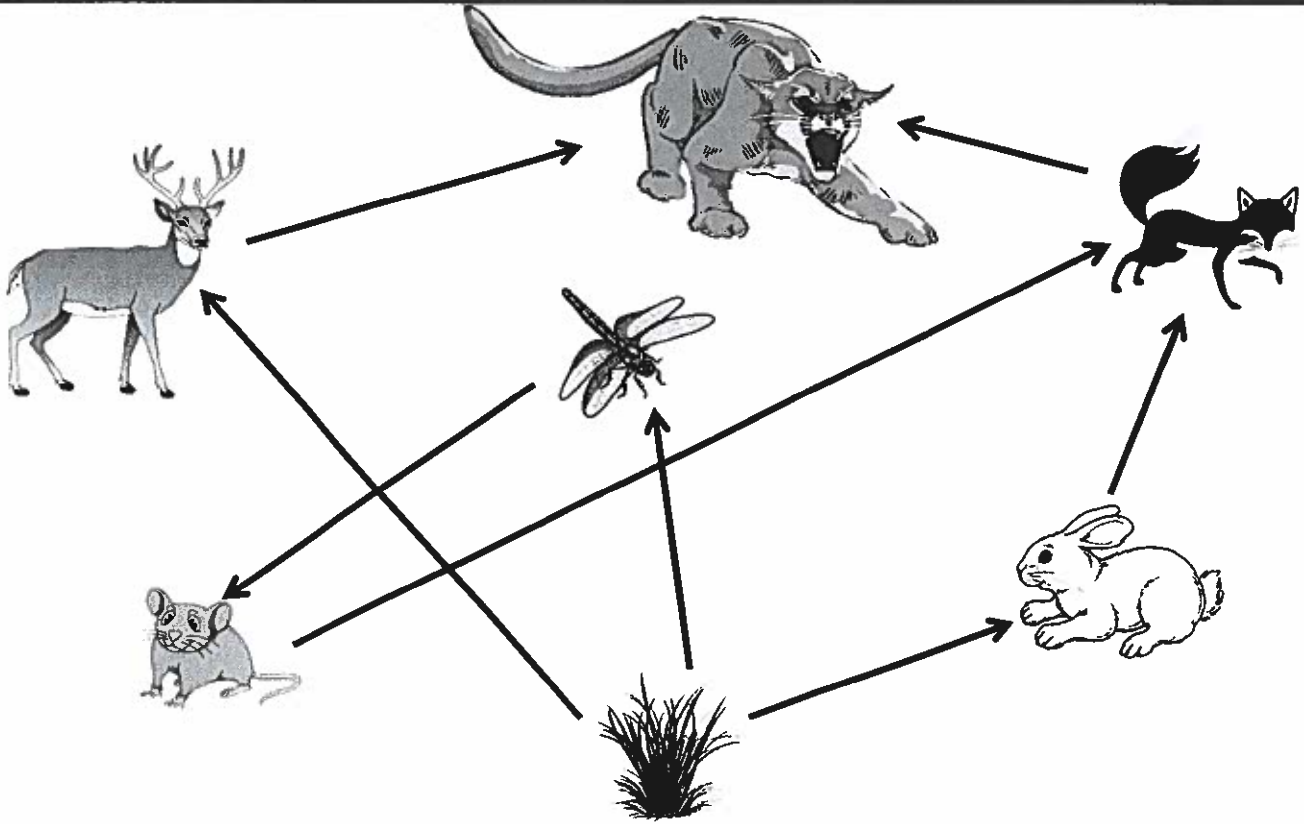
Nature Field Trip

Student	Observations
1	10 white-tailed deer
2	2 blue jays, 3 northern cardinals, and 1 house sparrow eating seeds
3	1 snapping turtle on a rock; 2 snapping turtles near the edge of a pond
4	6 bullfrogs in a pond; 30 bullfrog tadpoles hatching from eggs

Which student made observations of a community of organisms?

- A. Student 1
- B. Student 2
- C. Student 3
- D. Student 4

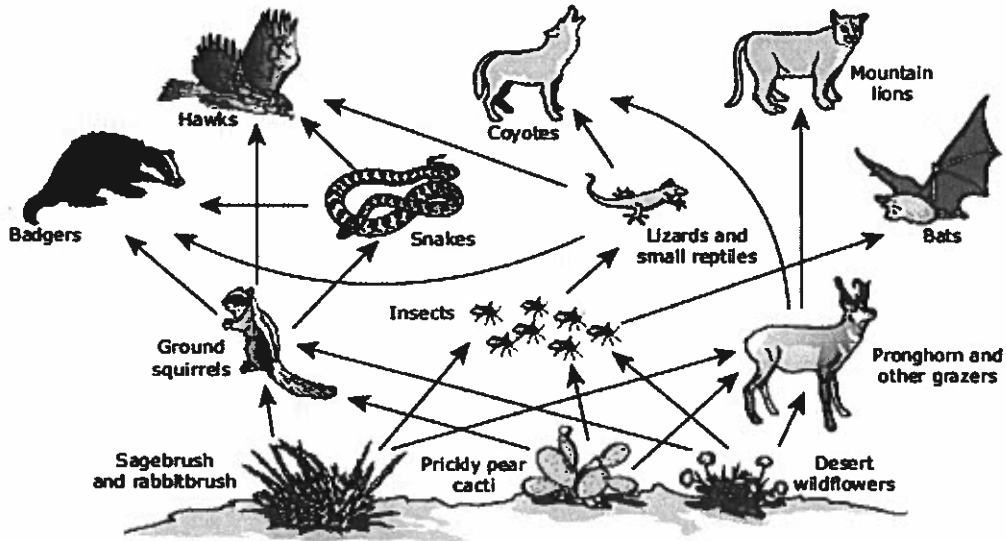
FOOD WEBS



1. Which organism is both a **producer** and an **autotroph**?
2. Which organism is sometimes a predator and sometimes prey?
3. What 2 organisms are the fox eating?
4. What would happen to the population of rabbits if the population of foxes disappeared? Why?
5. As the organisms in the food web hunt and obtain food, they use up energy. Each time an organism eats another, they only obtain 10% of that organism's energy. Which organism in the food web has the **most** amount of energy?
6. Which organism in the food web has the **least amount** of energy? How do you know?

EXAMPLE QUESTIONS:

_____ 1. The food web shows the flow of energy through a sagebrush-steppe ecosystem.



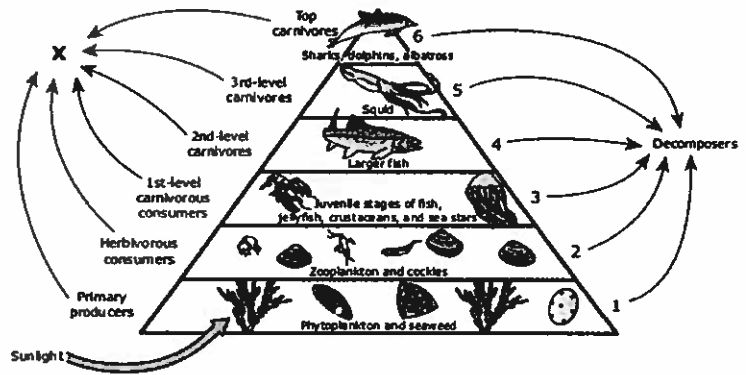
Which of these organisms receives a larger percentage of the energy captured by the producers than the bats?

