LT 4: Describe unique properties of water that enable life to exist on earth

Property	Definition of Property	Example of use in biology/ living world
Density as a Solid	Water is less dense as a solid than as a liquid	• Ice floats • Polar ice caps float on top of oceans, takes longer to melt
Cohesion	Water molecules stick to other water molecules	• creates surface tension → water skippers stay on top of water • Dew drops stick to leaves
Adhesion	Water molecules stick to other polar molecules	• water moves from roots to leaves for photosynthesis
Universal Solvent	Water can dissolve any polar or ionic molecule/ compound	• helpful to dilute liquids •
High Heat Capacity	Water takes a long time to heat up/ cool down	• this allows our oceans to maintain stable temperatures (which helps land temps as well)

LT 5: Compare and contrast the four main types of organic macromolecules

What do all 4 macromolecules have in commons?

Elements C H O N P S (carbon, hydrogen, oxygen, nitrogen, phosphorous, sulfur)

LT 6: List the chemical elements found in the four main macromolecules.

Carbohydrates	Lipids
C H O	C H O
Nucleic Acids	**Proteins**
C H O N P	C H O N S

LT 7: Explain the function and importance of macromolecules.

Write the function and an example of each macromolecule.

Lipids: Long term energy storage, insulation

ex: Saturated / unsaturated fats

Carbohydrates: Simple energy for organism

ex: glucose

Nucleic Acids: Storage and transfer of genetic material (instructions)

ex: DNA + RNA

Proteins: Structural support, cellular functions, movement in cells,

ex: enzymes

LT 9: Chemical Reactions in living things

Label Reactants and Products

$$CH_4 + O_2 \text{ -----> } CO_2 + H_2O$$

Reactants Products

Fill in the Boxes for Anabolic and Catabolic

	Anabolic	Catabolic
Builds or breaks?	Builds	Breaks
Energy Needs?	stores	releases

LT 1: Compare living things to determine the characteristics of living things

For each characteristic of life, write one example of an organism showing that trait.

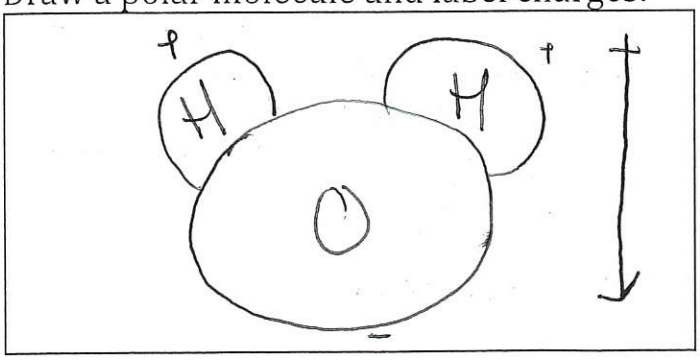
1. Growth and Change: Plants grow from a seed to a full plant
2. Maintain Homeostasis: Humans sweat when we are hot to regulate our temperature
3. Has a metabolism: When we eat our body breaks down our food and makes energy

LT 3: Describe polar and non-polar molecules and their properties

What is a polar molecule? Include example.

A polar molecule has a partially positive + partially negative end ex: water!

Draw a polar molecule and label charges:

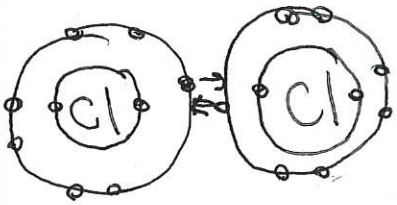


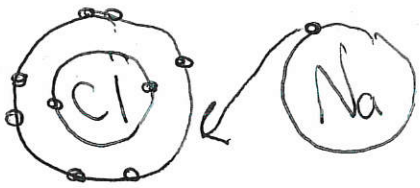
What type of bond involves polar molecules?

