Part 2 Biogeochemical Cycles

Name:

Part 2 Lesson 1 Biogeochemical Cycles Water Cycle

Biogeochemical Cycles.

Bio =_____

Geo =_____

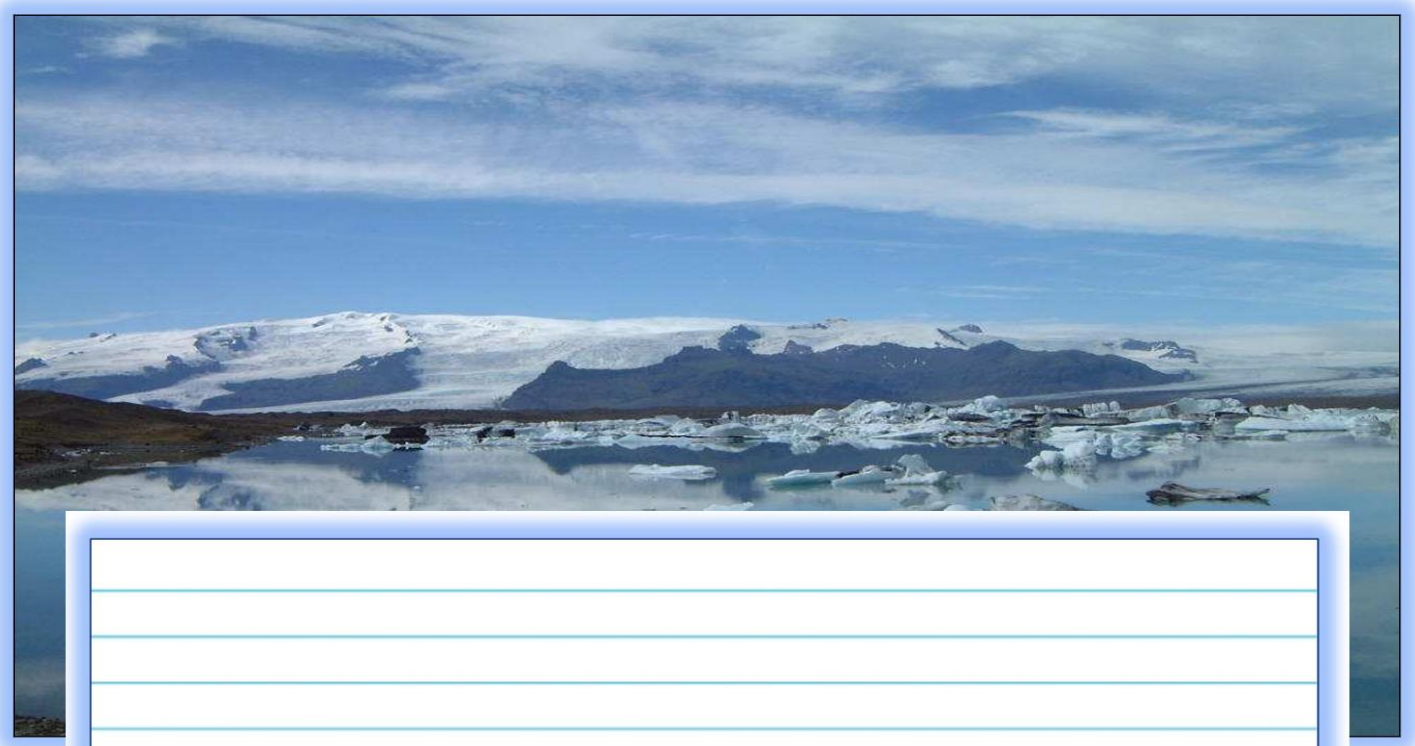
Chemical =Changes in _____

Cycles = _____ event, full turn.

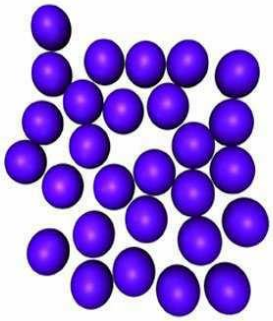
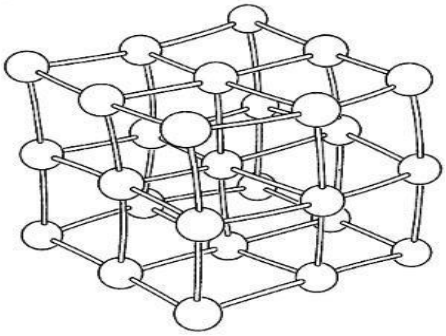
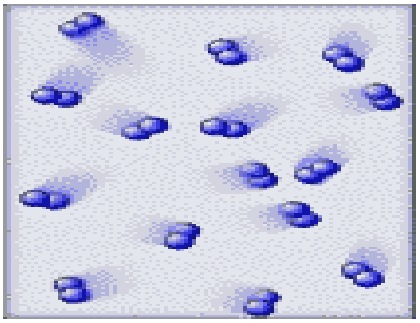
A general theme for all of the biogeochemical cycles we will study.

They go from the _____ world (biotic) to the _____-living (abiotic).

What's so special about the image below? It's a big deal!

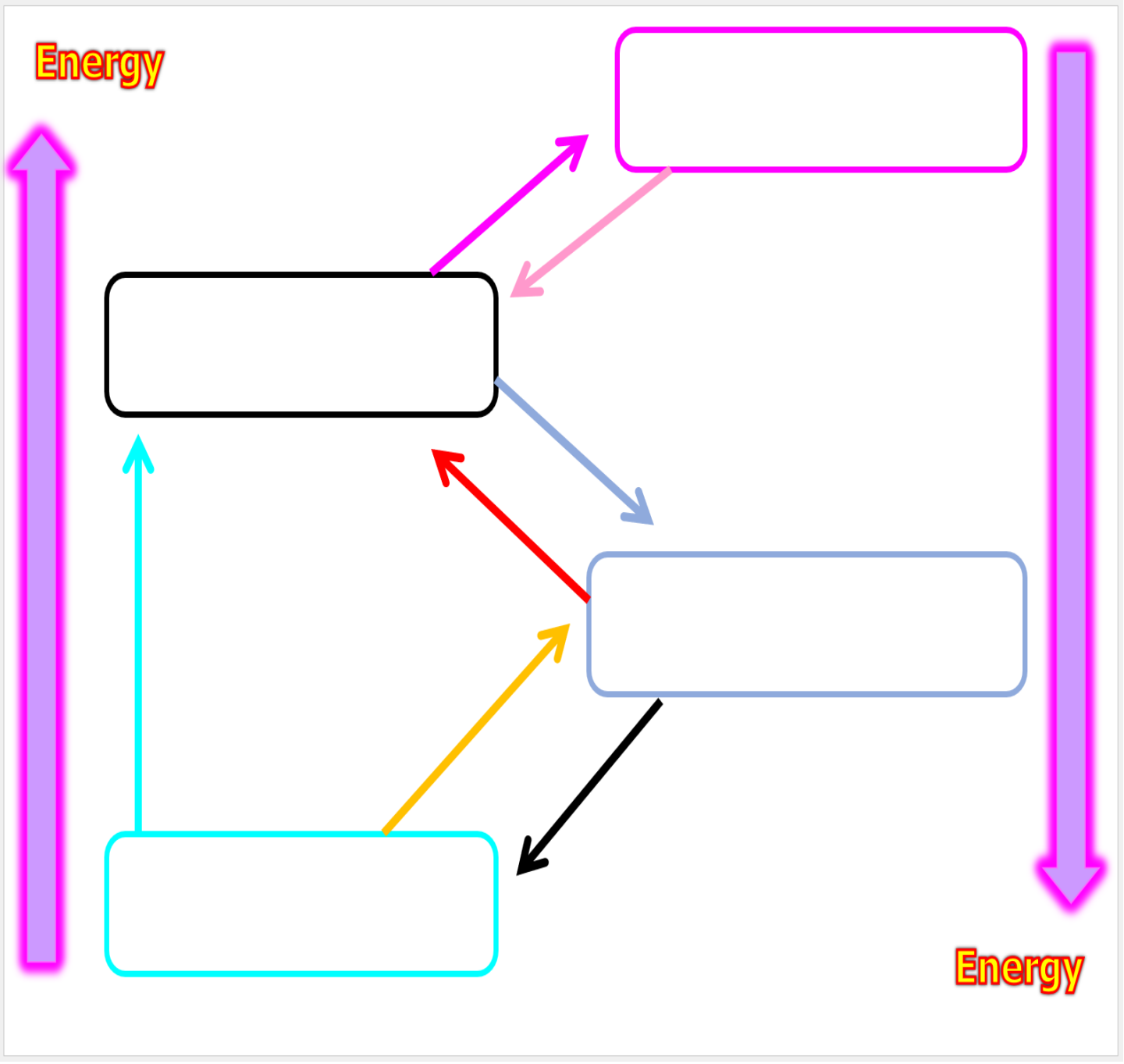


Name each state of matter on a molecular level. (Solid, Liquid, Gas)

 Semi Ordered	 Called a crystal _____	

		Moving fast!
True or False? On earth water exists in all three states of matter?	True or False? The lower density of ice causes it to float?	True or False? The oceans and atmosphere move heat around the planet?

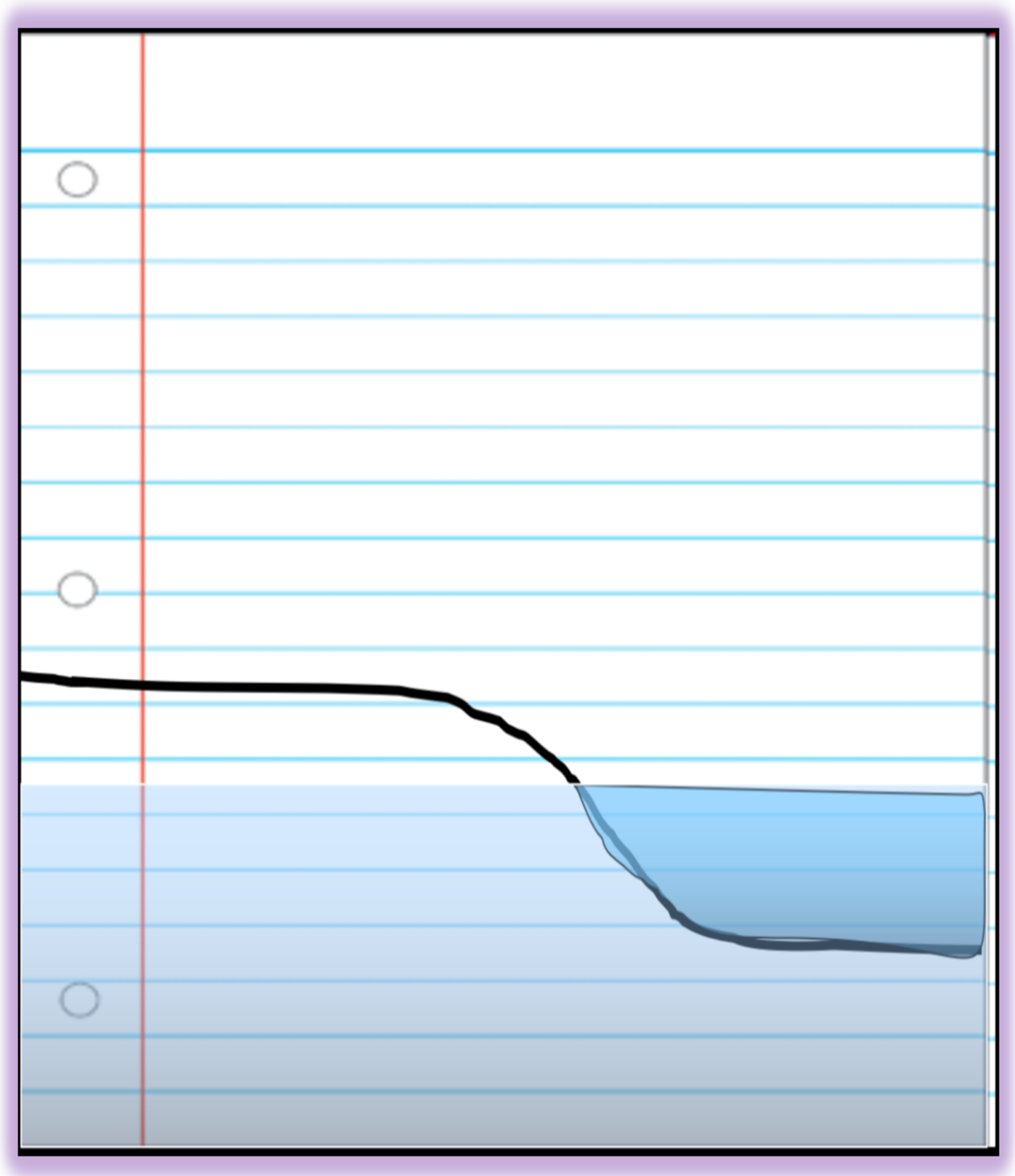
The Water Cycle also known as the hydrologic cycle
Driven by the _____ and _____.



Lesson #2 The Water Cycle

The hydrologic cycle (Water Cycle): The continuous movement of water _____, _____, and _____ the surface of the earth.

Please complete the diagram below on the water cycle as described in the slideshow



Evaporation – Substance changes from a _____ state to _____ state (requires energy).

Condensation – Water vapor (gas) turns back to a _____. (energy removed from the system /cold) -cloud formation.

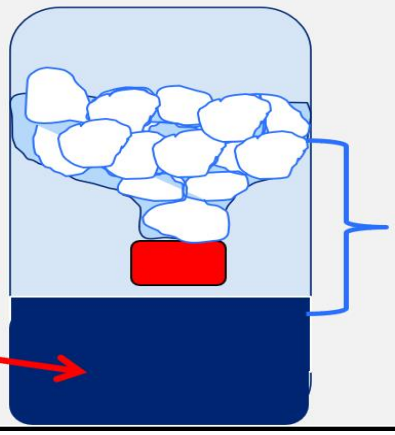
Why did condensation droplets form on the cold soda can?

- Where did the water come from?

Precipitation – Water that is so heavy it _____ as liquid / solid.

Soda bottle cut by teacher, then flipped, and filled with ice cubes by students.

Next fill bottle with very warm water and food coloring.



Observe water cycle and record observations

Part 2 Lesson #3 Water Cycle Continued

Sublimation – Solid state turns directly to a _____ state skipping liquid phase.

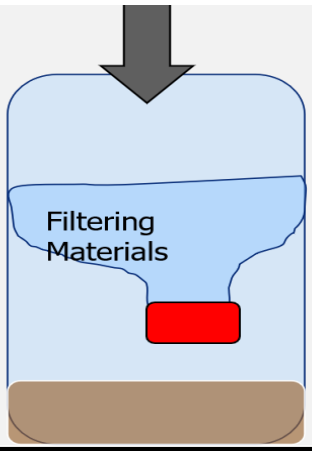
Evapotranspiration – Water released by _____ into air.
Non-living to the living, and back again.

Observations of Evapotranspiration. Did it work? Was water observed inside the bag? Did it work? Why or why not?

Surface run-off: The water flow which occurs when soil is full to capacity and excess water travels over the _____.

Percolation: The slow movement of water through the _____.

Soda bottle cut by teacher or parent, invert the top like so. Add cap
Your group must brainstorm methods to filter water, bring in the materials as a group and assemble tomorrow.