- A. Mountain lions
- B. Snakes
- C. Hawks
- D. Ground squirrels

_____ 2. A marine ecosystem is represented in the picture on the right.

What is lost to the environment at each of the trophic levels of this ecosystem?

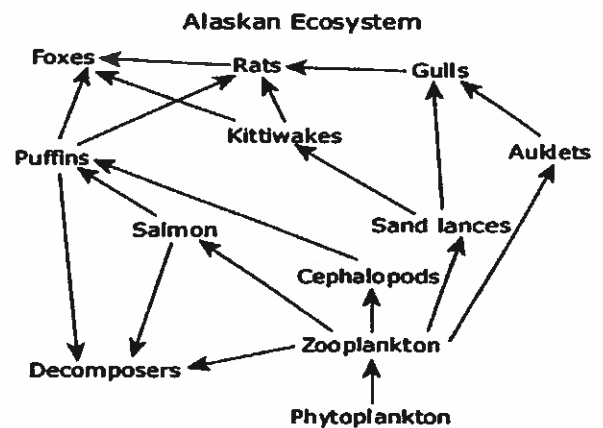
- A. Nutrients from the soil
- B. Living space for the organisms
- C. Food sources
- D. Energy in the form of heat



_____ 3. Food webs such as the one shown were first used in 1927 by the animal ecologist Charles Elton. The food web below represents the feeding relationships among organisms in an Alaskan ecosystem.

An environmental change that removed which of these organisms from the ecosystem would cause the most instability?

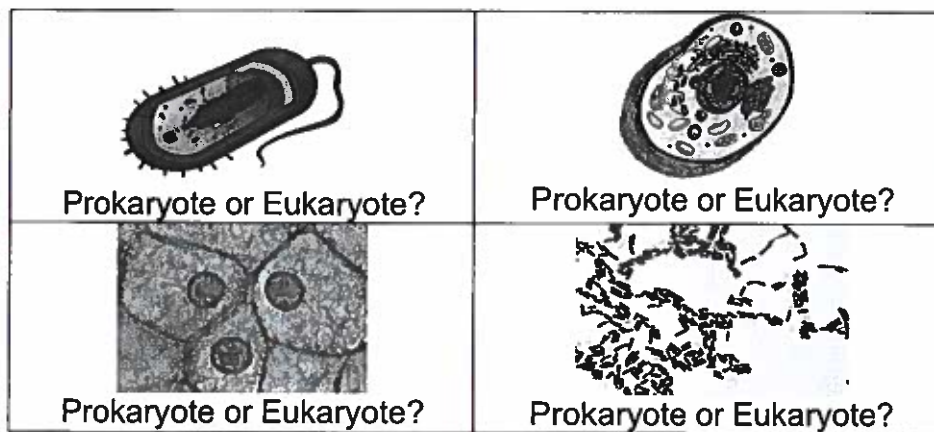
- A. Auklets
- B. Foxes
- C. Salmon
- D. Zooplankton



PROKARYOTIC AND EUKARYOTIC CELLS

1. What does the word prokaryote mean?
2. Based on the chart, in the history of evolution, which was first? Circle or highlight one.
EUKARYOTES or PROKARYOTES
3. What is the **MAJOR** difference between a prokaryote and eukaryote?

Directions: Determine if the pictures below belong to a prokaryote or eukaryote. Circle or highlight your answers.



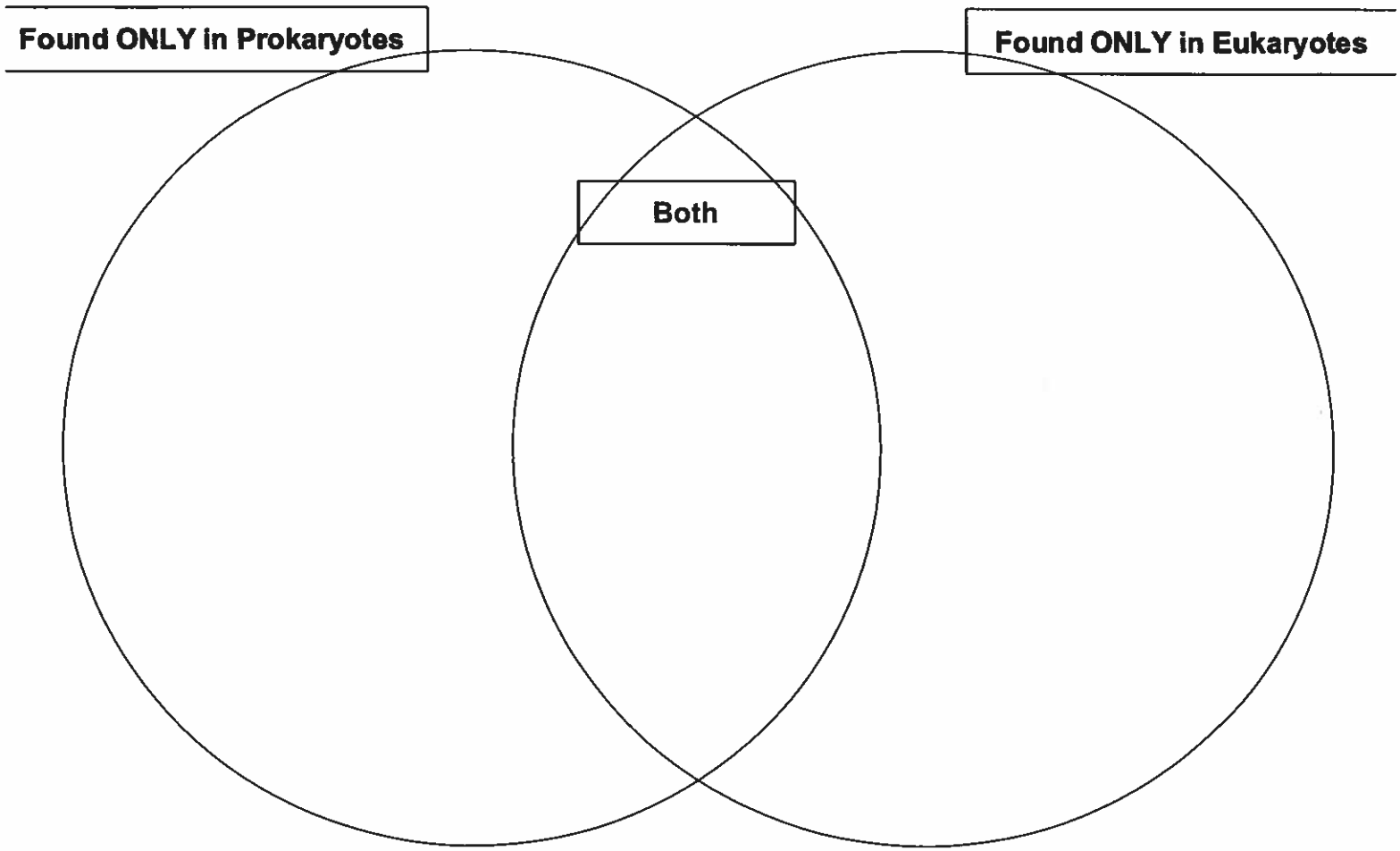
4. Besides looking for a nucleus, list 2 ways you can usually tell the difference between a prokaryote and eukaryote in pictures?
 -
 -
5. How do prokaryotic cells obtain nutrition?
6. How do eukaryotic cells obtain nutrition?
7. Which organelles do both prokaryotic and eukaryotic cells share?