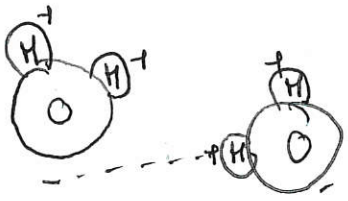
Hydrogen Bonds

LT 2: Describe the chemical bonds and forces that bring atoms together

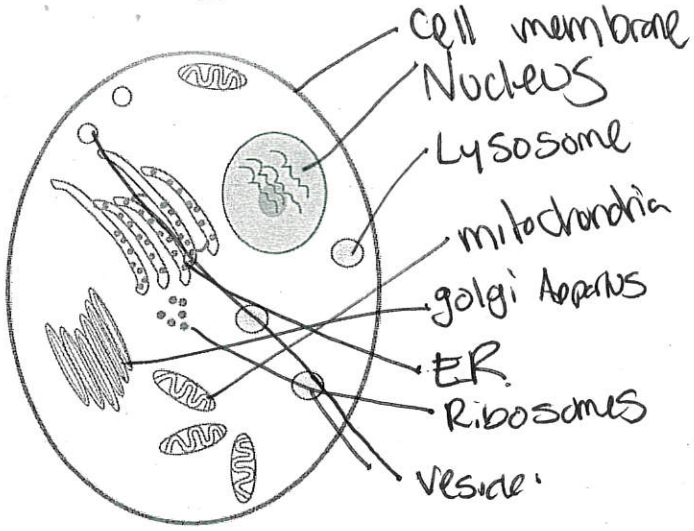
Complete the following tables for bond types

Covalent Bonds	
How do the atoms interact?	Atoms share electrons
Picture or Example	

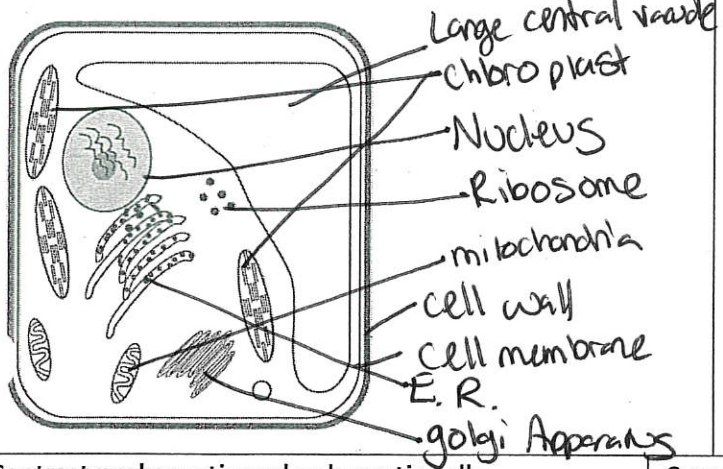
Ionic Bonds	
How do the atoms interact?	Atoms give/take electrons
Picture or Example	

Hydrogen Bonds	
How do the atoms interact?	weak bond between polar molecule (+ → −)
Picture or Example	

Label the following picture of an animal cell:



Label the following picture of a plant cell:



Word Bank: Nucleus, Nucleolus, Golgi Apparatus, Ribosome, Cytoplasm, Endoplasmic Reticulum, Vacuole, Vesicle, Lysosome, Chloroplast, Mitochondria, Cell Membrane, Cell Wall, DNA

1. Controls movement of materials into and out of the cell = Cell membrane
2. Site of cellular respiration. Releases energy stored in the molecule glucose = mitochondria
3. ~~Site of ribosome production~~ = ~~nucleolus~~
4. Site of Protein Synthesis = ribosome
5. Cellular package containing products, such as finished proteins = vesicle
6. Controls the cell's activities/Contains the genetic material = nucleus
7. Modifies and packages proteins = E.R.
8. Transports and finishes proteins and other biological molecules: golgi apparatus
9. Removal of wastes; digestion of biological molecules= lysosome
10. Fluid portion of the cells outside the nucleus that contains organelles = cytoplasm
11. Provides support and protection for plant cells = cell wall
12. Site of Photosynthesis; stores energy in the molecule glucose = chloroplasts
13. Instructions for making proteins = DNA
14. Stores materials until needed by the cell = vacuole

Contrast prokaryotic and eukaryotic cells

	Prokaryotes	Eukaryotes
Example	Bacteria	Plants + Animals
Size	Small	Big
Simple or Complex	Simple	Complex
DNA is...	Free	in Nucleus
Membrane bound organelles?	Nope	Yes!