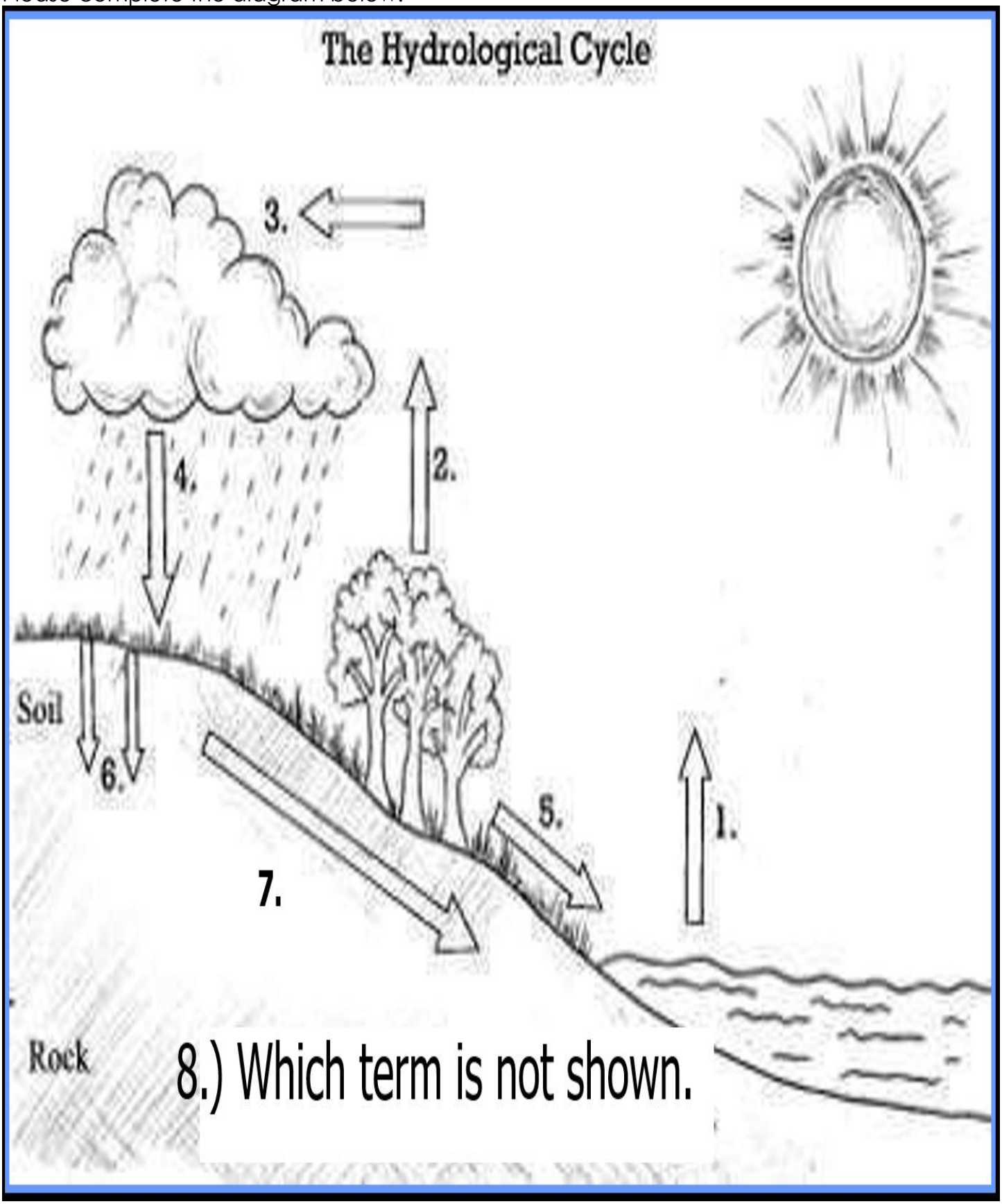


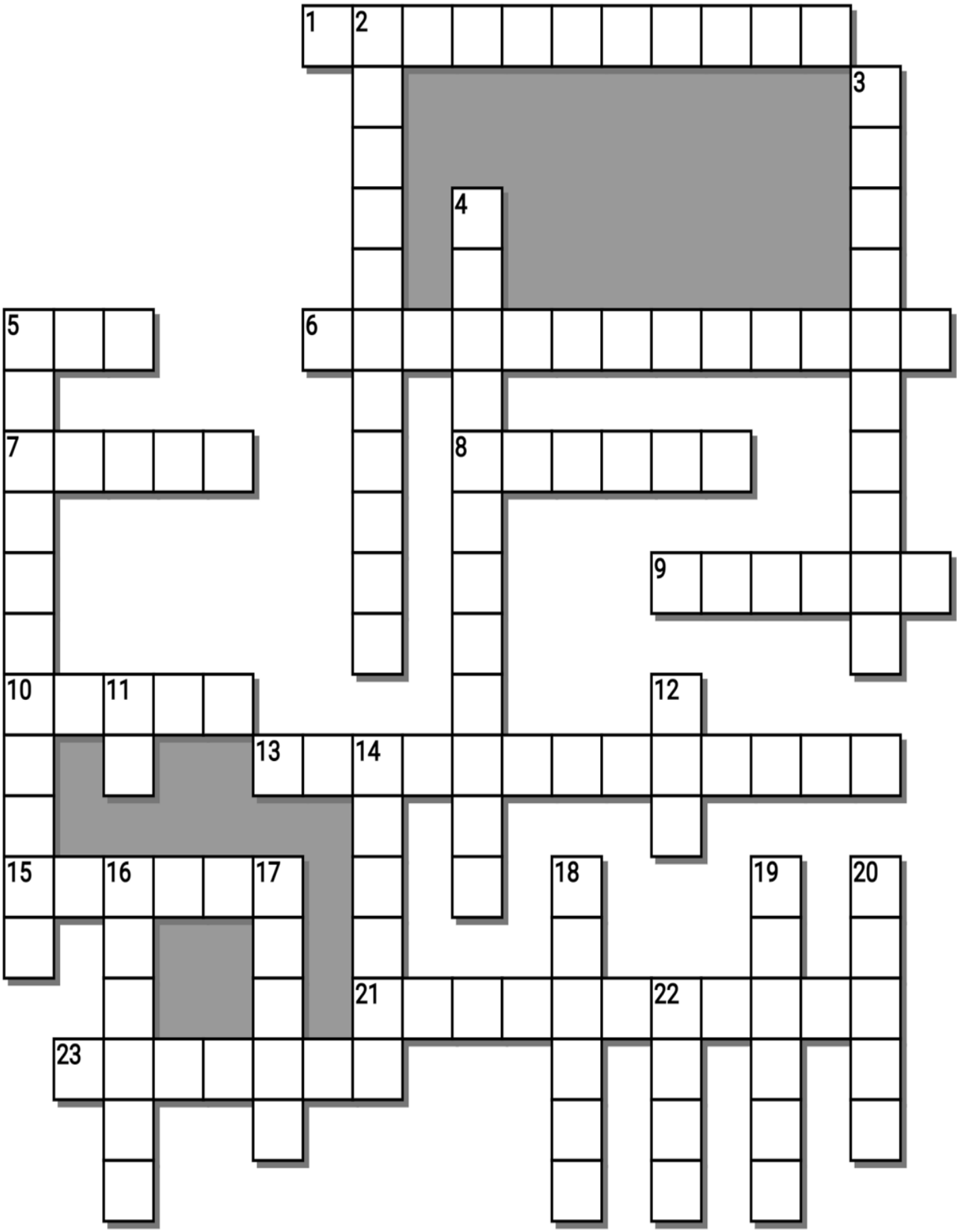
Teacher is going to create nasty water with coffee grounds, garlic powder, and vegetable oil, and salt.
Teacher will add dirty water to the top.

Were you able to get the water clear? Did it work? Why or why not? What did you use?

Groundwater discharge: Water that has been _____ seeps back into the oceans, or into rivers or lakes.

Please complete the diagram below.

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Across

1. The slow movement of water through the soil. Cleans and purifies.
5. The Water Cycle is driven by the _____ and Gravity
6. Water released by plants into air. Non-living to the living, and back again.
7. The hydrologic cycle (Water Cycle): The continuous movement of water on, above, and _____ the surface of the earth.
8. The Water Cycle, Cycles Matter and _____ around the planet.
9. Has definite volume but not shape.
10. The hydrologic cycle (Water Cycle): The continuous movement of water on, _____, and below the surface of the earth.
13. Water that is so heavy it falls as liquid / solid.
15. Most of the water on planet earth (Collection) is stored in the _____ (97%)
21. _____ discharge: Water that has been underground seeps back into the oceans, or into rivers or lakes.
23. The Water Cycle is driven the Sun and _____?

Down

2. Substance changes from a liquid state to gas state (requires energy).
3. The Water Cycle is often called the _____ Cycle
4. Water vapor (gas) turns back to a liquid. (Energy needs to be removed) Cloud formation.
5. Solid state turns directly to a gas state skipping liquid phase.
11. The hydrologic cycle (Water Cycle): The continuous movement of water __, above, and below the surface of the earth.
12. No definite shape or volume.
14. You need to add this to get water to evaporate
16. You need to take this away from water in its gas phase to turn it into a liquid
17. Has a definite shape and volume
18. Surface ___-___: The water flow which occurs when soil is full to capacity and excess water travels over the land.
19. The Water Cycle, Cycles _____ and Energy around the planet
20. Water on Earth exists in all _____ states of matter
22. The _____ is driven by the uneven heating and cooling on planet earth (from the sun) and moves moisture around the planet.

--------Teacher can remove this word bank to make more puzzle more challenging----------

Possible Answers

ABOVE, BELOW, CONDENSATION, ENERGY, ENERGY, ENERGY, EVAPORATION, GAS, GRAVITY, GROUNDWATER, HYDROLOGIC, LIQUID, MATTER, OCEANS, ON, PERCOLATION, PRECIPITATION, RUN-OFF, SOLID, SUBLIMATION, SUN, THREE, TRANSPIRATION, WIND

Water Cycle Quiz Game

Name:

1-20 = 5 pts Lesson 4 and Answers Lesson 5 Due: Today

*20-*25 * = Bonus + 1 pt,

(Secretly write owl in correct space +1 pt) Score ____ / 100

Final Question = 5 pt wager

STATE YOUR MATTER	WET WILLY	AROUND AND AROUND	MOVING AND GROOVIN	CLOUD LIKE Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

Final Question Wager ____/5 Answer: _____

_____

Part 2 Lesson 6 Carbon Cycle

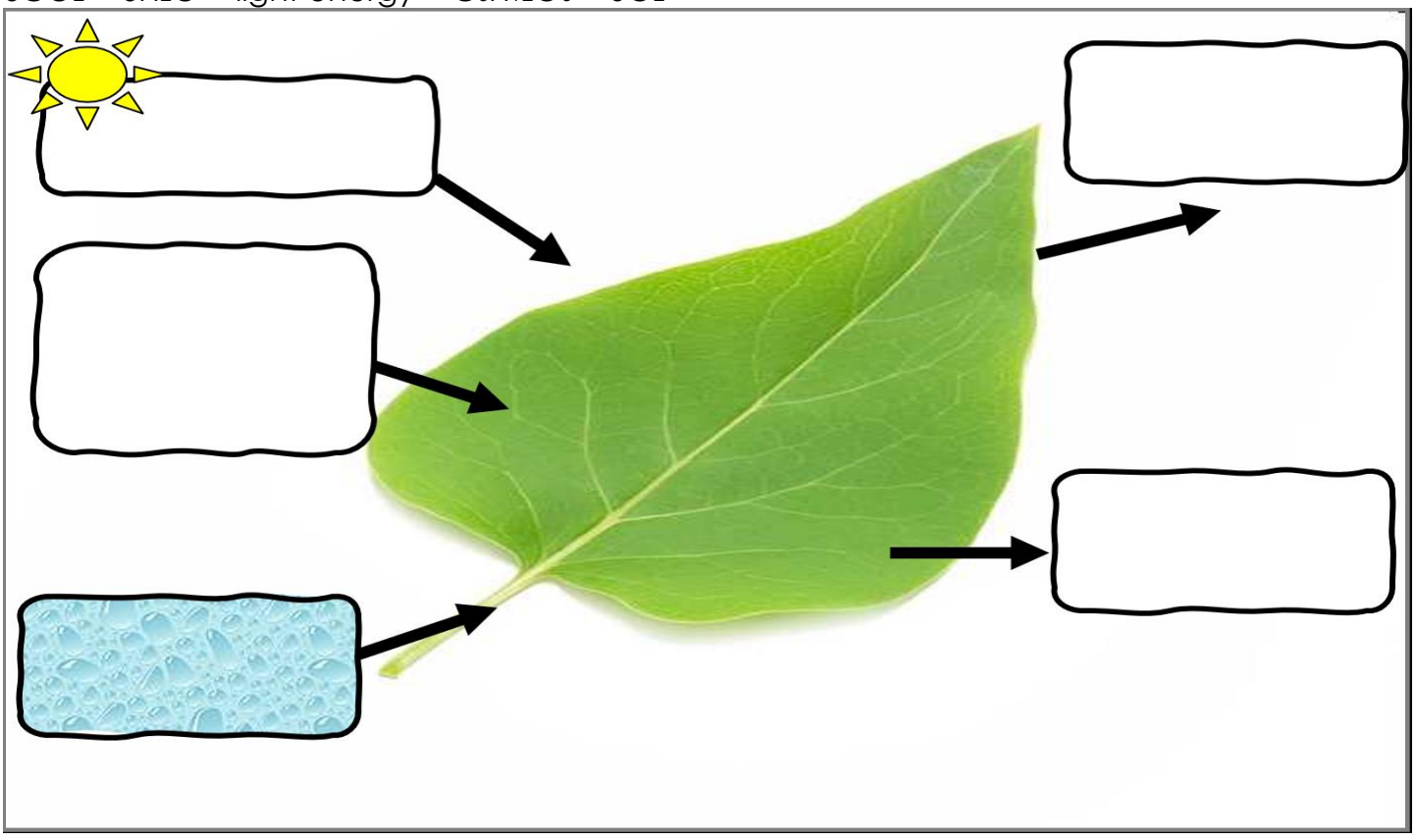
_____ Cycle: The circulation of carbon into organisms (biotic) and back again (abiotic). Atmosphere, Land, Water, Oceans.

The energy flow of _____ occurs because of plants. Plants harness the energy from the _____ , and pass it on to all other life forms.

Photosynthesis – Plants make sugar from _____. Light energy is turned into _____ energy (sugars – carbon based).

Which of the following statements is false of photosynthesis? and the answer is… A.) Photosynthesis requires sunlight, carbon dioxide, and water. B.) Oxygen and glucose are produced in photosynthesis. C.) Carbon Dioxide and water are produced. D.) In photosynthesis, plants use radiant energy from the sun to create chemical energy in the form of sugars. E.) None of the above.	Which of the following equations is true of photosynthesis? $6O_2 + C_6H12O_6$ Energy → $6CO_2 + 6H_2O$ $C_6H_{12}O_6 + 6O_2$ → Energy + Chloroplasts. $6O_2 + 6CO_2 + 6O_2$ → Energy + $C_6H_{12}O_6$ $6CO_2 + 6H_2O$ + Energy → $C_6H_{12}O_6 + 6O_2$ $6O_2 + 6CO_2$ + → Energy + $C_6H_{12}O_6 + 6O_2$ Energy + $6H_2O$ → Energy + $6O_2 + 6CO_2$ $CO_2 + 3H_2O$ + Energy → $C_6H_{12}O_6 + O_2$ $6CO_2 + 6H_2O$ → Energy + $6CO_2 + 6O_2$ Energy → $6O_2 + C_6H_{12}O_6 + 6CO_2$

$6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$



Part 2 Lesson 7 Photosynthesis Continued

Photosynthesis is the process by which light energy is utilized to convert _____and _____ into food to be used by plants.

_____ is released into the air during the process. (O_2) Waste

Light or solar energy is captured by _____ (CHLOR-oh-phil), the green pigment in leaves.

It is then converted into _____ energy which is stored as starch or sugar. These starches and sugars are stored in roots, stems and fruits. They are available to the plant as food or fuel.

Photosynthesis

-Produces _____ from energy.

-Occurs only in cells with _____.

-_____is produced. Waste Product

-_____ is used.

-Carbon _____ is used.

-Occurs in _____.

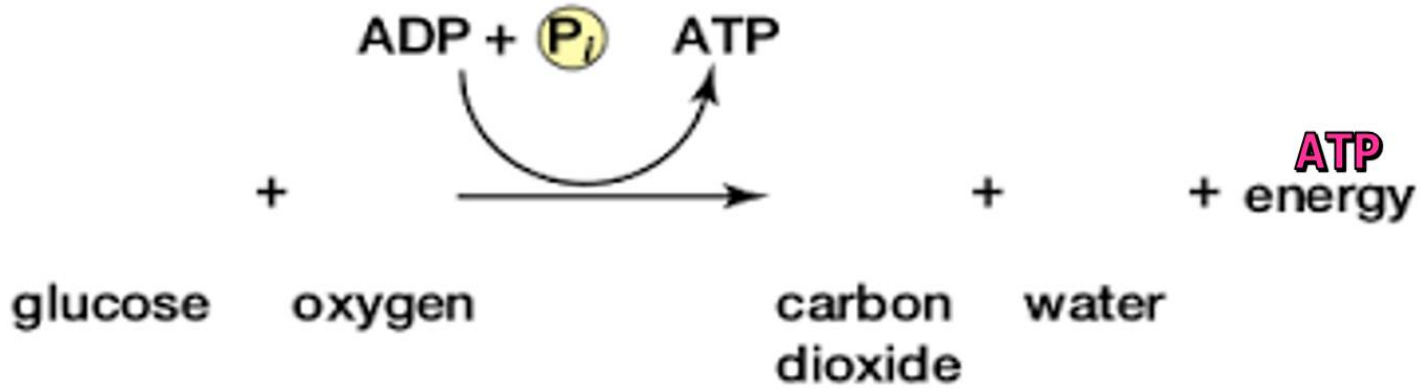
Part 2 Lesson 8 Cellular Respiration

Cellular Respiration: Processes whereby certain organisms obtain _____ from organic molecules.