Directions: Put a check mark in each box that the organelle can be found in. You will sometimes check more than one box. One of them has been done for you as an example.

	PROKARYOTE	EUKARYOTE:	
		Plant	Animal
Golgi Body			
Cell Membrane			
Cell Wall	✓	✓	
Mitochondrion			
Lysosome			
DNA			
Nucleus			
Ribosome			
Chloroplast			

Directions: Use the facts about prokaryotes and eukaryotes and write them in the correct places on the Venn diagram. You will use each fact only once.

DNA/RNA floats freely	Has ribosomes	Highly specialized	DNA is found in a membrane bound nucleus
Unicellular and multicellular	Has no membrane bound organelles	10x larger than the other	Has DNA
Organelles are surrounded by a membrane	Reproduce without sex (asexual)	Are living	Exists only as single celled organisms



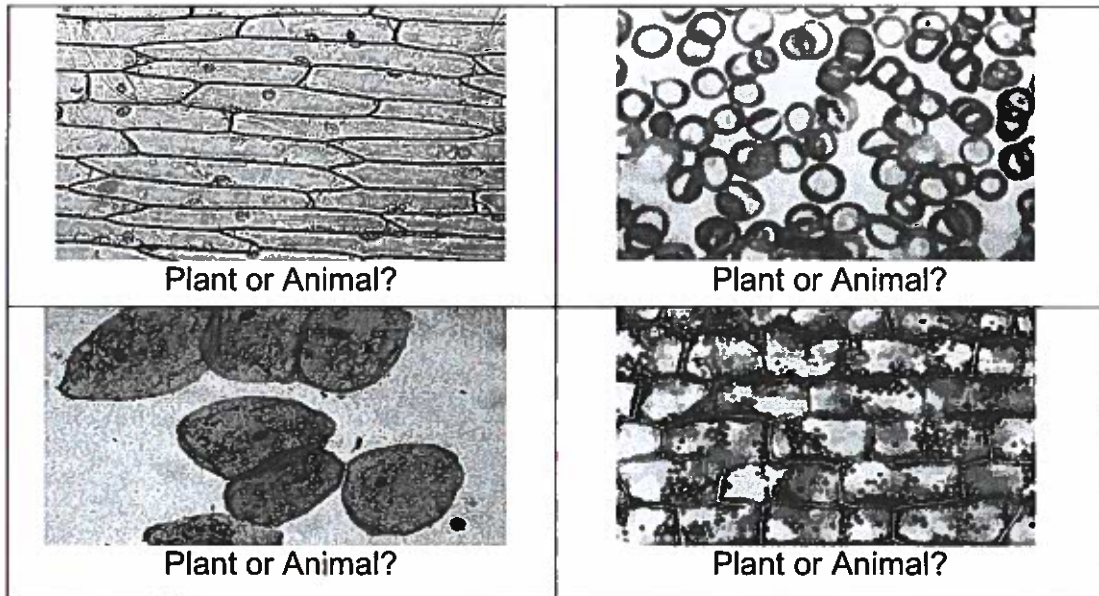
STRUCTURE AND FUNCTION OF CELLS

Directions: Fill in the name of the organelle that goes with the function. One has been done for you as an example.

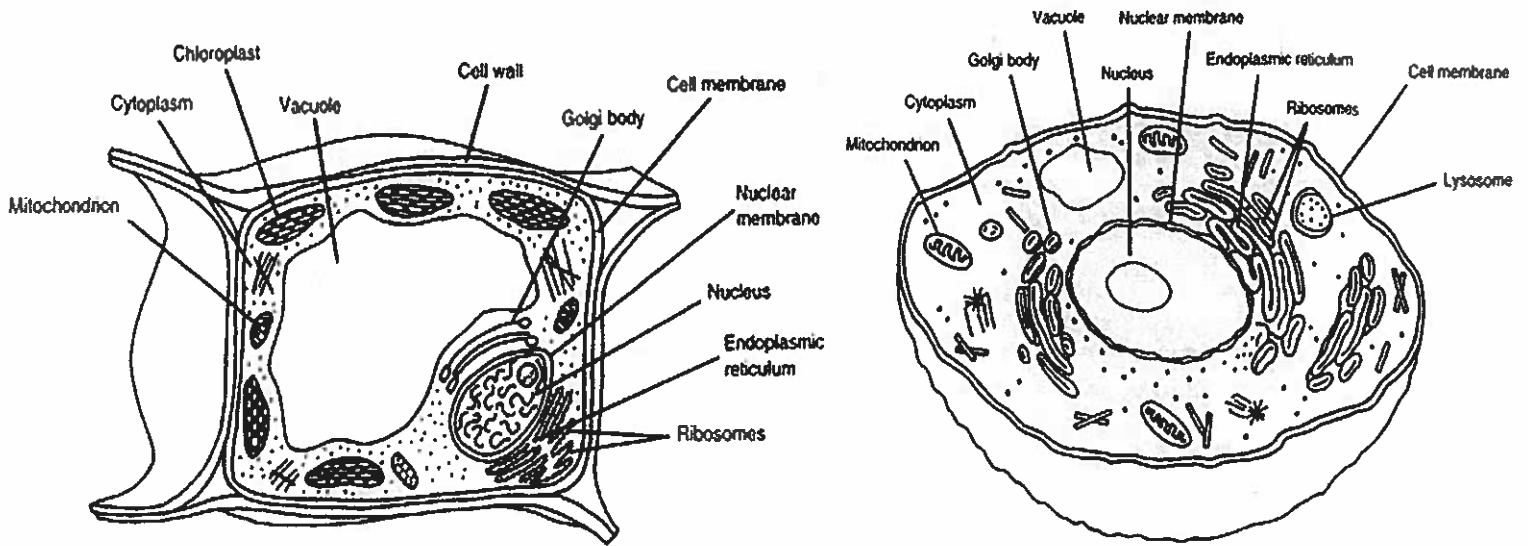
ORGANELLE	FUNCTION
	Creates energy for the cell
	Converts light energy from the sun into sugar through photosynthesis
	Provides structure and support for the cell
	Creates protein from the amino acids in the cell
	Contains the genetic material (DNA) of the cell
Cell/Plasma Membrane	Controls what goes into and out of the cell
	Makes plants green

1. Based on the information from above, how would you define the word **organelle** in your own words?

Directions: Determine if the cells pictured below belong to a plant cell or animal cell based on their shapes. Circle or highlight your answer choice.