Write it out:

____, whereas _____. While ____, ____.

Compare and contrast bacteria, plant, and animal cells

	Bacteria	Plant	Animal
DNA	X	X	X
Nucleus		X	X
Cytoplasm	X	X	X
Cell Wall		X	
Cell Membrane	X	X	X
Ribosomes	X	X	X
Mitochondria		X	X
Nucleolus		X	X
Lysosome			X
Chloroplast		X	
Large Central Vacuole		X	
Golgi Apparatus		X	X
E.R.		X	X

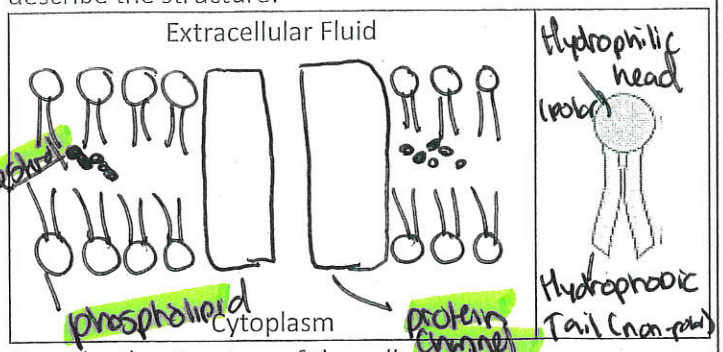
Write it out:

= All cells have

= Unique to plants

= Unique to Animals

Draw the cell membrane, including all important parts, label the parts of one phospholipid molecule and describe the structure:



Describe the structure of the cell membrane:

_____

_____

_____

_____

_____

_____

The cell membrane is best described as _____, which means that _____. Phospholipids are arranged so that _____ and _____.

Compare and contrast simple diffusion, facilitated diffusion and active transport:

	Simple Diffusion	Facilitated Diffusion	Osmosis
Is energy Required?	no	no	no
Moves which type of molecules (Large, Water, Small)	Small molecules	Large molecules	water
Moves through (phospholipids or transport proteins)	phospholipids	transport proteins	BOTH

Write it out: _____

_____

_____

_____

_____

A common feature of ____, ____ and ____ is ____. ____ whereas, ____. While ____, ____.

Why do all cells need a cell membrane?

_____

- Protect cell

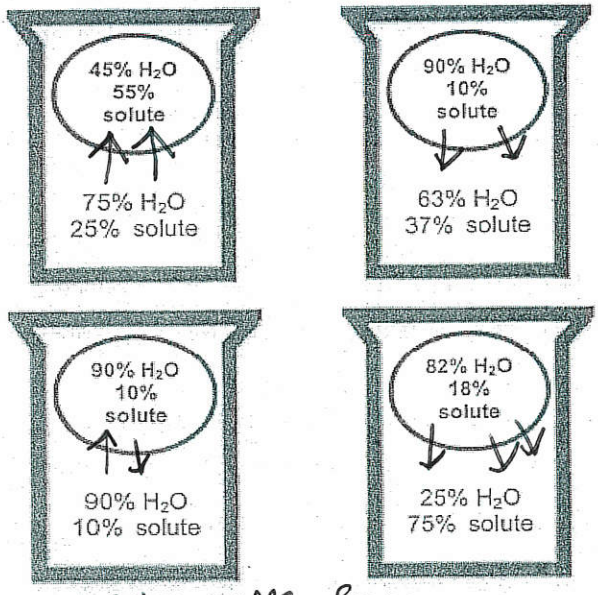
_____

- Regulate what comes in and out

Contrast Passive and Active Transport

	ACTIVE	PASSIVE
ENERGY REQUIRED?	yes	no
High→Low OR Low→High	Low→high	high→low

Predict the movement of water into or out of the cell by drawing arrows on the pictures below.



Water moves from High → Low

Explain how osmosis works in a cell to maintain homeostasis. Use evidence from your lab for support.

_____

Homeostasis = Body keeping stable state

_____

Osmosis = movement of water from high to low concentration.

_____

Cells will move water across membrane from high→low in order to keep equilibrium.

Use: Homeostasis can be defined as _____. One example of homeostasis is _____. During this process _____. We saw this in our lab when _____.

State the purpose of photosynthesis. Convert light energy into Chemical energy Stored in glucose

Write the balanced photosynthesis equation (Chemical Reaction)

$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} 6O_2 + C_6H_{12}O_6$

Carbon Dioxide + Water → oxygen + glucose

Identify the reactants essential requirements, and products of photosynthesis (mark X in box)

Hint: not all molecules will be marked off

Molecule	Reactant	Essential Requirement	Product
Glucose			X
Carbon Dioxide	X		
Oxygen			X
Sunlight		X	
Water	X		
Chlorophyll		X	
ATP			

State the purpose of cellular respiration: Convert glucose (chemical energy) into cellular energy in the form of ATP

Write the complete, balanced Cellular Respiration equation (Chemical Reaction)

$C_6H_{12}O_6 + 6O_2 \longrightarrow 6CO_2 + 6H_2O + ATP$

glucose + oxygen → carbon dioxide + water + energy

Identify the reactants and products of cellular respiration. (mark X in box)

Hint: Not all molecules will be checked.