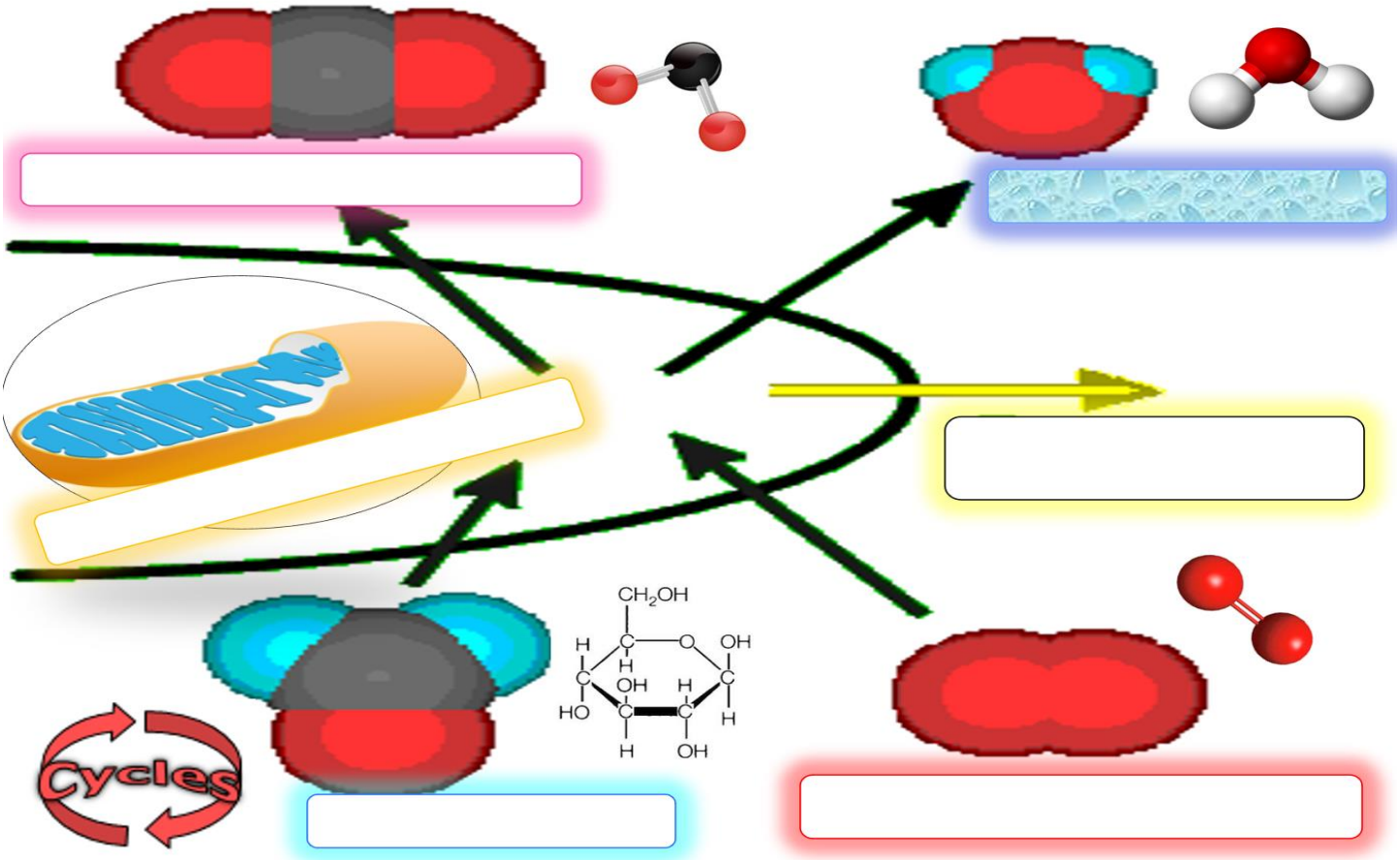
Side Note About Food: Food's macronutrients undergo chemical breakdown as they move through the digestive system.

Which of the following is correct for the respiration equation. $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ CO_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6H_2O + energy$ $6\ CO_2 + 6H_2O\ \ C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy	Which of the following is correct for the respiration equation. $6\ O_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ O_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 + 6H_2O + C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy $6O_2 + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 6H_2O + energy\ (ATP)$

Cellular Respiration



Please fill-in the missing terms as described in the slideshow. Word Bank: Mitochondria, Energy (ADP+P to ATP), Carbon Dioxide (CO_2), Water (H_2O), Oxygen (O_2), Glucose/Sugar $C_6H_{12}O_6$



Cellular Respiration

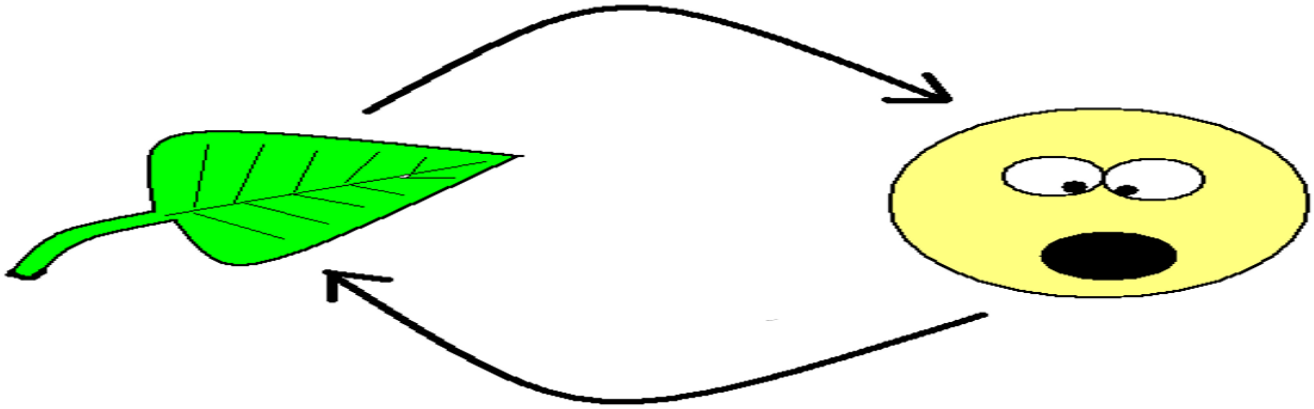
-Burns _____ for energy.
-Energy is _____. ADP+P to ATP
-Occurs in most _____.
-_____ is used.
-_____ is produced.
-_____ dioxide produced. "Waste Product"
-Occurs in _____ and _____.

Part 2 Lesson 9 Respiration Wrap Up, CO_2 O_2 Balance

The carbon dioxide oxygen _____.

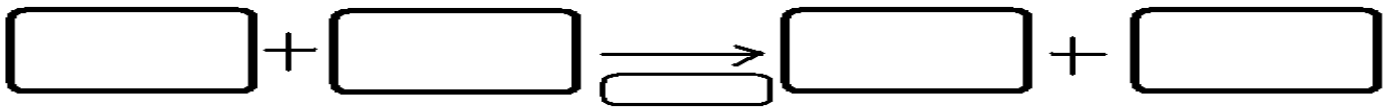
-The plant uses _____ and produces _____ during photosynthesis.

-Animals use _____ and produce _____ during cellular respiration.



The _____ acid cycle is a series of chemical reactions used by all aerobic organisms to generate energy.

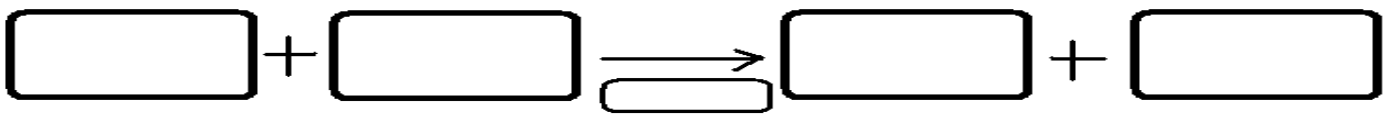
Requires the oxidation of _____—derived from carbohydrates, fats, and proteins—into carbon dioxide.



Which of the following is the correct equation for photosynthesis?

1 A) $6O_2 + 6H_2O$ + light energy = $C_{12}H_6O_6 + 6O_2$
2 B) $6CO_2 + 6H_2O$ + sugar = $C_6H_{12}O_6 + 6O_2$
3 C) $6CO_2 + 6O_2$ + light energy = $C_6H_{12}O_6 + 6H_2O$
4 D) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6H_2O$
5 E) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$

Write out the equation for **<u>cellular respiration</u>** in the boxes below.

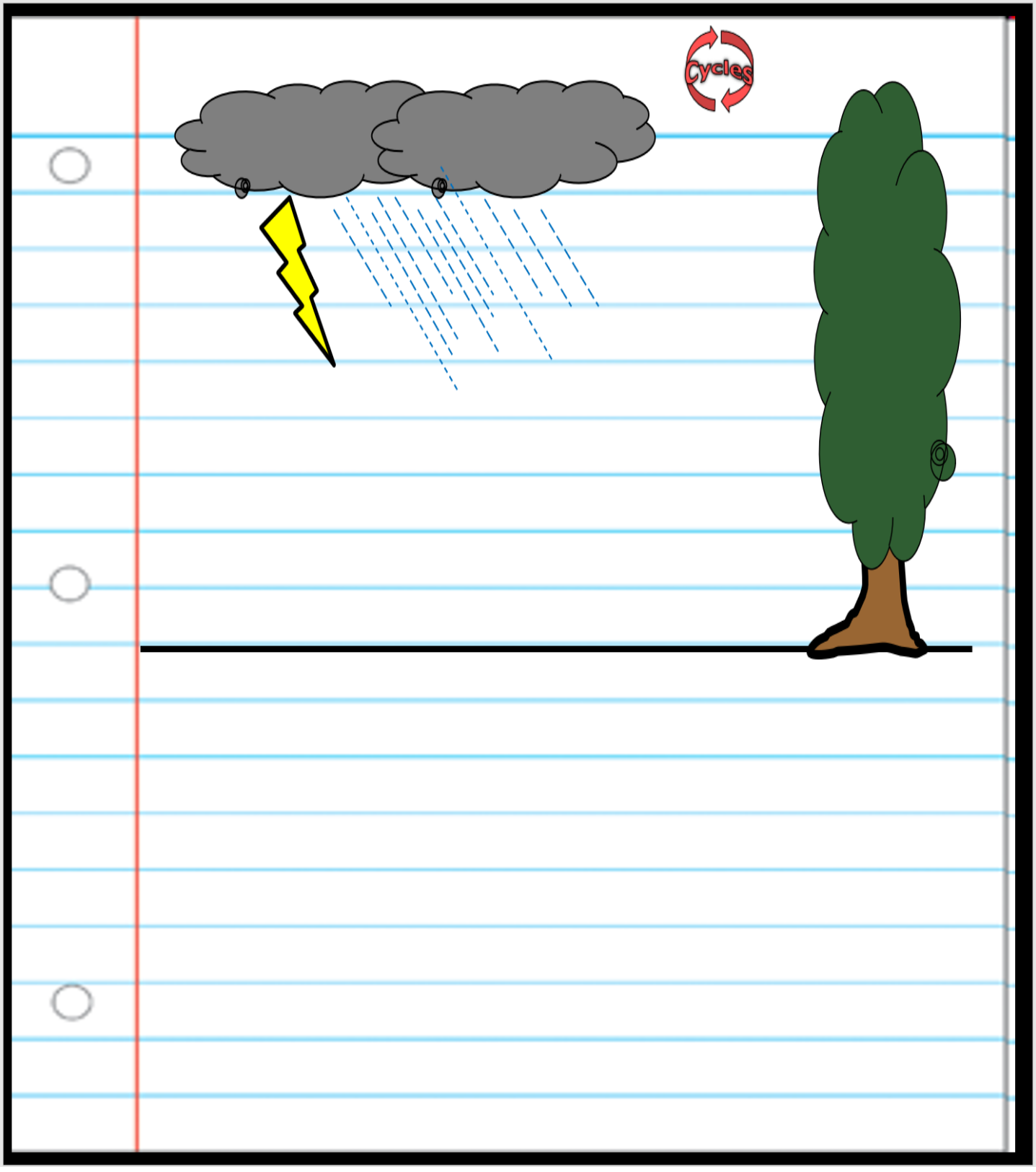


Which of the following is the correct equation for cellular respiration?

1 A) $C_6H_{12}O_6 + 6H_2O$ = Released energy + $6CO_2 + 6H_2O$.
2 B) $C_6H_{12}O6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
3 C) $C_6H_{12}O_6 + 6O_2$ = Released energy + $6O_2 + 6H_2O$.
4 D) $C_{12}H_6O_6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
5 E) $C_6H_{12}O_6 + 6CO_2$ = Released energy + $6O_2 + 6H_2O$.

Part 2 Lesson 10 Nitrogen Cycle

Nitrogen Cycle: The circulation of nitrogen; _____from the _____, absorbed by _____, eaten by _____ that die and decay _____ the nitrogen back to the soil.



Nitrogen in _____ is inert (N_2 Gas) which is not reactive. (Can't use)
_____on plant roots convert nitrogen in atmosphere into
nitrate ions (NO_3^-) (NO_2-)
ammonia (NH_4)

Nitrogen fixing bacteria in the soil and on the root nodules of plants can _____ the nitrogen.
- Fix means change its form so a plant can use it.

Plants can now use this _____ to get the nitrogen they need to build proteins so they can grow, repair, and reproduce.

All life requires nitrogen-compounds, e.g., proteins and nucleic acids.
Animals get their nitrogen from eating _____ or eating _____that ate plants.
Eventually, plants and animals _____. Ammonia (NH_3) / Decay / Waste

When plants and animals die.
Nitrifying bacteria _____ the nitrogen in their tissues. (Nitrites NO_2)
_____nitrifying bacteria can also change the NH_3 Nitrate back to N_2 Nitrogen gas

When the nitrogen is denitrified, it then bonds with another nitrogen to form inert N_2 gas in the _____ until the cycle repeats.

Part 2 Lesson 11 Nitrogen Cycle Review

All life requires nitrogen-compounds, e.g., proteins and nucleic acids.
Air, which is _____% nitrogen gas (N_2), is the major reservoir of nitrogen.
But most organisms _____ use nitrogen in this form.
Plants must secure their nitrogen in "_____" form, i.e., incorporated in compounds such as:
- nitrate ions (_____)
- ammonia (_____)
- urea (_____)2CO

Animals secure their nitrogen (and all other) compounds from plants (or animals that have _____ on plants).

Four processes participate in the cycling of nitrogen through the biosphere:
-Nitrogen _____: Break apart N_2 so it can join to other atoms and be used.
-Plants with the help of bacteria take up nitrogen.
-Decay and _____ passes on nitrogen
-Denitrification: Nitrogen returned to the _____ by bacteria.
- Happens with poor soil management.