2. By looking at the pictures above, explain the differences between **plant** and **animal** cells:



3. List the organelles that a plant cell has that an animal cell does not.

4. How are the organelles in the cell like the organs inside of the human body?

5. Which organelles make new things for the cell and what do they make?

EXAMPLE QUESTIONS:

1. Some students used information they gathered from lab investigations to prepare a table. They entered the table in their lab notebooks.

Cell 1	Cell 2
Is smaller than 5 micrometers	Is larger than 10 micrometers
Does not have a nucleus	Has a membrane-bound nucleus
Does not have membrane-bound organelles	Has membrane-bound organelles
Has circular DNA	Has linear DNA

Which of these correctly identifies the two cells described in the table?

- A. Cell 1 is eukaryotic, and Cell 2 is prokaryotic.
- B. Cell 1 is prokaryotic, and Cell 2 is eukaryotic.
- C. Both Cell 1 and Cell 2 are eukaryotic.
- D. Both Cell 1 and Cell 2 are prokaryotic.

2. Using a light microscope, a student identified the following characteristics of four organisms found in a sample of pond water.

Pond-Water Organisms

Organism 1	Single-celled, nucleus, large vacuole
Organism 2	Single-celled, no nucleus, cell wall
Organism 3	Single-celled, no nucleus
Organism 4	Single-celled, nucleus

Based on the observations of the student, which organisms most likely belong to the taxonomic group for bacteria?

- A. Organisms 1 and 2
- B. Organisms 3 and 4
- C. Organisms 1 and 4
- D. Organisms 2 and 3

3. Four different types of cells are shown.



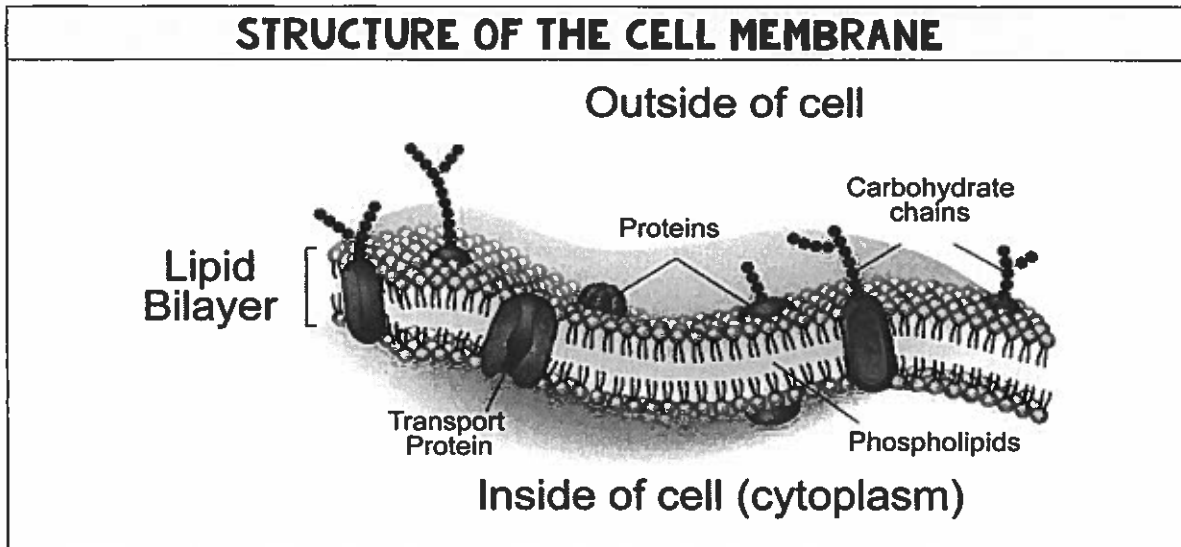
Which characteristic is shared by all four cells?

- A. A mechanism for transforming sunlight into energy
- B. Self-locomotion
- C. Membrane-bound organelles that transport substances
- D. Genetic material composed of DNA

4. Which group of organelles are directly responsible for the production of new molecules within the cell?

- A. Ribosomes, the endoplasmic reticulum, and Golgi apparatuses
- B. Golgi apparatuses, lysosomes, and the plasma membrane
- C. The endoplasmic reticulum, plastids, and vacuoles
- D. The nucleolus, vacuoles, and ribosomes

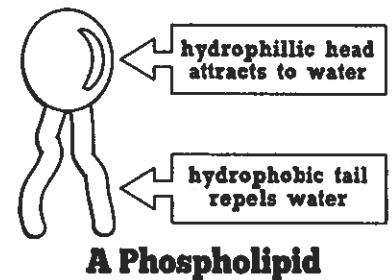
TRANSPORT OF MOLECULES ACROSS A MEMBRANE



1. What **biomolecule** is the lipid bilayer and cell membrane made up of?

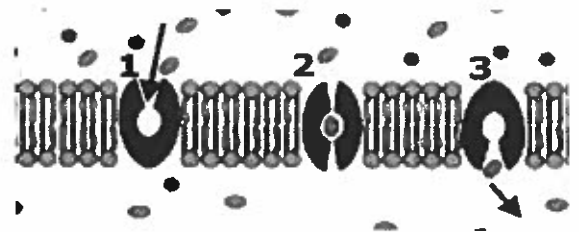
2. Each _____ is made up of two parts:

- A polar head that is attracted to _____.
- A non-polar pair of tails that _____ by water.

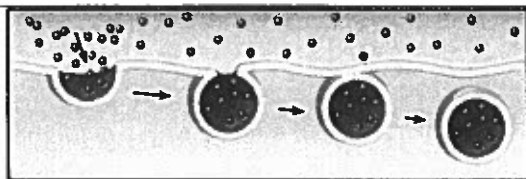


3. In **facilitated diffusion** (pictured on the right), the _____ transports substances across the membrane.

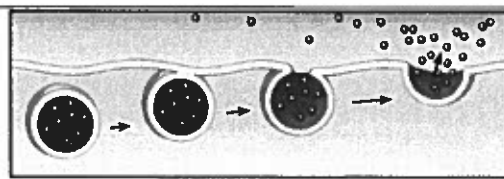
- This is an example of **passive transport**, where the cell does not use energy to transport materials.