Molecule	Reactant	Essential Requirement	Product
Glucose	X		
Carbon Dioxide			X
Oxygen	X		
~~Sunlight~~			
Water			X
~~Chlorophyll~~			
ATP			X

Identify the cellular organelle and human structures involved in cellular respiration

In which cellular organelle does cellular respiration take place? mitochondria

Explain how oxygen gets to cells for respiration:

O_2 enters through respiratory system. 1. through trachea to lungs 2. diffuses into blood through alveoli 3. pumped by heart to cells in body

Explain how Glucose gets to the cells for respiration:

Glucose enters through the digestive system 1. Food broken down into glucose 2. Diffuses into blood through small intestine 3. Pumped by heart to cells

How does the circulatory system work to support CR?

How is this an example of homeostasis?

your heart beats faster when you need more energy (ATP) ex. (after exercise) to get reactants O_2 + glucose to the cells for cellular respiration. This maintains a stable state (homeostasis)

Identify the cellular organelle and plant structures involved in photosynthesis.

In which cell organelle does photosynthesis take place? Chloroplast

Which cells contain chlorophyll and are the location of photosynthesis? mesophyll cells

Through which structure does CO_2 and O_2 travel? stomata

Water? xylem vessels

Sunlight? waxy cuticle and upper epidermis

Explain how plant structures help to get the reactants and ~~products~~ essential requirements to the cells for photosynthesis.

1. CO_2 enters through stomata
2. H_2O enters through xylem vessels
3. Sunlight enters through waxy cuticle + upper epidermis
4. Chlorophyll located in mesophyll cells

2E3: Contrast photosynthesis and cellular respiration.

	Photosynthesis	Cellular Respiration
Which Organisms do it? (plants/animals/both)	Plants	Both!
Reactants	carbon Dioxide + water	glucose + oxygen
Products	glucose + oxygen	Carbon Dioxide + water (ATP)
Cell Organelle	Chloroplast	mitochondria
Anabolic or Catabolic? (Energy stored or released)	Anabolic (energy stored)	Catabolic (energy released)

Vocabulary

Stem Cells: template cell that can be differentiated into a specialized cell (i.e. nerve cell, bone cell, etc.)

Cell Differentiation: Process of stem cell becoming specialized

Specialized Cell: A cell that serves a specific function

-Ex: Blood cells, muscle cells, nerve cells, + more!

Tissue: A group of cells that work together

Hierarchy of Life

Smallest

- Atom
- molecule
- macromolecule
- organelle
- CELLS
- tissue
- organ ~~System~~
- organ system
- organism

Biggest

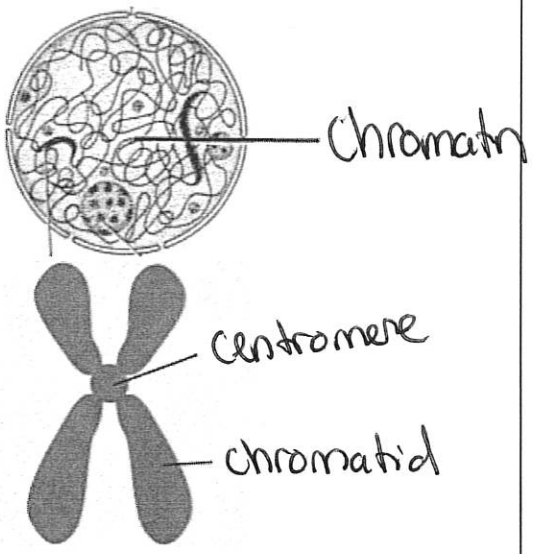
Explain why stem cell research can be helpful:

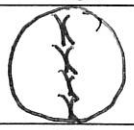
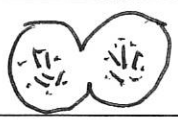
- Test medicines + new therapies
- research on development
- create tissues + organs for replacement of damaged organs

Explain why stem cell research can be controversial:

- need fertilized eggs / embryos to develop
  - ↳ some believe that you are taking an unborn life when you get stem cells

Label the chromosome below



Name of Step	Picture of Cell	Describe what is happening
INTERPHASE		• Cell grows • DNA Replicates (makes a copy)
Prophase		• Chromatin (DNA) condenses into Chromosomes (nucleus dissolves)
Metaphase		• Chromoses line-up along the center-line
Anaphase		Chromatids pull apart to either side of cell
Telo phase		-Cell begins to split into 2 • nucleus forms around chromosomes