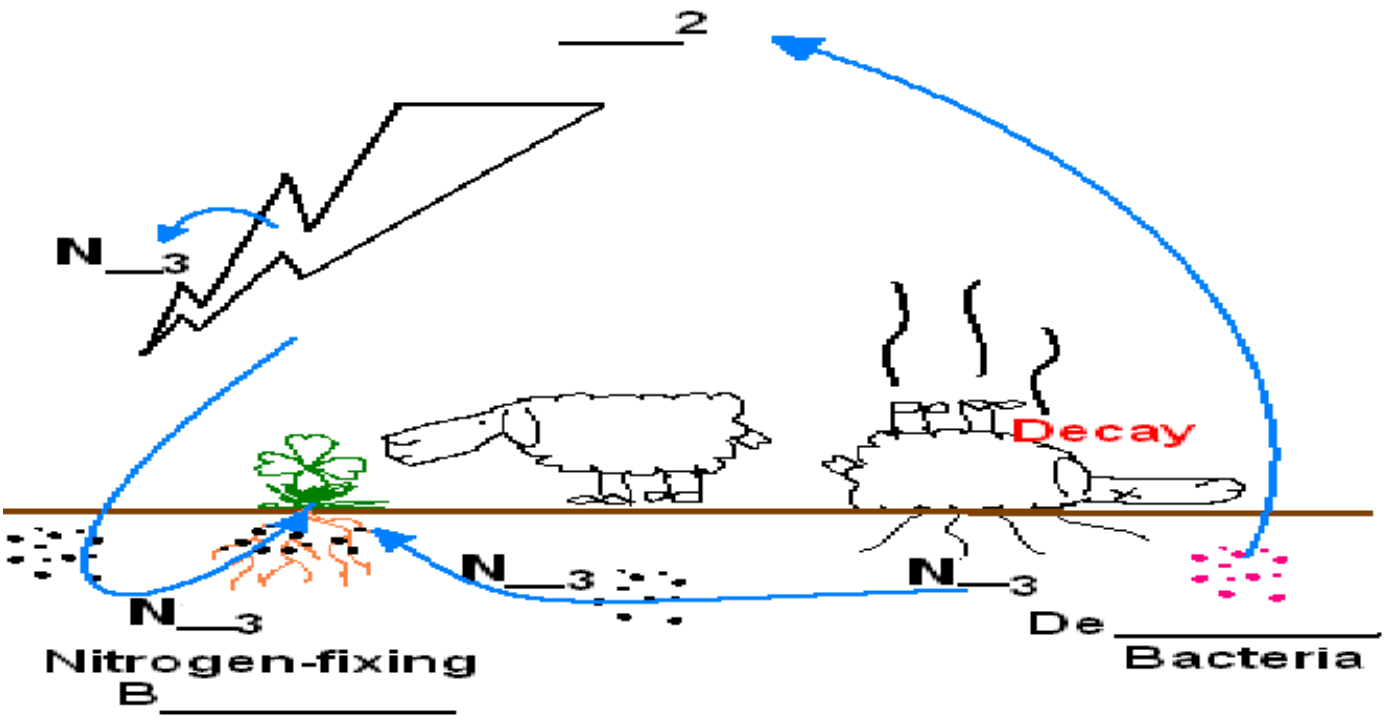
Manmade _____ also puts nitrogen into the soil. (Ammonia NH3)
- Excess / poor management of nitrogen can result in pollution.

Nitrogen in atmosphere is inert (N_2 Gas) which is not reactive. (Can't use)
- Bacteria on plant _____ convert nitrogen in atmosphere into
  - nitrate ions (NO_3^-) (NO_2-)

- ammonia (NH_4)

Which is a bogus statement below? Four processes participate in the cycling of nitrogen through the biosphere. A.) Nitrogen fixation: Break apart N2 so it can join to other atoms and be used. B.) Decay: Passes on through eating / waste. C.) Plants with the help of bacteria take up nitrogen. D.) Denitrification: Nitrogen is removed from air.	Which is a bogus statement below? Four processes participate in the cycling of nitrogen through the biosphere. A.) Nitrogen fixation: Break apart NO3 so it can join to other atoms and be used. B.) Decay: Passes on through eating / waste. C.) Plants with the help of bacteria take up nitrogen. D.) Denitrification: Nitrogen returned to the air.

Describe the nitrogen cycle below on the lines and fill in the blanks on the picture.



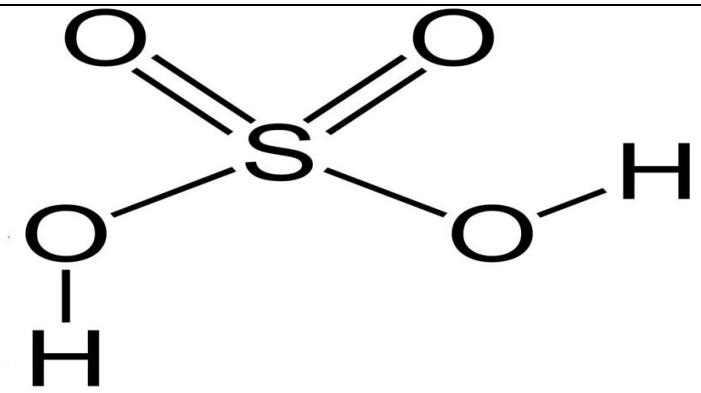
Part 2 Lesson 12 Acids and Bases (pH)

An acid is any hydrogen-containing substance that is capable of _____ a proton (hydrogen ion) to another substance.

Acidic substances are usually identified by their _____ taste. ... Acids are known to turn litmus _____.

A base is a molecule or ion able to _____ a hydrogen ion from an acid.

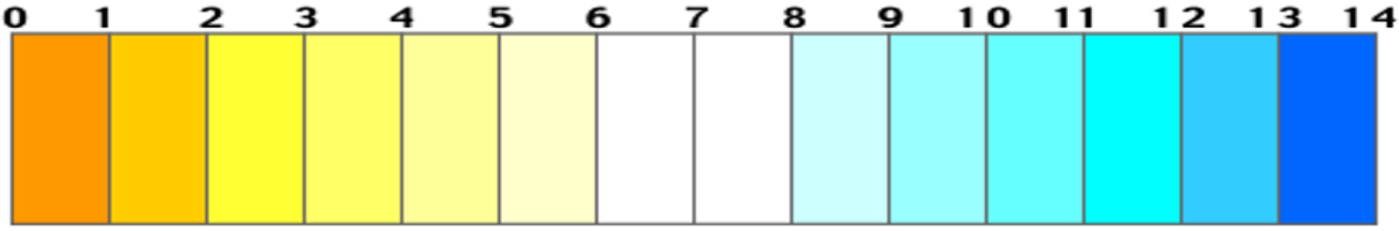
Which is the acid and which is the base?

 Answer=	 Answer=

Water in a pure state has a _____ pH.

Pure water is neither acidic or basic. It's considered neutral.

Provide some info on the pH scale below as described in the slideshow.

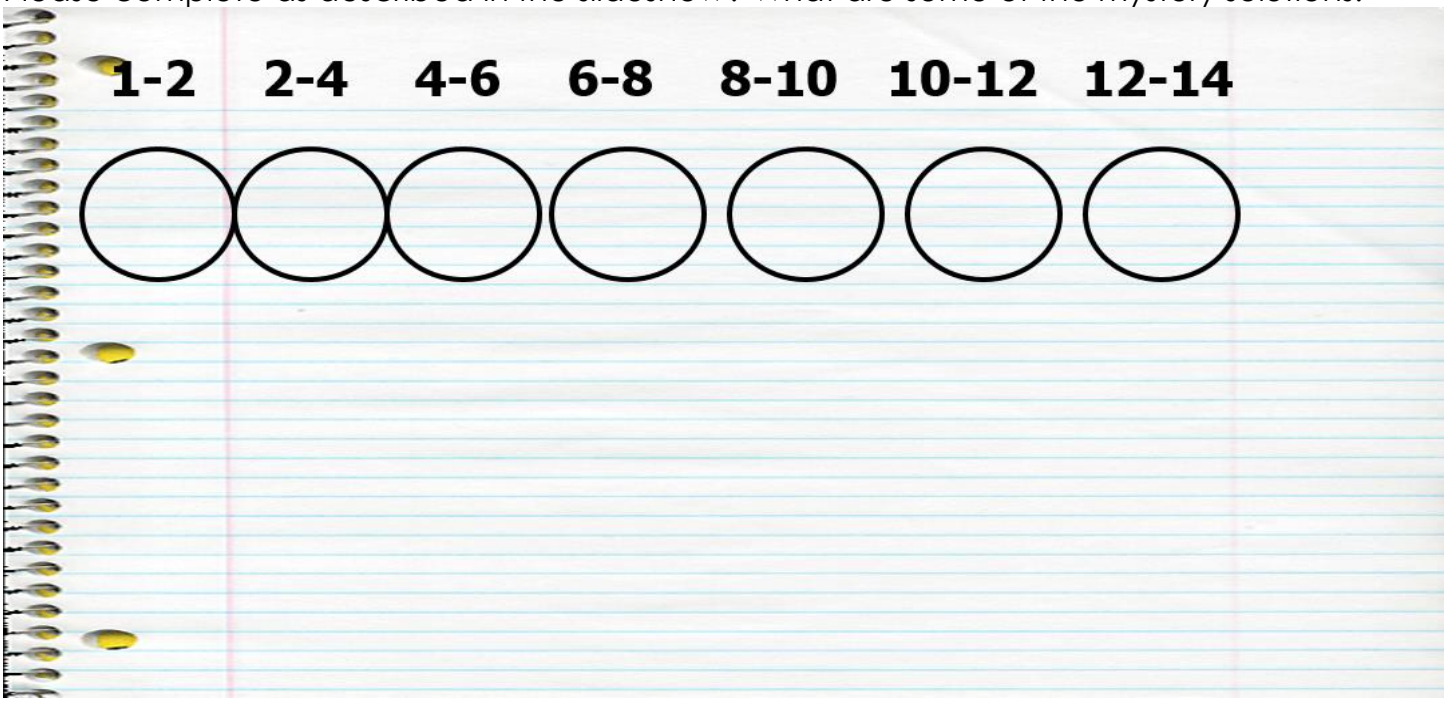


Use the diagram below to assist you in writing a short paragraph that describes the differences between acids and bases?

Which is an acid? And which is a base?

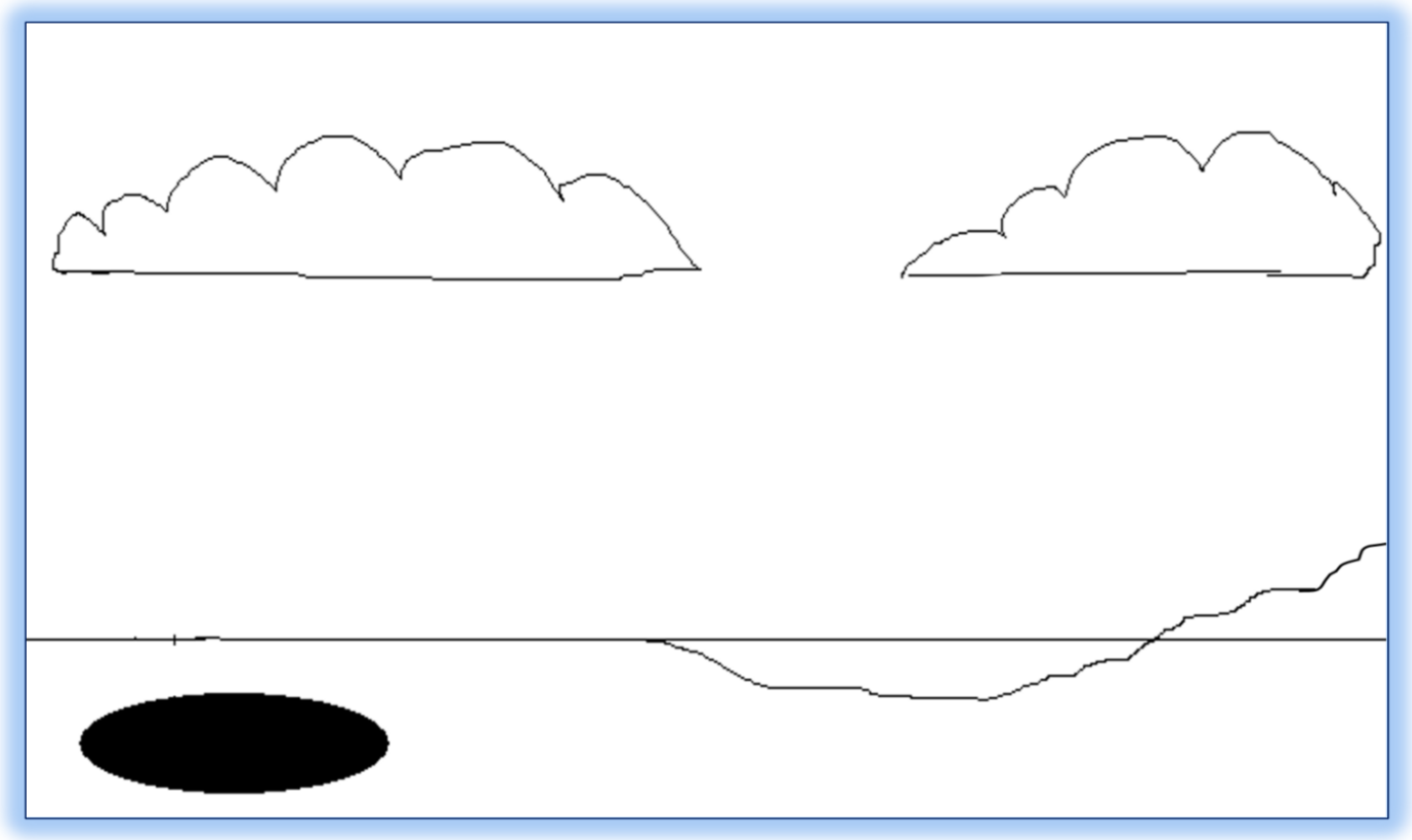
-A substance which when added to water produces hydroxide ions [OH^-]. -Turns litmus blue. -They react with most cations to precipitate hydroxides. -Taste bitter -Do not taste in the lab.	-A substance which when added to water produces hydrogen ions [H^+]. -React with zinc, magnesium, or aluminum and form hydrogen ($H_{2(g)}$). -React with compounds containing CO_3^{2-} and form carbon dioxide and water. -Turns litmus red. -Taste sour (lemons contain citric acid, for example). -Tasting Acids in the lab would be unsafe.

Please complete as described in the slideshow? What are some of the mystery solutions.



Part 2 Lesson 13 Acid Rain

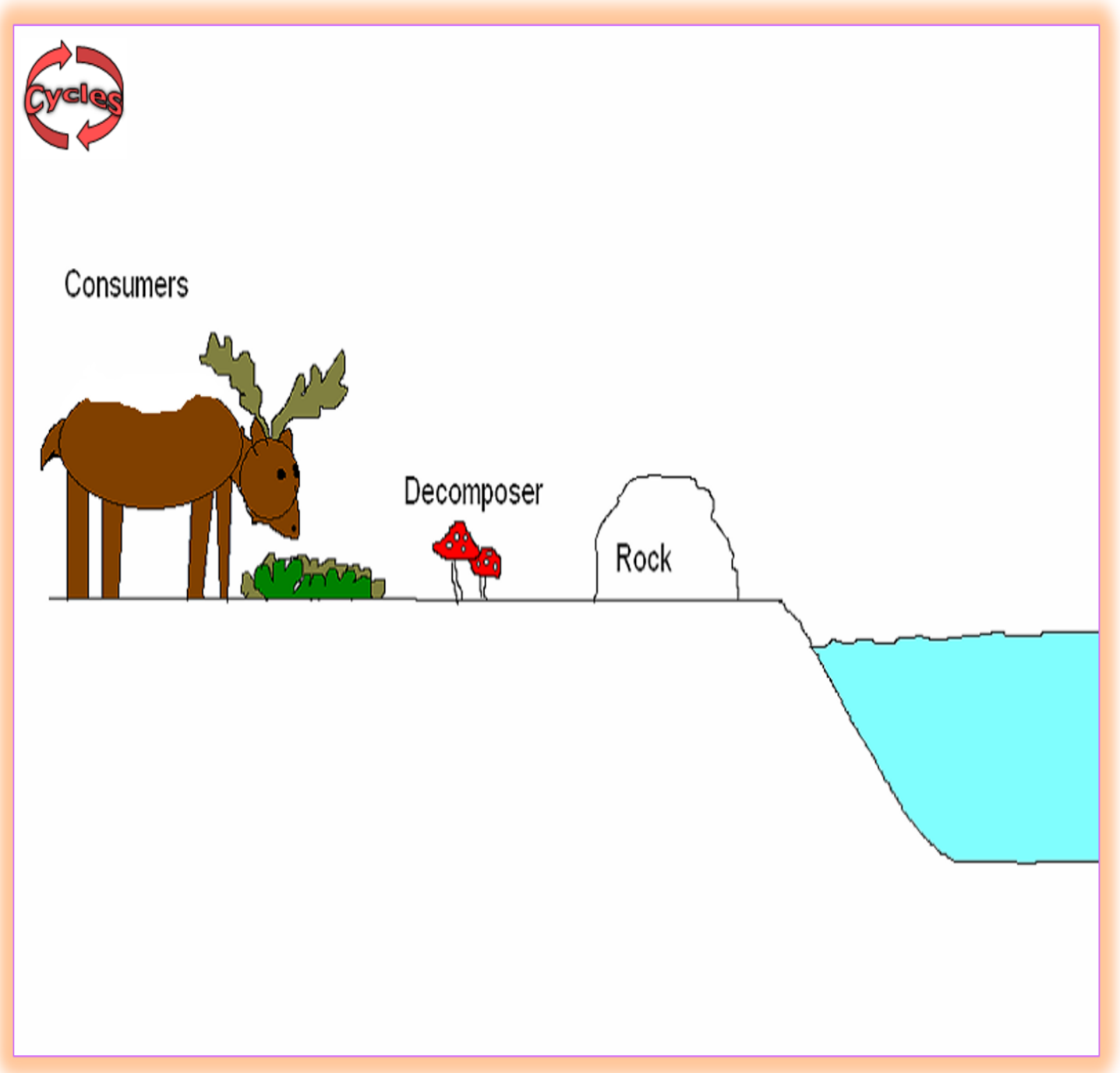
_____ is a rain or any other form of precipitation that is unusually acidic, meaning that it has elevated levels of hydrogen ions. It can have _____on plants, aquatic animals, and infrastructure. Please complete the chart below as described in the slideshow.