4. In **active transport**, the cell moves molecules against concentration gradient. This process requires energy in the form of ATP. Why does the cell need to expend energy for this process?



5. Describe **endocytosis**, pictured above.



6. Describe **exocytosis**, pictured above.

Directions: Draw and label a picture of each cell in the different types of osmosis. Use arrows to show the direction of water movement.

ANIMAL CELL OSMOSIS		
Hypotonic	Isotonic	Hypertonic

PLANT CELL OSMOSIS		
Hypotonic	Isotonic	Hypertonic

Directions: Use the pictures above to answer the question below.

Remember: salt, sugar, and starch *pulls* water to itself.

7. In which condition has the cell been placed inside of a solution of sugar? _____
8. In which condition does the cell have too much sugar inside of it? _____
9. In which condition has the animal cell reached **homeostasis**? _____
10. Look over the animal cell osmosis pictures at the top of the paper and answer this question. Which picture would show the cells of a freshwater fish if it were placed inside of a saltwater aquarium? **Why?**

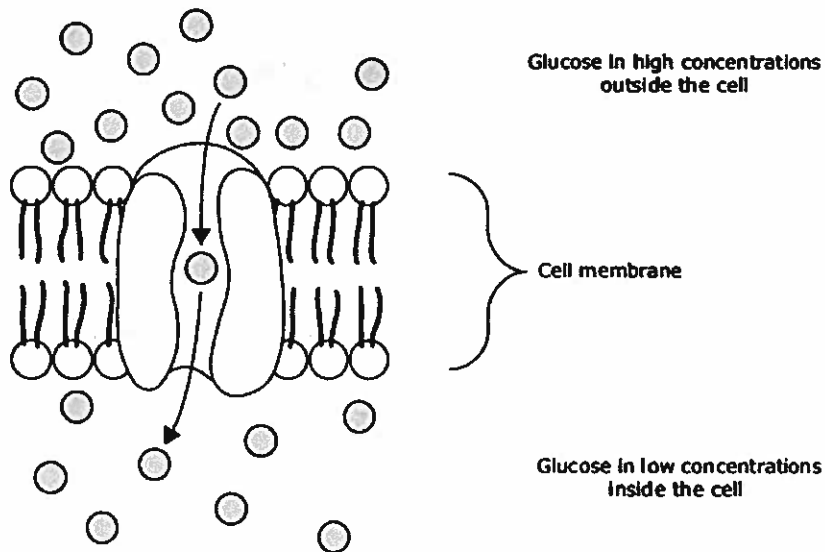
EXAMPLE QUESTIONS:

_____ 1. Some students used vinegar to dissolve away the shells of three eggs and used these eggs as models of human red blood cells. The students observed the changes in the eggs when they were placed in different solutions.

Which statement best describes the role of the cell membrane in this model?

- A. The cell membrane is an impermeable barrier that prevents water from entering the cell.
- B. The cell membrane allows solutes to enter the cell, which causes the cell to shrink.
- C. The cell membrane allows water to enter and leave the cell.
- D. The cell membrane removes solutes from the environment.

_____ 2. This diagram shows cellular activity across a cell membrane.



Which two processes does this diagram most directly model?

- A. Energy conversions and synthesis of new molecules
- B. Synthesis of new molecules and homeostasis
- C. Transport of molecules and energy conversions
- D. Homeostasis and transport of molecules

_____ 3. The cellular process known as the sodium-potassium pump was discovered in the 1950s by Jen Christian Skou, a Danish scientist. This process is a form of active transport that moves three sodium ions to the outside of a cell for every two potassium ions that it moves into the cell. Which of these best explains why energy is needed for active transport?

- A. Ions are negatively **charged**.
- B. Ions are **attached** to large proteins.
- C. Ions are trapped **inside** the plasma membrane.
- D. Ions are moved **against** the concentration gradient.

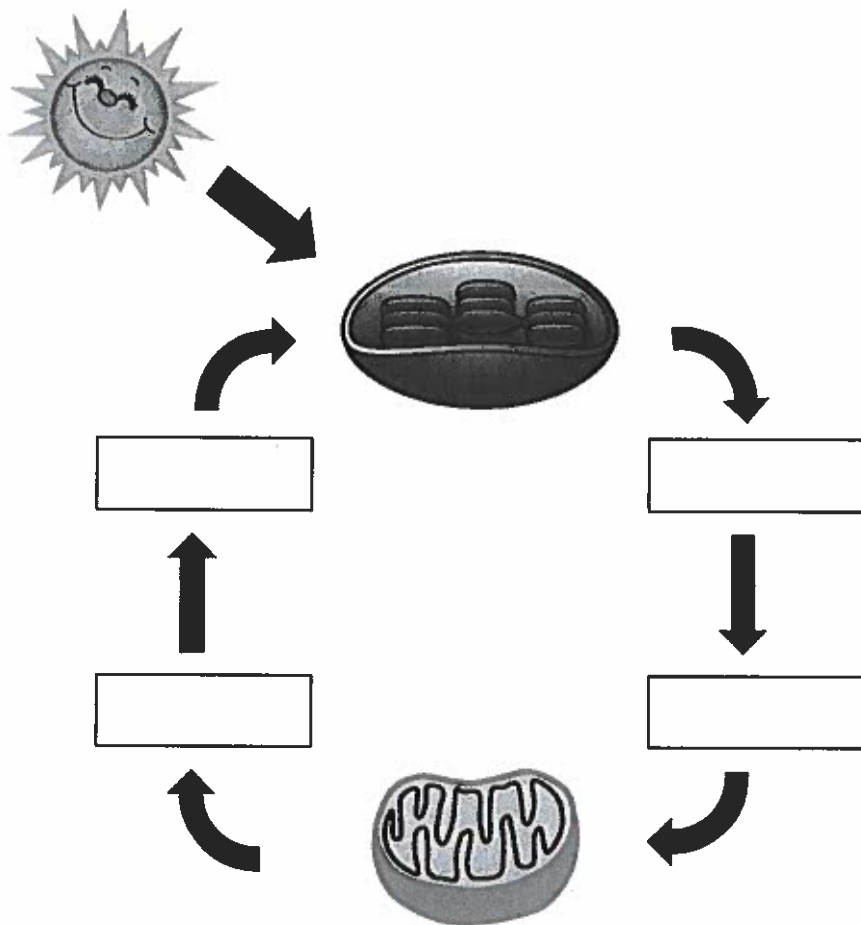
CELLULAR ENERGY

Directions: Fill in the blank boxes for the two types of chemical energy equations.

PHOTOSYNTHESIS



CELLULAR RESPIRATION



Directions: Input the compounds below into the illustration on the left that shows the cycle of photosynthesis and cellular respiration. Use each chemical compound only once.