Part 2 Lesson 14 Phosphorous Cycle

_____cycle: The biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and ecosphere. (No _____!)

Complete the diagram of the phosphorous cycle as described in the slideshow below.



Importance of phosphorus

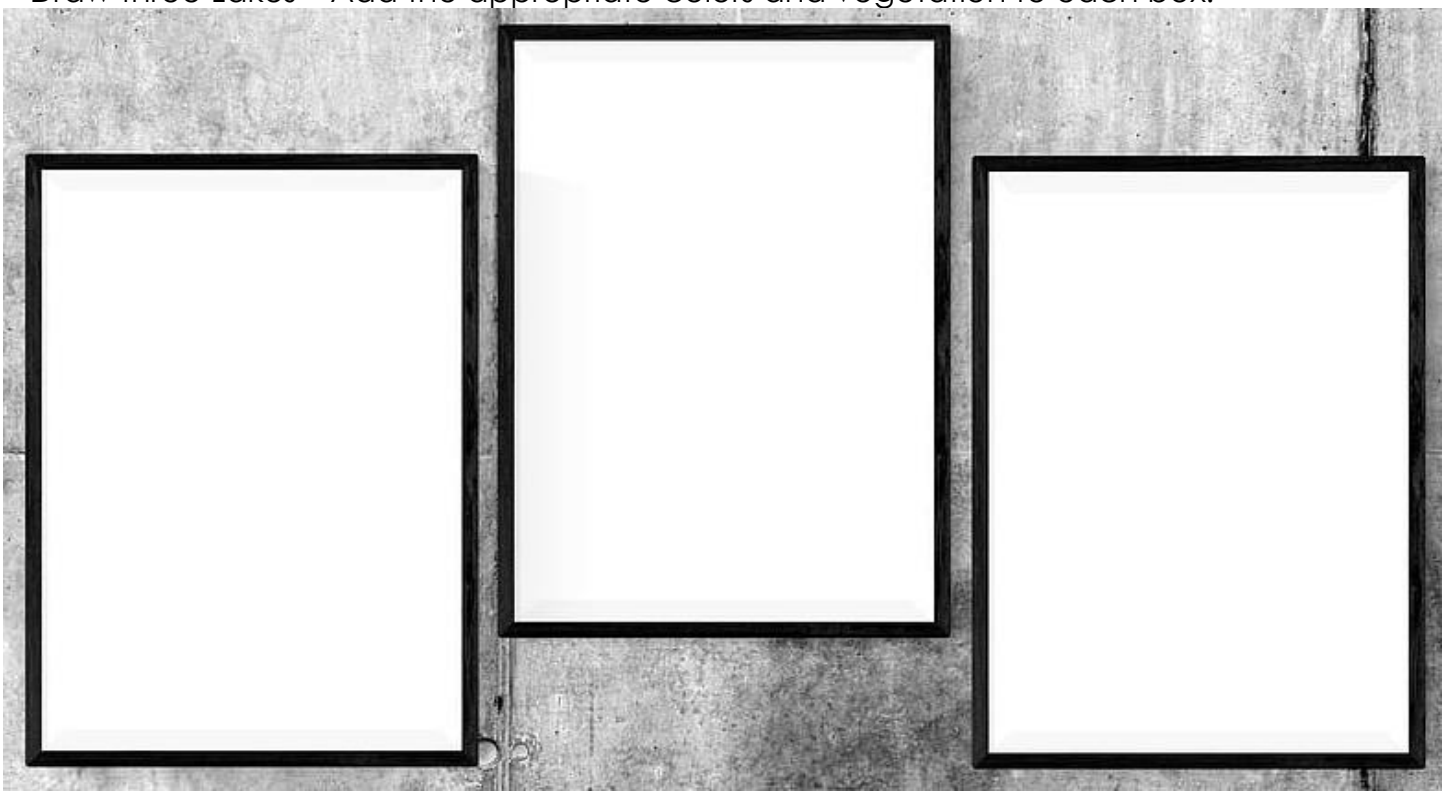
Important _____for plants and animals.
Part of _____ molecule in our cells.
In the fats of our cell membrane.
Part of our _____ and teeth.

Sketch the container

- Experiment from two weeks ago.
  - Please sketch what the four containers look like now.
  - What does fertilizer do to an aquatic system?

Control	Low	Medium	High

Draw three Lakes – Add the appropriate colors and vegetation to each box.



Olgiotrophic

Describes a lake or river with _____ productivity.

Mesotrophic

Production is considered _____.

Eutrophic

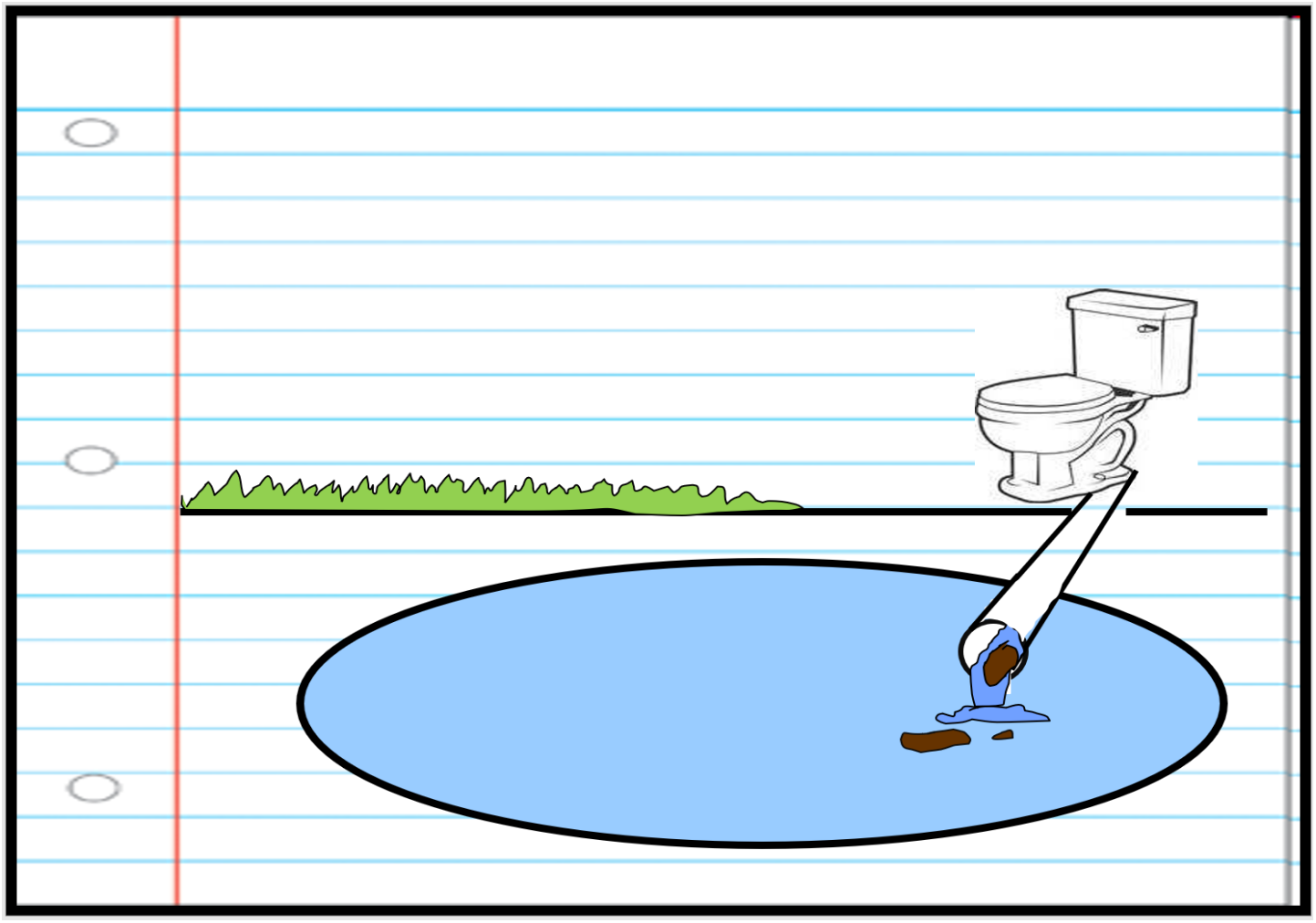
Having concentrations of nutrients optimal or for plant or animal _____. It is used to describe _____or soil solutions.

Which one is Olgiotrophic and which is Eutrophic?

Answer=	Answer=

Part 2 Lesson 15 Eutrophication

Please sketch below ad described in the slideshow.



Eutrophication

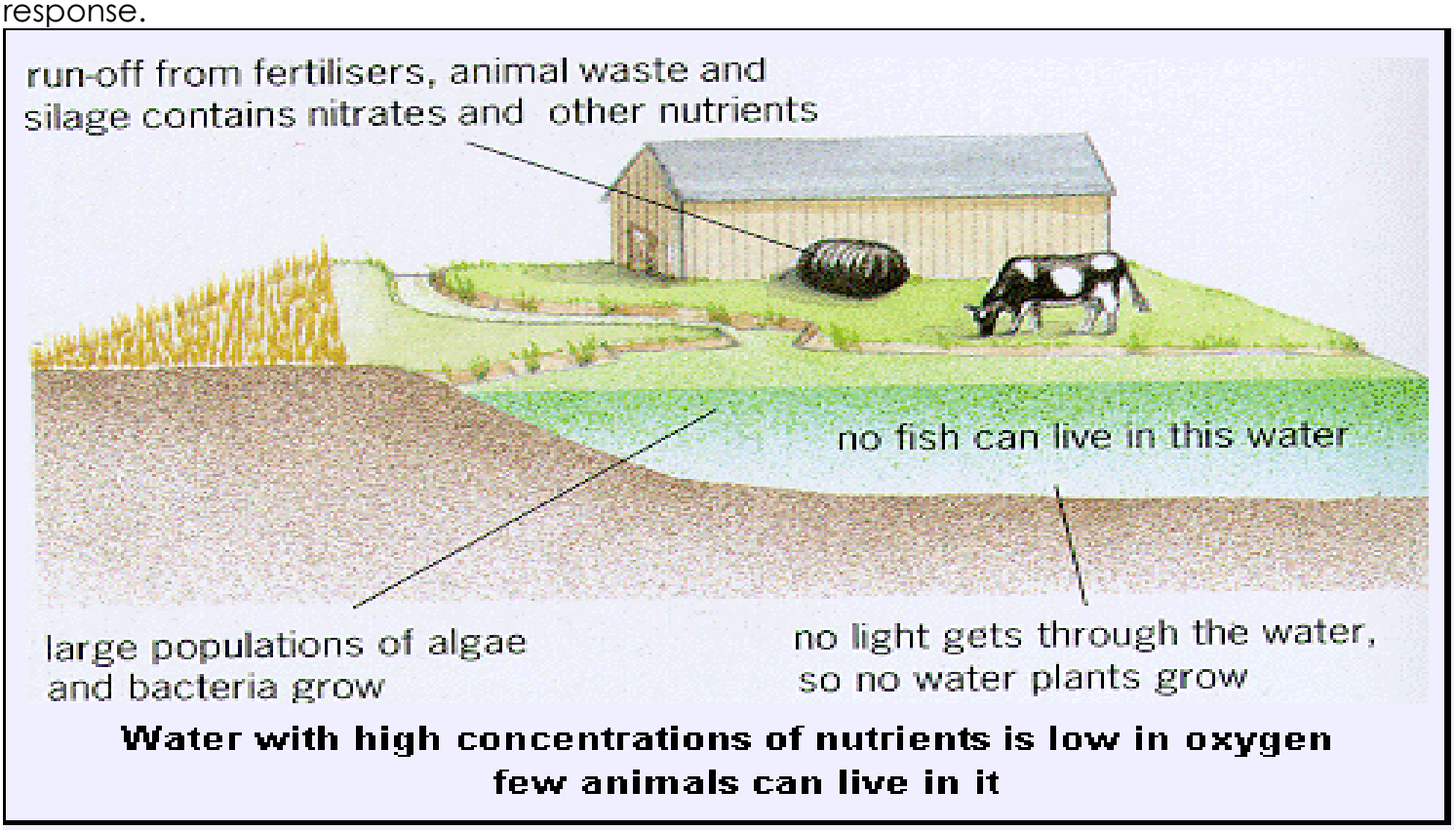
Aquatic plants use Phosphorus and Nitrogen and _____
Aquatic plants overpopulate and _____
Bacteria break down dead plants and use _____in water (respiration).
_____ oxygen left for fish / other aquatic life and they die.

Activity 1-10 – Olgiotrophic, Mesotrophic, or Eutrophic or Eutrophication

1)	2)	3)
4)	5)	6)
7)	8)	9)
10)	*11)	Score=

Please label the following pictures as olgiotrophic, mesotrophic, eutrophic, or eutrophication.

Please describe Eutrophication below. Use the pictures with text as a resource in your response.



Across

1. In chemistry, any substance that in water solution is slippery to the touch, tastes bitter, changes the colour of indicators (e.g., turns red litmus paper blue), reacts with acids to form salts, and promotes certain chemical reactions (base catalysis).
3. The Water Cycle also known as the _____ cycle
4. Nitrifying _____ break down the nitrogen in their tissues. (Nitrites NO2)
7. _____ Water Body: Having concentrations of nutrients optimal or for plant or animal growth. It is used to describe nutrient or soil solutions.
11. n ecology and Earth science, a _____ cycle is a pathway by which a chemical substance is turned over or moves through the biotic and the abiotic compartments of Earth
15. Water that is so heavy it falls as liquid / solid.
17. _____ Cycle: The circulation of carbon into organisms (biotic) and back again (abiotic). Atmosphere, Land, Water, Oceans.
18. The energy flow of life occurs because of _____. Plants harness the energy from the sun, and pass it on to all other life forms.
20. Evaporation – Substance changes from a liquid state to gas state (requires energy).
22. The process by which light energy is utilized to convert water and carbon dioxide into food to be used by plants.
24. Water vapor (gas) turns back to a liquid. (energy required/cold) -cloud formation.

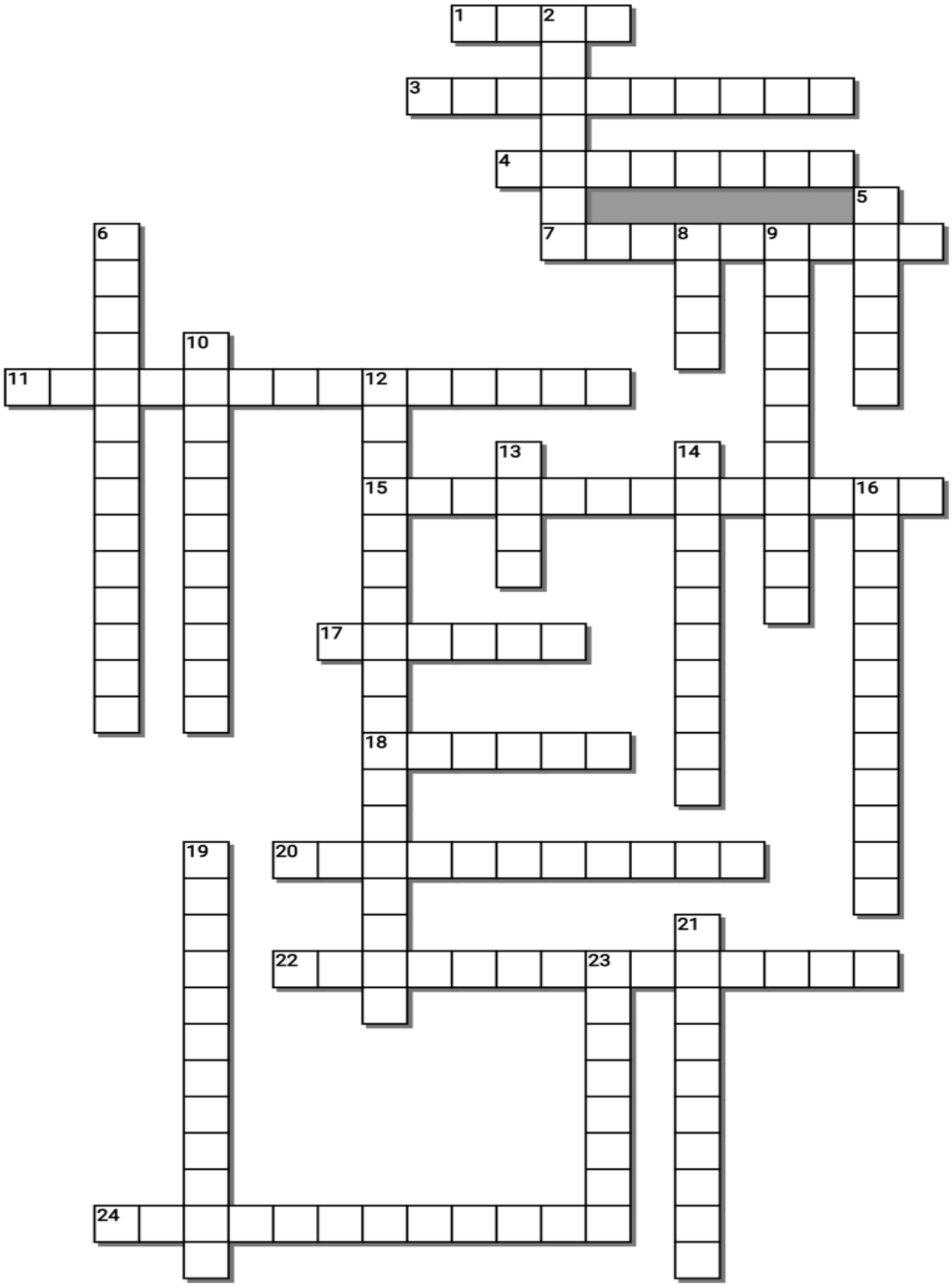
Down

2. _____ run-off: The water flow which occurs when soil is full to capacity and excess water travels over the land_.
5. Water can exist on earth as a solid, _____ , and gas.
6. This occurs with an excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.
8. Acid _____ is a rain or any other form of precipitation that is unusually acidic, meaning that it has elevated levels of hydrogen ions. It can have harmful effects on plants, aquatic animals, and infrastructure.
9. The slow movement of water through the soil.
10. Cellular _____: Processes whereby certain organisms obtain energy from organic molecules.
12. Evapotranspiration – Water released by plants and animals back into air.
13. A chemical substance that neutralizes alkalis, dissolves some metals, and turns litmus red; typically, a corrosive or sour-tasting liquid of this kind.
14. When the nitrogen is denitrified, it then bonds with another nitrogen to form inert N2 gas in the _____ until the cycle repeats.
16. Describes a lake or river with low productivity.
19. _____ bacteria can also change the NH3 Nitrate back to N2 Nitrogen gas
21. _____ cycle: The biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and ecosphere. (No Atmosphere)
23. _____ Cycle: The circulation of nitrogen; nitrates from the soil, absorbed by plants, eaten by animals that die and decay returning the nitrogen back to the soil.

----------teacher can remove this word bank to make puzzle more challenging----------

Possible Answers

ACID, BASE, CARBON, CONDENSATION, DENITRIFYING, EUTROPHIC, EUTROPHICATION, NITROGEN, OLGIOTROPHIC , PERCOLATION, PHOSPHORUS , PHOTOSYNTHESIS, PLANTS, PRECIPITATION, RAIN, RESPIRATION, SURFACE, ATMOSPHERE, BACTERIA, BIOGEOCHEMICAL, EVAPORATION, EVAPOTRANSPIRATION, HYDROLOGIC, LIQUID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Part 2 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Part 4 Lesson 16

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

WATER CYCLE	CARBON CYCLE	NITROGEN CYCLE	PHOSPHOROUS CYCLE	CYCLES Bonus round 1 pt each
1)	6)	11)	16)	*21)
2)	7)	12)	17)	*22)
3)	8)	13)	18)	*23)
4)	9)	14)	19)	*24)
5)	10)	15)	20)	*25)

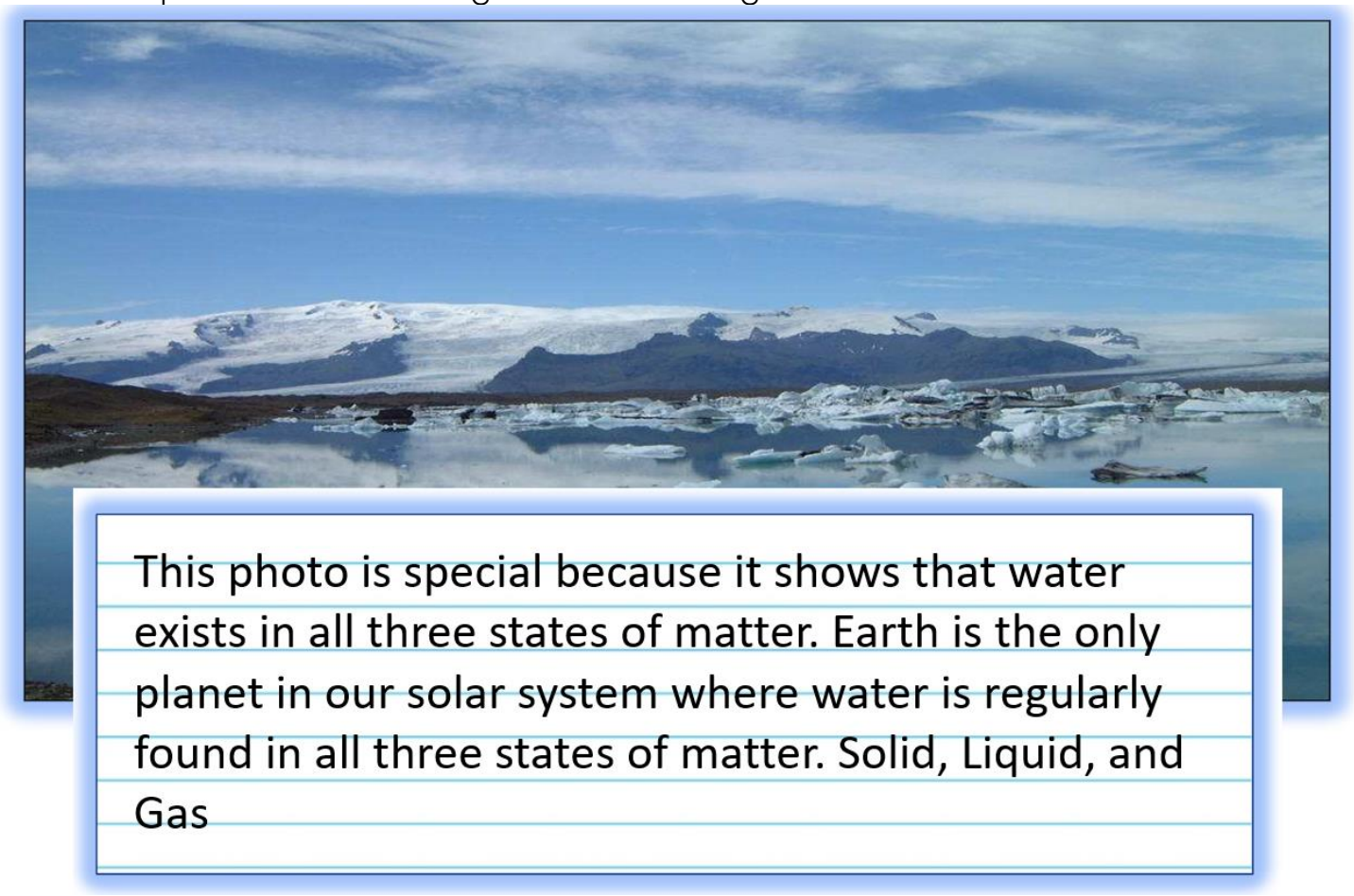
Final Question Wager ___/5 Answer: _____

Part 2 Biogeochemical Cycles

Name:

Part 2 Lesson 1 Biogeochemical Cycles Water Cycle

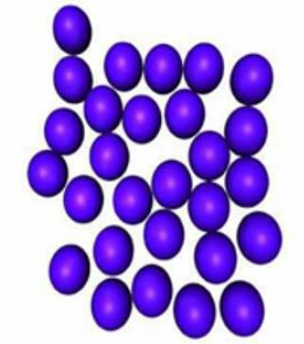
What's so special about the image below? It's a big deal!



This photo is special because it shows that water exists in all three states of matter. Earth is the only planet in our solar system where water is regularly found in all three states of matter. Solid, Liquid, and Gas

Name each state of matter on a molecular level. (Solid, Liquid, Gas)

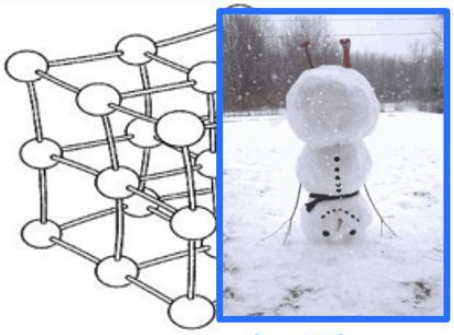
Name each state of matter on a molecular level. (~~Solid, Liquid, Gas~~)



Semi Ordered

Liquid

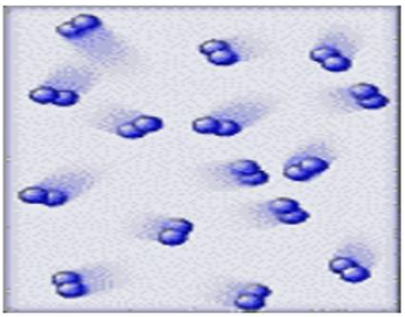
True or False? On earth water exists in all three states of matter?



Called a crystal Lattice

Solid

True or False? The lower density of ice causes it to float?



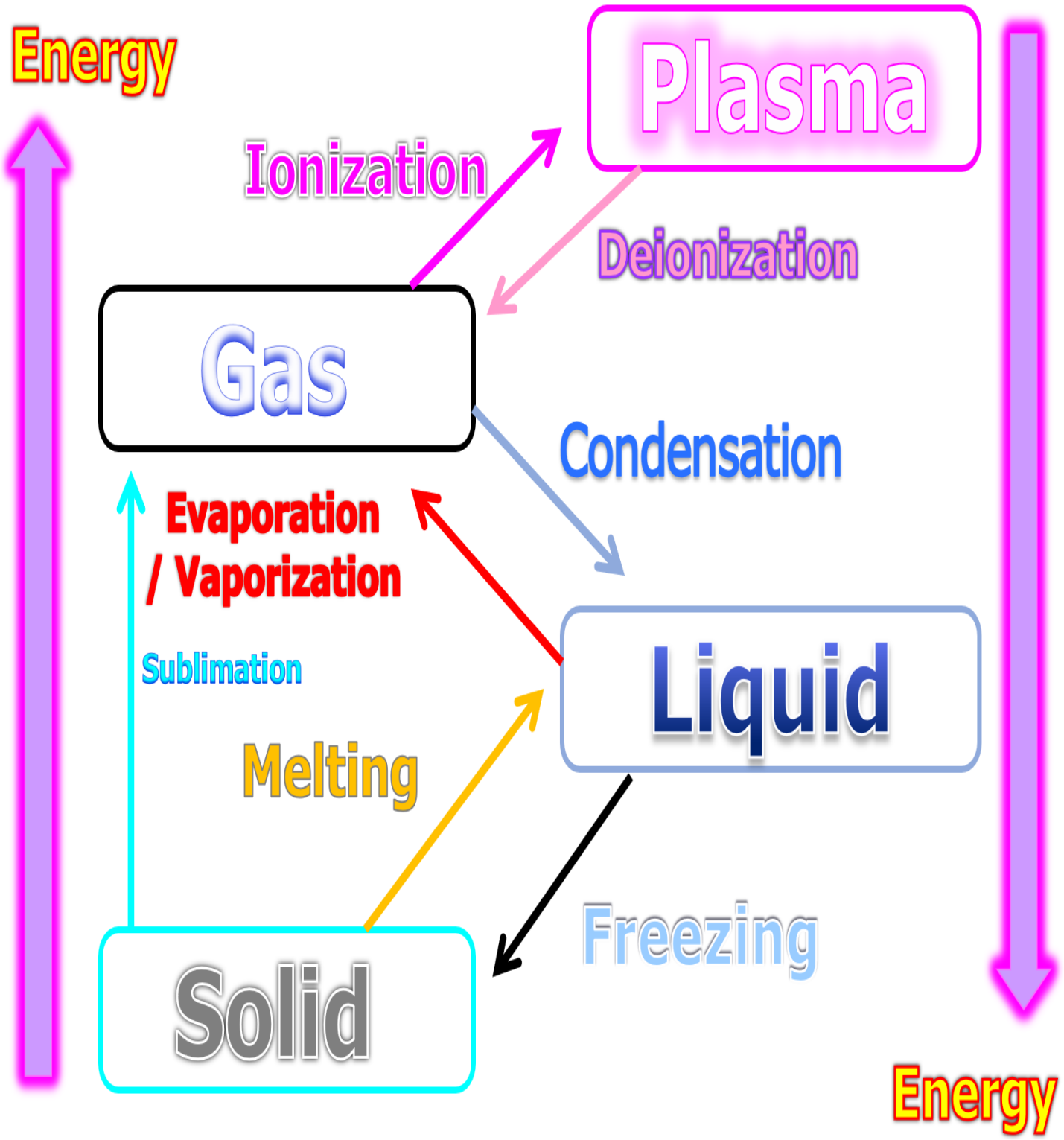
Moving fast!

Gas

True or False? The oceans and atmosphere move heat around the planet?

The Water Cycle also known as the hydrologic cycle

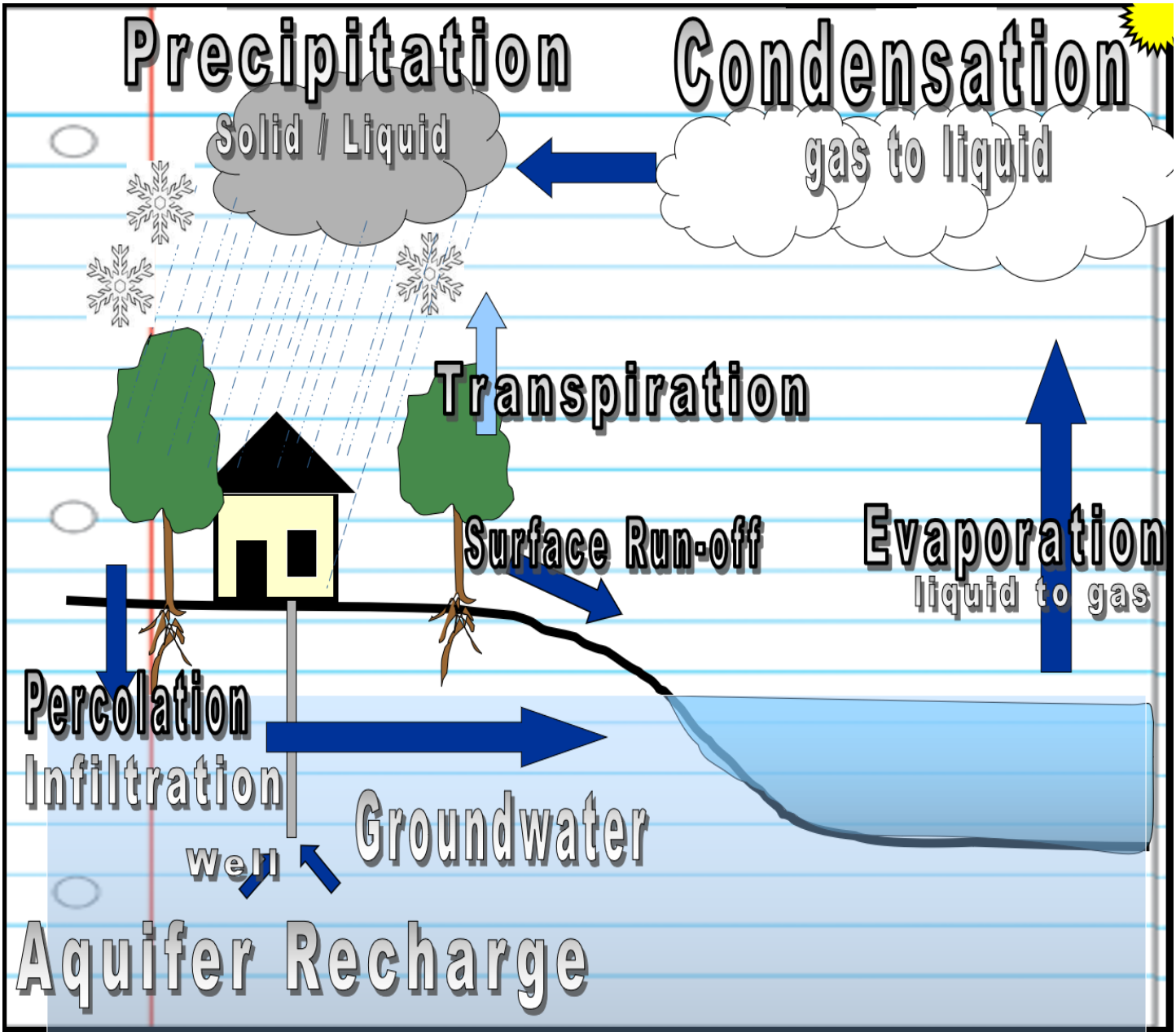
Driven by the Sun and Gravity.