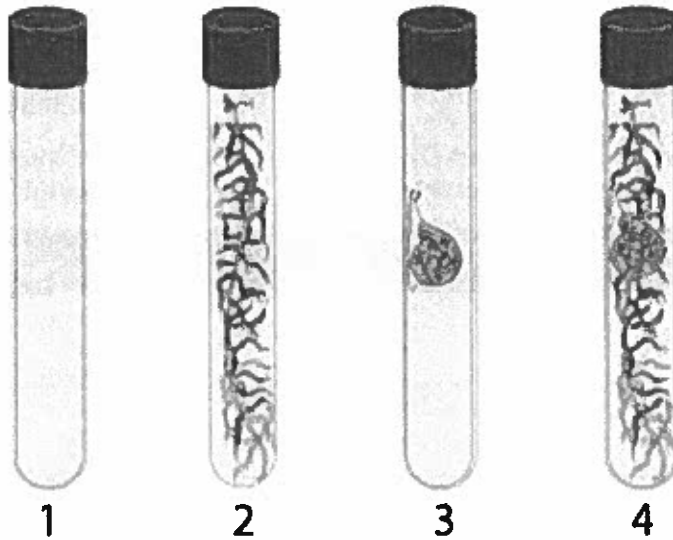
CO_2

O_2

$\text{C}_6\text{H}_{12}\text{O}_6$

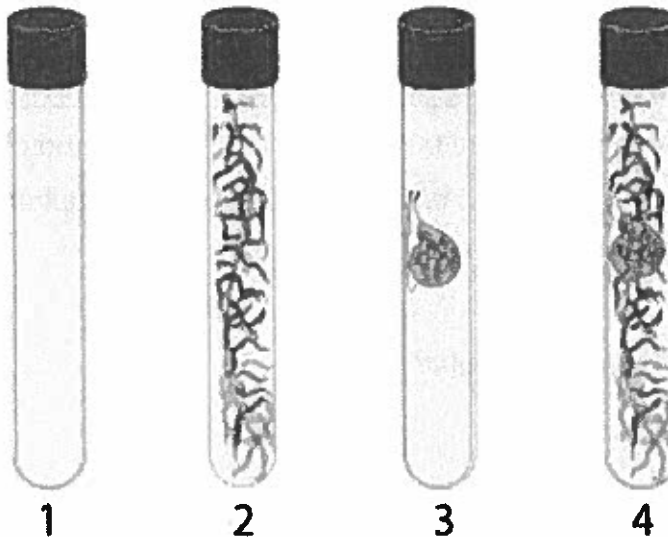
H_2O

Directions: Answer the questions based on the pictures. *Note: in the presence of CARBON DIOXIDE (CO₂) the chemical Bromothymol Blue will turn from blue to yellow.*



TUBE 1 is the control. In the presence of Bromothymol Blue, only TUBE 3 turned yellow.

1. What process took place to change the water color in TUBE 3 from blue to yellow?
2. Why did TUBES 2 and 4 stay blue?



TUBE 1 is the control. In the presence of Bromothymol Blue, only TUBE 2, 3, and 4 turned yellow.

3. What process caused TUBES 2, 3, and 4 to change from blue to yellow?
 - WHY?
4. Why did TUBE 1 in both experiments stay blue?

Directions: Use the facts about photosynthesis and cellular respiration and write them in the table below. You will use each fact only once.

Needs the sun	Carbon Dioxide and Water are a product	Occurs during the day	Takes place in the mitochondria
Occurs in plants and animals	Water and Carbon Dioxide are a reactant	ATP is made	Occurs during the day and night
Takes place in the chloroplast	Sugar and Oxygen are a product	Sugar and Oxygen are a reactant	Takes place in only plants

PHOTOSYNTHESIS	CELLULAR RESPIRATION

5. Which biomolecule is a product of photosynthesis, and a reactant of cellular respiration?

6. Plants need animals to do _____. When animals exhale _____ the plants take it in through the stomata and uses it. Animals need plants to do _____. Without plants, animals would not have any _____ to breathe and toxic _____ would build up.

7. How do plants make energy at night?

8. Plants, animals, and microorganisms all use cellular respiration. In the aerobic conditions, or in the presence of oxygen, cellular respiration can produce _____ ATP. Under anaerobic conditions, or without enough oxygen, organisms then convert to the lactic acid fermentation cycle. Lactic fermentation, or anaerobic respiration, produces a total of _____ ATP. Which cycle is more efficient for producing energy?

EXAMPLE QUESTIONS:

_____ 1. Which statement best describes the relationship between the products of photosynthesis and the reactants in cellular respiration?

- A. The products of photosynthesis serve as the reactants in cellular respiration to provide chemical energy.
- B. The products of photosynthesis combine with the reactants in cellular respiration to remove ATP from cells.
- C. The products of photosynthesis inhibit the reactants in cellular respiration in the presence of light.
- D. The products of photosynthesis change the structure of the reactants in cellular respiration in the presence of light.

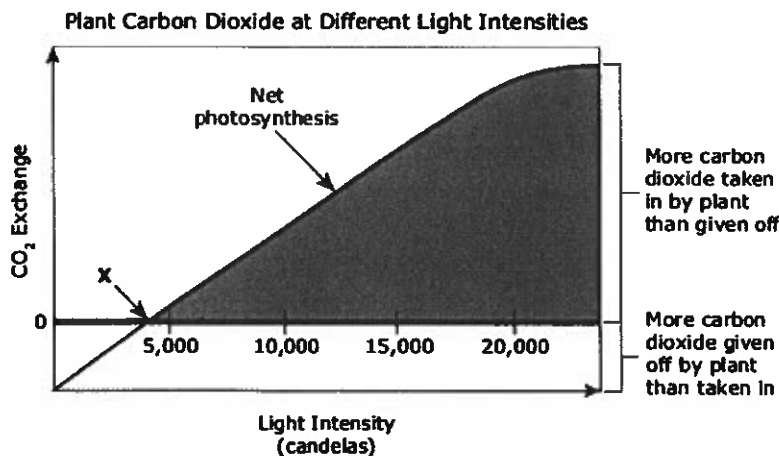
_____ 2. Diatoms are one of the most common types of phytoplankton in marine habitats. Like plants, diatoms contain chlorophyll and produce glucose from which of the following?

- A. O_2 and ATP
- B. CO_2 and O_2
- C. ATP and H_2O
- D. CO_2 and H_2O

_____ 3. Cells can generate as many as 36 to 38 molecules of adenosine triphosphate (ATP) from the metabolism of one molecule of glucose. Which cellular process results in this amount of ATP production?

- A. Anaerobic cellular respiration
- B. Protein synthesis
- C. Aerobic cellular respiration
- D. Photosynthesis

_____ 4. Most plant leaves take in more carbon dioxide as light increases. They give off carbon dioxide if light intensity is too low. The graph shows a plant's carbon dioxide levels at different light intensities.