Lesson #2 The Water Cycle

The hydrologic cycle (Water Cycle): The continuous movement of water On, Above, and Below the surface of the earth.

Please complete the diagram below on the water cycle as described in the slideshow



Evaporation – Substance changes from a liquid state to gas state (requires energy).

Condensation – Water vapor (gas) turns back to a liquid. (energy loss required/cold) -cloud formation.

Why did condensation droplets form on the cold soda can?

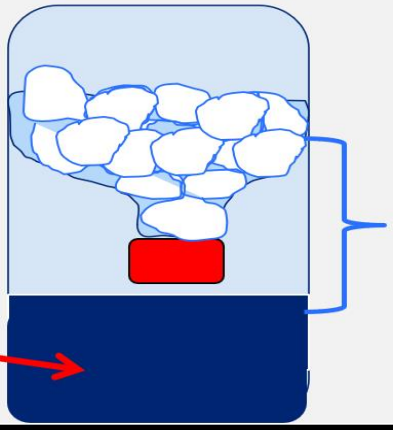
- Where did the water come from?

Condensation formed on the cold soda can because water vapor near the soda can turned from a gas to a liquid.

Precipitation – Water that is so heavy it falls as liquid / solid.

Soda bottle cut by teacher, then flipped, and filled with ice cubes by students.

Next fill bottle with very warm water and food coloring.



Observe water cycle and record observations

Observations will be that condensation will form on the outside of container, and more on the inside. Condensation should be visible on the container near the ice cubes, and it should become so heavy that it forms droplets and falls back into the warm water. The cycle would then repeat.

Lesson #3 Water Cycle Continued

Sublimation – Solid state turns directly to a gas state skipping liquid phase.

Evapotranspiration – Water released by plants into air.
Non-living to the living, and back again.

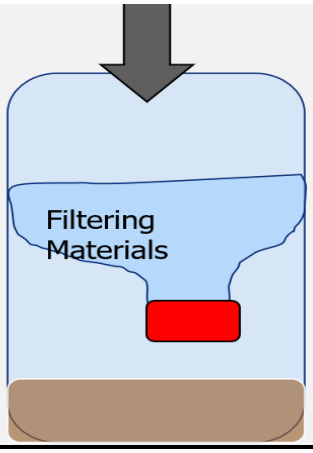
Observations of Evapotranspiration. Did it work? Was water observed inside the bag? Did it work? Why or why not?

Water droplets should be visible on the inside of the bag. The plant released water vapor when its cells do cellular respiration. Water is a product of cellular respiration.

Surface run-off: The water flow which occurs when soil is full to capacity and excess water travels over the _____.

Percolation: The slow movement of water through the _____.

Soda bottle cut by teacher or parent, invert the top like so. Add cap
Your group must brainstorm methods to filter water, bring in the materials as a group and assemble tomorrow.



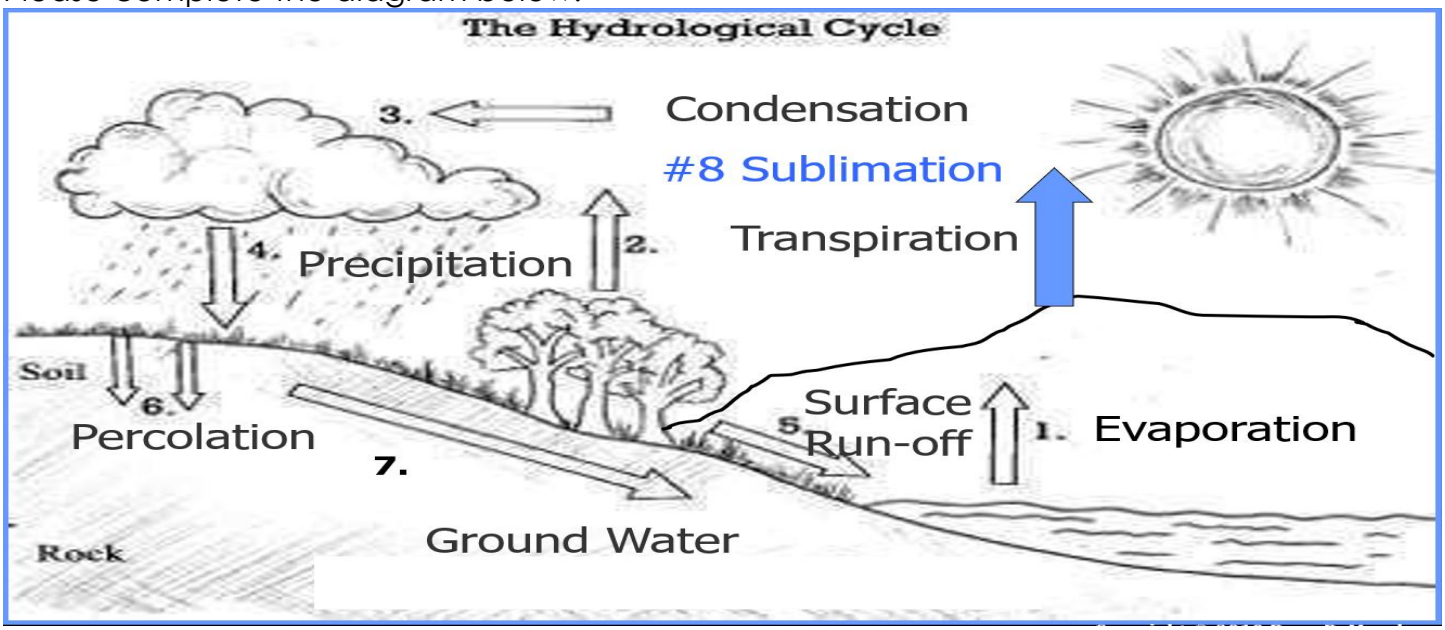
Teacher is going to create nasty water with coffee grounds, garlic powder, and vegetable oil, and salt.
Teacher will add dirty water to the top.

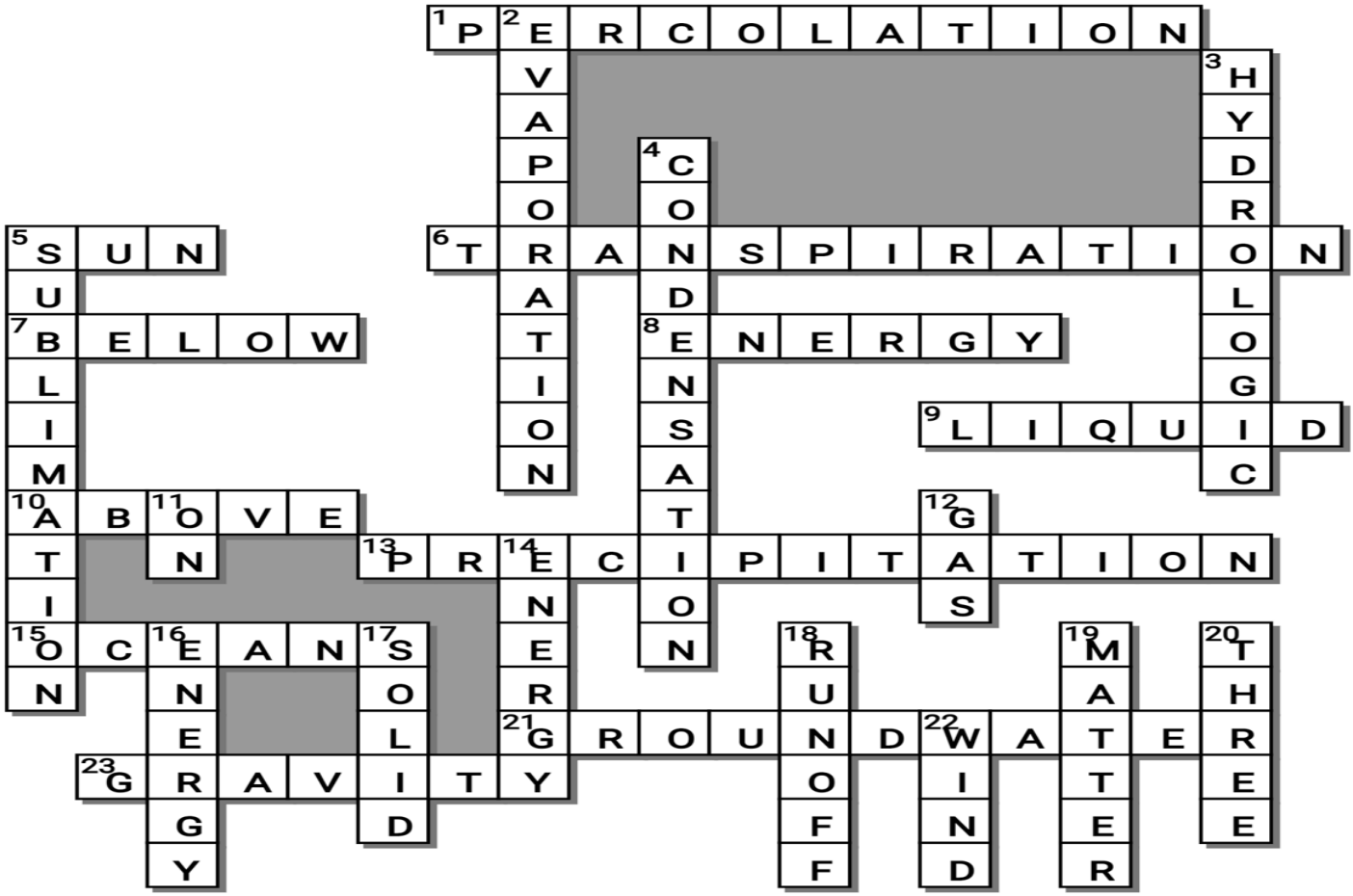
Were you able to get the water clear? Did it work? Why or why not? What did you use?

Hopefully the use of filters, an old cotton T-Shirt, Sand or other mediums would have filtered some of the solids and colors from the water. Answers will vary.

Groundwater discharge: Water that has been underground seeps back into the oceans, or into rivers or lakes.

Please complete the diagram below.





Across

1. The slow movement of water through the soil. Cleans and purifies.
5. The Water Cycle is driven by the _____ and Gravity
6. Water released by plants into air. Non-living to the living, and back again.
7. The hydrologic cycle (Water Cycle): The continuous movement of water on, above, and _____ the surface of the earth.
8. The Water Cycle, Cycles Matter and _____ around the planet.
9. Has definite volume but not shape.
10. The hydrologic cycle (Water Cycle): The continuous movement of water on, _____, and below the surface of the earth.
13. Water that is so heavy it falls as liquid / solid.
15. Most of the water on planet earth (Collection) is stored in the _____ (97%)
21. _____ discharge: Water that has been underground seeps back into the oceans, or into rivers or lakes.
23. The Water Cycle is driven the Sun and _____?

Down

2. Substance changes from a liquid state to gas state (requires energy).
3. The Water Cycle is often called the _____ Cycle
4. Water vapor (gas) turns back to a liquid. (Energy needs to be removed) Cloud formation.
5. Solid state turns directly to a gas state skipping liquid phase.
11. The hydrologic cycle (Water Cycle): The continuous movement of water __, above, and below the surface of the earth.
12. No definite shape or volume.
14. You need to add this to get water to evaporate
16. You need to take this away from water in its gas phase to turn it into a liquid
17. Has a definite shape and volume
18. Surface ___-___: The water flow which occurs when soil is full to capacity and excess water travels over the land.
19. The Water Cycle, Cycles _____ and Energy around the planet
20. Water on Earth exists in all _____ states of matter
22. The _____ is driven by the uneven heating and cooling on planet earth (from the sun) and moves moisture around the planet.

--------Teacher can remove this word bank to make more puzzle more challenging----------

Possible Answers

ABOVE, BELOW, CONDENSATION, ENERGY, ENERGY, ENERGY, EVAPORATION, GAS, GRAVITY, GROUNDWATER, HYDROLOGIC, LIQUID, MATTER, OCEANS, ON, PERCOLATION, PRECIPITATION, RUN-OFF, SOLID, SUBLIMATION, SUN, THREE, TRANSPIRATION, WIND

Water Cycle Quiz Game

Name:

1-20 = 5 pts Lesson 4 Due: Today

*20-*25 * = Bonus + 1 pt,

(Secretly write owl in correct space +1 pt) Score ____ / 100

Final Question = 5 pt wager

STATE YOUR MATTER	WET WILLY	AROUND AND AROUND	MOVING AND GROOVIN	CLOUD LIKE Bonus round 1 pt each
1) Blue Planet	6) Sun And Gravity	11) Transpiration	16) Groundwater	*21) Michelin Man
2) SOLID LIQUID GAS	7) Evaporation Condensation Precipitation	12) Surface Run-Off	17) Letter E 11,000 Gallons	*22) Ghostbusters
3) Energy	8) Transpiration and Precipitation were switched	13) Groundwater Discharge Natural Spring	18) Condensation Energy Removed	*23) Casper
4) Condensation gas to liquid Melting solid to liquid	9) Sublimation	14) Oceans (97%)	19) Snow, Hail, Ice Pellets	*24) Snuggle Fabric Softener
5) Deionization Condensation Freezing Energy	10) Percolation	15) Above, On, Below the Surface	20) Wind	*25) Monty Python Holy Grail

Final Question Wager ____/5 Answer: Final Question Condensation (Gas to Liquid) and evaporation(Liquid to Gas)

Part 2 Lesson 6 Carbon Cycle

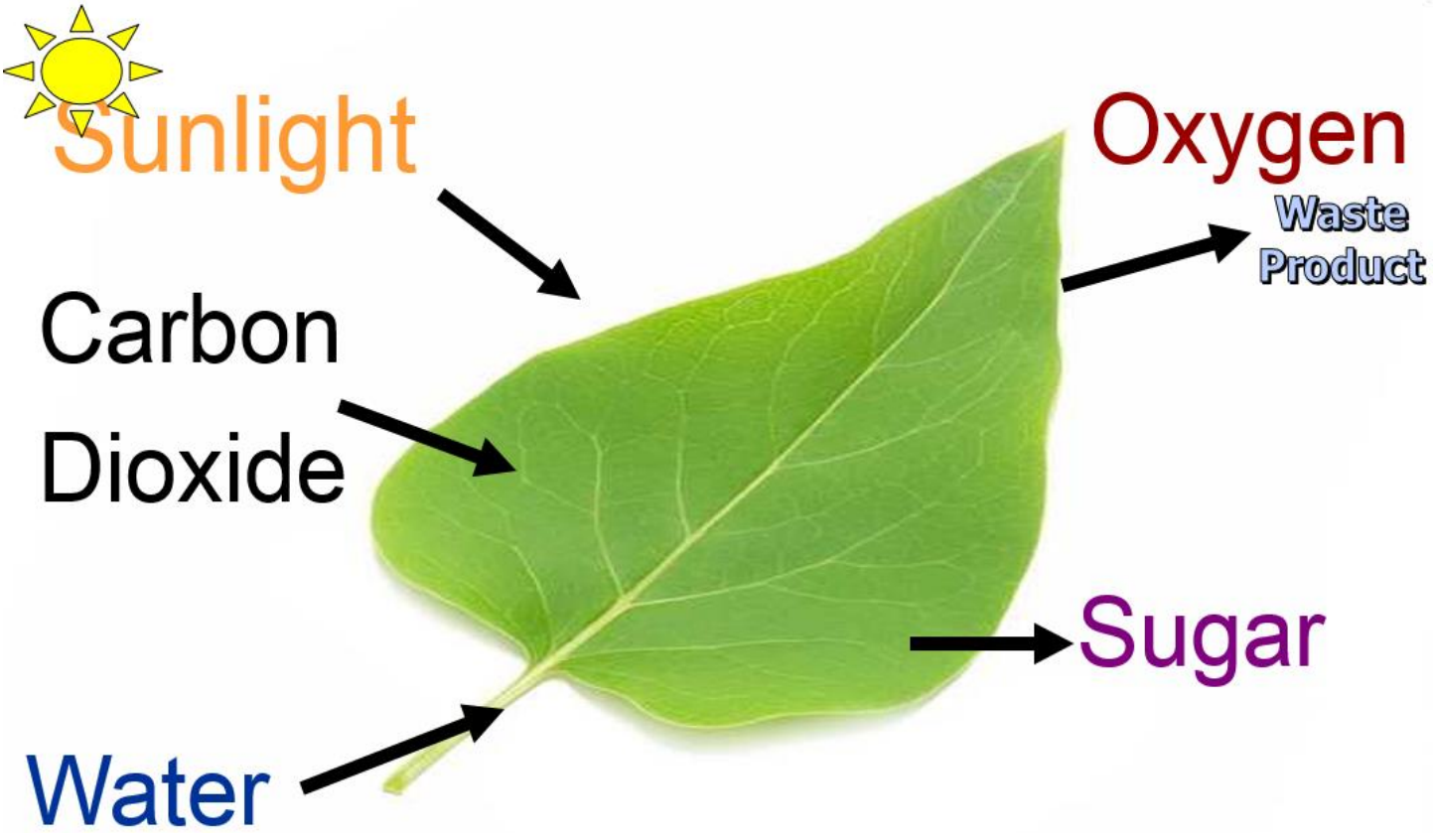
Carbon Cycle: The circulation of carbon into organisms (biotic) and back again (abiotic). Atmosphere, Land, Water, Oceans.