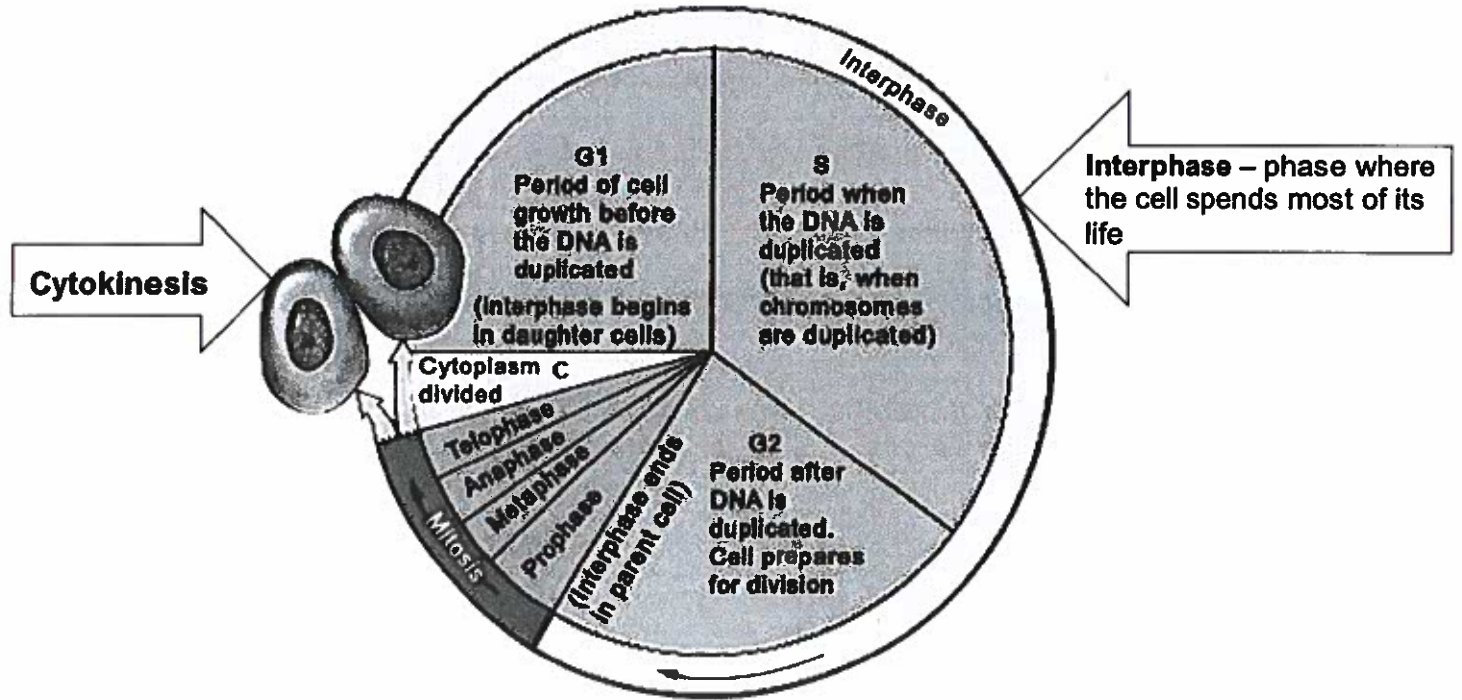


At point X, the rate of which process is equal to the rate of photosynthesis?

- A. Cellular respiration
- B. Transpiration
- C. Growth
- D. Reproduction

CELL CYCLE

Directions: Answer the following questions using the picture of the cell cycle as a reference.



1. During what part of the cell cycle do the chromosomes get copied and DNA is duplicated?

2. Look back at the cell cycle picture above. What must the cell do before it can go from the **G1** phase to the **S** phase?

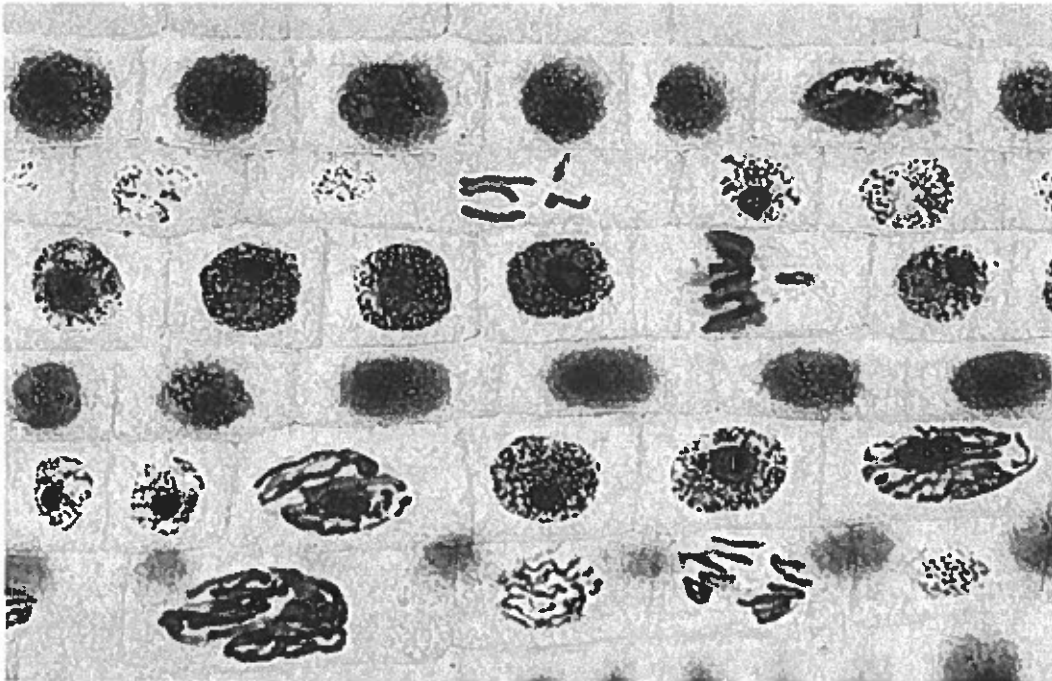
3. What are the 4 true steps to MITOSIS? (Hint: remember PMAT)
 - _____
 - _____
 - _____
 - _____

4. Based on the picture, what does the word **cytokinesis** mean?

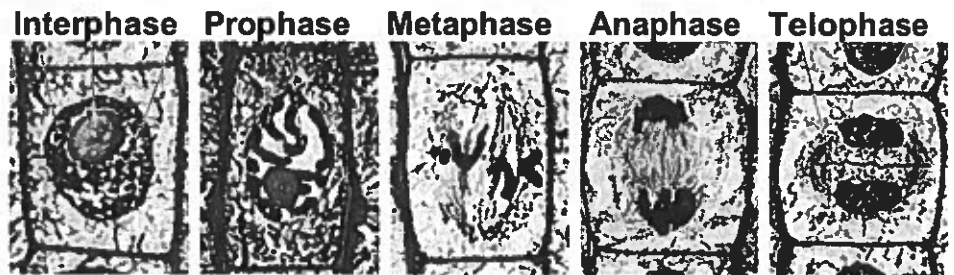
5. Mitosis begins in one cell. After going through the steps of the cell cycle and completing cytokinesis, how many daughter cells does mitosis produce?

6. Daughter cells are _____ to the parent cells.

Directions: Look at the microscope picture of mitosis below. Count up the number of cells in each phase and write it in the chart below.



PHASE	NUMBER OF CELLS
Interphase	
Prophase	
Metaphase	
Anaphase	
Telophase	



6. Which phase had the most cells?

- Why did this phase have the most amounts of active cells at the time the microscope picture was taken? (*hint: look back at the cell cycle picture on the previous page.*)

7. Cancer is caused when cells divide uncontrollably, resulting in a mass of tissue called a tumor that serves no purpose for the body other than to use up nutrients. Is cancer caused by a virus, a mutation, or a bacterium? How do you know? Explain.

Meiosis

the process by which haploid sex cells are created, each containing 23 chromosomes

Interphase



Prophase



Metaphase



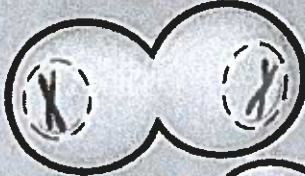
Crossing over, the exchange of DNA information, may occur

Sister chromatids do not separate



Anaphase

Telophase



Chromosome replication does not occur

Meiosis II

Prophase II



Metaphase II



Anaphase II



Telophase II



Cytokinesis

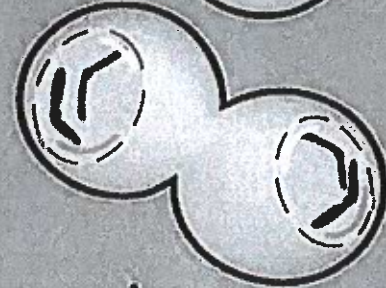
4 haploid cells - Meiosis is complete

Mitosis

the process by which diploid cells are created, each containing an identical copy of DNA with 46 chromosomes



Sister chromatids separate



2 diploid cells - Mitosis is complete

Directions: Use the large mitosis and meiosis comparison picture on the previous page to complete the chart on this page.

	MITOSIS	MEIOSIS
How many times does the cell divide?		
Does it happen in eukaryotic or prokaryotic cells?	<i>Both</i>	
How many daughter cells are produced after cytokinesis?		
How many chromosomes does each daughter cell have?		
Are the daughter cells identical or different than the original cell?		
Does crossing-over happen?		
In what type of cell does it take place? (gametic or somatic?)		
Do the sister chromatids separate?		
Why does the cell need to divide?		<i>To make more sex cells</i>

8. Why is crossing-over important in meiosis?
9. Why does meiosis cause **genetic diversity** and mitosis doesn't?
10. What part of the cell tells it how and when to reproduce?
11. What pulls the chromatids apart during mitosis and meiosis?

EXAMPLE QUESTIONS:

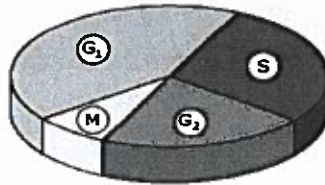
_____1. Telophase is a stage of a cellular process that begins after the chromosomes have moved to opposite poles of the cell. During which cellular process does telophase occur?

- A. Translation B. Interphase C. Transcription D. Mitosis

_____2. Sexual reproduction in animals depends of the production of gametes. Which of these processes produces gametes in animals?

- A. Mitosis B. Fertilization C. Meiosis D. Binary Fission

_____ 3. Checkpoints occur between the stages of the cell cycle. If a cell does not meet certain criteria at the end of a stage, it will not move to the stage.



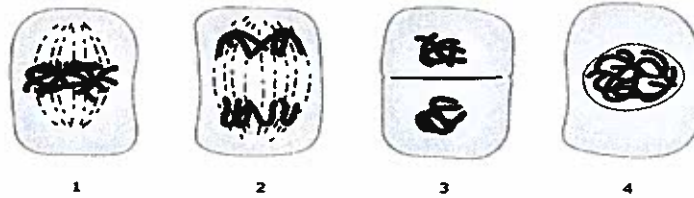
Which of these occurs before the cell enters the G₂ stage of the cell cycle?

- A. The nuclear membrane disintegrates.
- B. DNA replicates.
- C. Centrioles form.
- D. The nucleolus divides.

_____ 4. During meiosis, homologous chromosomes exchange genetic material. This exchange of genetic material –

- A. increases the genetic variation
- B. reduces the diploid number to the haploid number
- C. increases the haploid number to the diploid number
- D. reduces the probability of mutations

_____ 5. The diagram shows cells in different phases of mitosis. A student is trying to find a cell in a particular phase of mitosis. The student is looking for evidence that spindle fibers are separating the chromosomes to ensure that each new nucleus has one copy of each chromosome.



Which cell is the phase of mitosis that the student is searching for?

- A. Cell 1
- B. Cell 2
- C. Cell 3
- D. Cell 4

_____ 6. Cells pass through a G₂ checkpoint before entering mitosis. Ideally, if DNA damage is detected, the cells do not enter mitosis until the damage is repaired. Why is DNA damage repaired before the cells enter mitosis?

- A. So that another round of DNA synthesis does not have to take place.
- B. So that the chromosomes can align at the metaphase plate during mitosis.
- C. So that the cytoplasm can be divided equally between the two daughter cells.
- D. So that healthy daughter cells are produced, allowing the organism to continue growing.

_____ 7. Oncogenes are mutated forms of genes. Oncogenes can transform a cell into a tumor cell. Some tumor cells are benign, while others are malignant. How does the presence of an oncogene lead to the formation of a tumor?

- A. ATP production is inhibited.
- B. Cell division is unregulated.
- C. Somatic cell growth is inhibited.
- D. Antibody activity is unregulated.

Name: _____

ECOSYSTEM INTERACTIONS

SCAVENGER HUNT

GO
OUTSIDE!
ASK FIRST!

Find as many items on the list as you can. Draw them on the back of the paper. Color for bonus. Number your drawings.

- 1. a bird or mammal interacting with a plant
- 2. an animal interacting with dirt or rocks
- 3. an insect interacting with a plant
- 4. an animal consuming food
- 5. a bird interacting with a nonliving component of its ecosystem
- 6. an insect interacting with a nonliving component of its ecosystem
- 7. a plant that needs shade to thrive
- 8. a plant interacting with a nonliving component of its ecosystem
- 9. a fungus that returns nutrients to the soil
- 10. an animal using a living or nonliving component of its ecosystem for shelter