The energy flow of life occurs because of plants. Plants harness the energy from the Sun , and pass it on to all other life forms.

Photosynthesis – Plants make sugar from light (CO_2 and Water). Light energy is turned into chemical energy (sugars – carbon based).

Which of the following statements is false of photosynthesis? and the answer is… A.) Photosynthesis requires sunlight, carbon dioxide, and water. B.) Oxygen and glucose are produced in photosynthesis. C.) Carbon Dioxide and water are produced. D.) In photosynthesis, plants use radiant energy from the sun to create chemical energy in the form of sugars. E.) None of the above.	Which of the following equations is true of photosynthesis? $6O_2 + C_6H12O_6$ Energy → $6CO_2 + 6H_2O$ $C_6H_{12}O_6 + 6O_2$ → Energy + Chloroplasts. $6O_2 + 6CO_2 + 6O_2$ → Energy + $C_6H_{12}O_6$ $6CO_2 + 6H_2O$ + Energy → $C_6H_{12}O_6 + 6O_2$ $6O_2 + 6CO_2$ + → Energy + $C_6H_{12}O_6 + 6O_2$ Energy + $6H_2O$ → Energy + $6O_2 + 6CO_2$ $CO_2 + 3H_2O$ + Energy → $C_6H_{12}O_6 + O_2$ $6CO_2 + 6H_2O$ → Energy + $6CO_2 + 6O_2$ Energy → $6O_2 + C_6H_{12}O_6 + 6CO_2$

$6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$



Part 2 Lesson 7 Photosynthesis Continued

Photosynthesis is the process by which light energy is utilized to convert water and carbon dioxide into food to be used by plants.

Oxygen is released into the air during the process. (O_2) Waste

Light or solar energy is captured by chlorophyll (CHLOR-oh-phil), the green pigment in leaves.

It is then converted into chemical energy which is stored as starch or sugar.

These starches and sugars are stored in roots, stems and fruits. They are available to the plant as food or fuel.

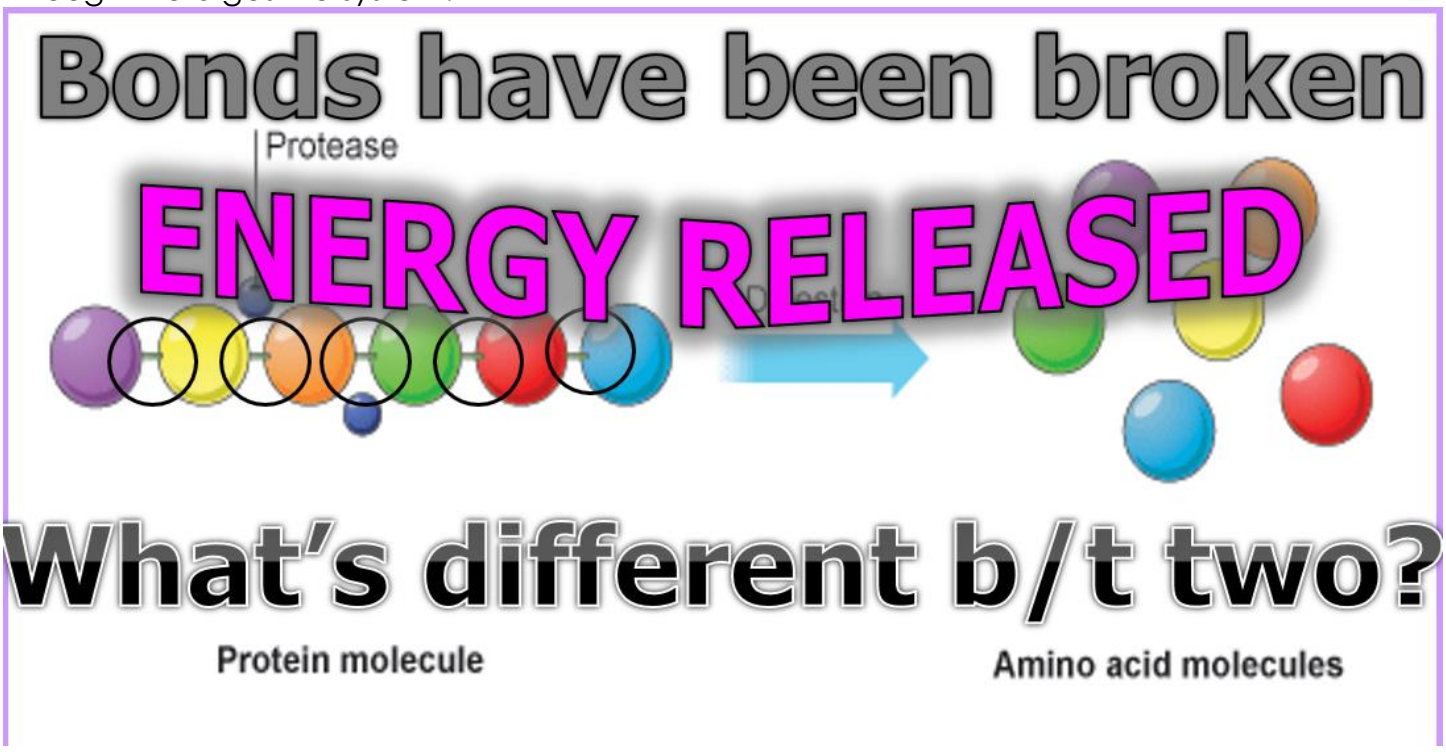
Photosynthesis

-Produces sugar from energy.
-Occurs only in cells with chloroplasts
-Oxygen is produced. Waste Product
-Water is used.
-Carbon dioxide is used.
-Occurs in light.

Part 2 Lesson 8 Cellular Respiration

Cellular Respiration: Processes whereby certain organisms obtain energy from organic molecules.

Side Note About Food: Food's macronutrients undergo chemical breakdown as they move through the digestive system.

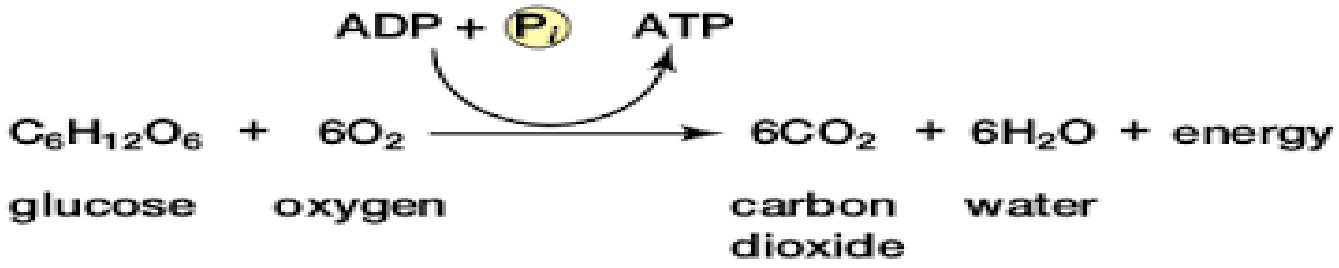


Mitochondria

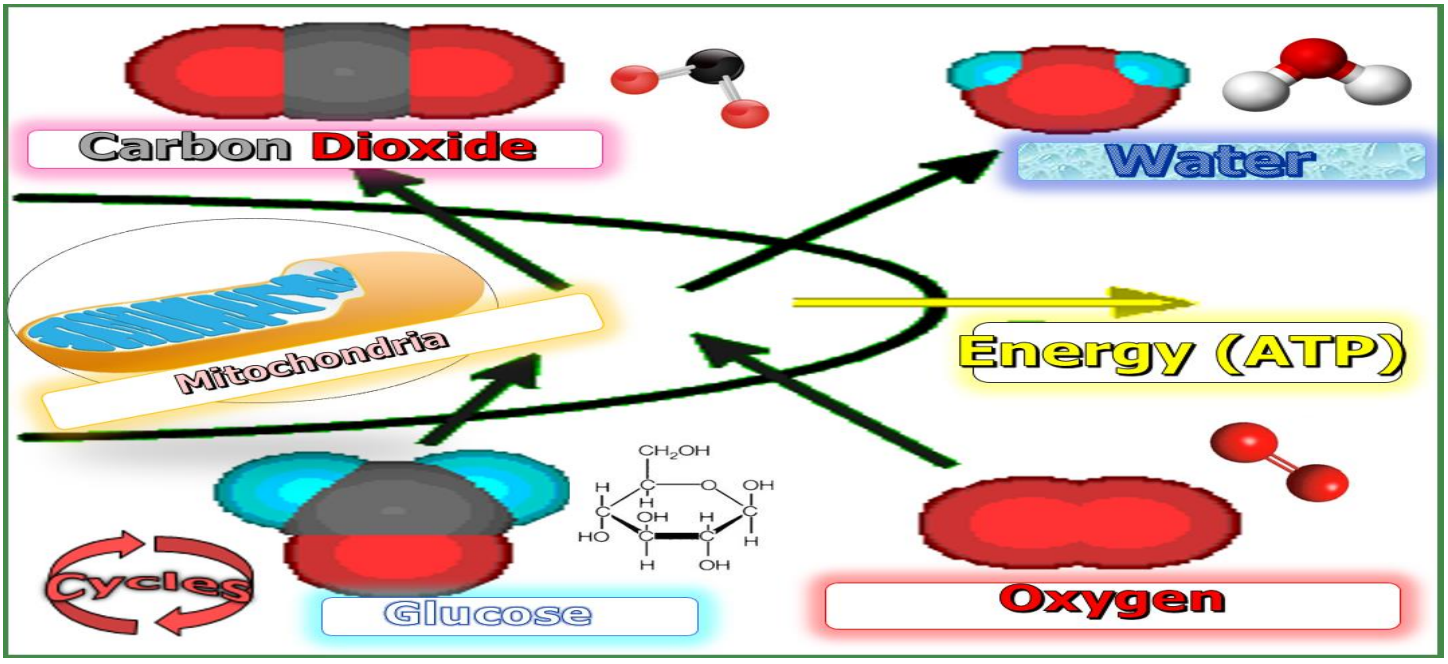
-Large organelle that makes energy for the cell. (respiration)
-Has folds (surface area) called cristae
-Two membranes
-Recycles wastes, produces urea
-Has its own DNA. Reproduce independently from cell.

Which of the following is correct for the respiration equation. $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ CO_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $C_6H_{12}O_6 + 6O_2 \rightarrow 6\ CO_2 + 6H_2O + energy$ $6\ CO_2 + 6H_2O\ \ C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy	Which of the following is correct for the respiration equation. $6\ O_2 \rightarrow 6H_2O + energy \rightarrow 6\ CO_2 \rightarrow 6H_2O$ $6\ O_2 + C_6H_{12}O_6 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 + 6H_2O + C_6H_{12}O_6 + 6O_2 \rightarrow 6O_2 + 6H_2O$ $C_6H_{12}O_6 + 6CO_2 \rightarrow 6O_2 + 6H_2O + energy$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy$ $6\ CO_2 \rightarrow 6H_2O + energy \rightarrow 6CO_2 \rightarrow 6H_2O + C_6H_{12}O_6$ $6CO_2 + 6O_2 \rightarrow 6H_2O + energy \rightarrow$ More energy $6O_2 + C_6H_{12}O_6 \rightarrow 6\ CO_2 + 6H_2O + energy\ (ATP)$

Cellular Respiration



Please fill-in the missing terms as described in the slideshow. Word Bank: Mitochondria, Energy (ADP+P to ATP), Carbon Dioxide (CO_2), Water (H_2O), Oxygen (O_2), Glucose/Sugar $C_6H_{12}O_6$



Cellular Respiration

-Burns sugar for energy.
-Energy is created. ADP+P to ATP
-Occurs in most cells.
-oxygen is used.
-water is produced.
-carbon dioxide produced. "Waste Product"

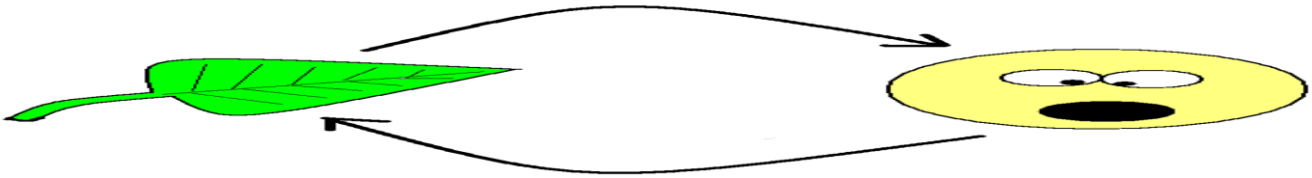
-Occurs in light and dark.

Part 2 Lesson 9 Respiration Wrap Up, CO_2 O_2 Balance

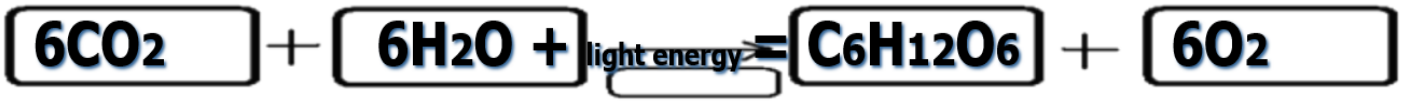
The carbon dioxide oxygen balance.

-The plant uses carbon dioxide and produces oxygen during photosynthesis.

-Animals use oxygen and produce carbon dioxide during cellular respiration.



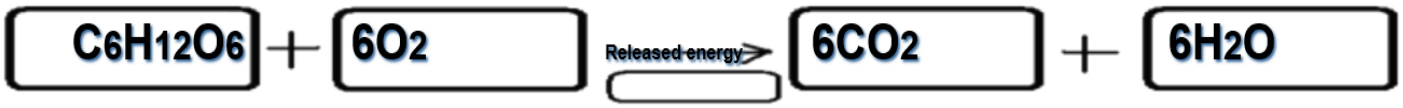
The balance of oxygen and carbon dioxide is maintained in the atmosphere by the oxygen released by the plant during photosynthesis and carbon dioxide released by human , animals etc. in the atmosphere. The balance of oxygen and carbon dioxide is made due to respiration and photosynthesis.



Which of the following is the correct equation for photosynthesis?

1. A) $6O_2 + 6H_2O$ + light energy = $C_{12}H_6O_6 + 6O_2$
2. B) $6CO_2 + 6H_2O$ + sugar = $C_6H_{12}O_6 + 6O_2$
3. C) $6CO_2 + 6O_2$ + light energy = $C_6H_{12}O_6 + 6H_2O$
4. D) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6H_2O$
5. E) $6CO_2 + 6H_2O$ + light energy = $C_6H_{12}O_6 + 6O_2$

Write out the equation for **cellular respiration** in the boxes below.

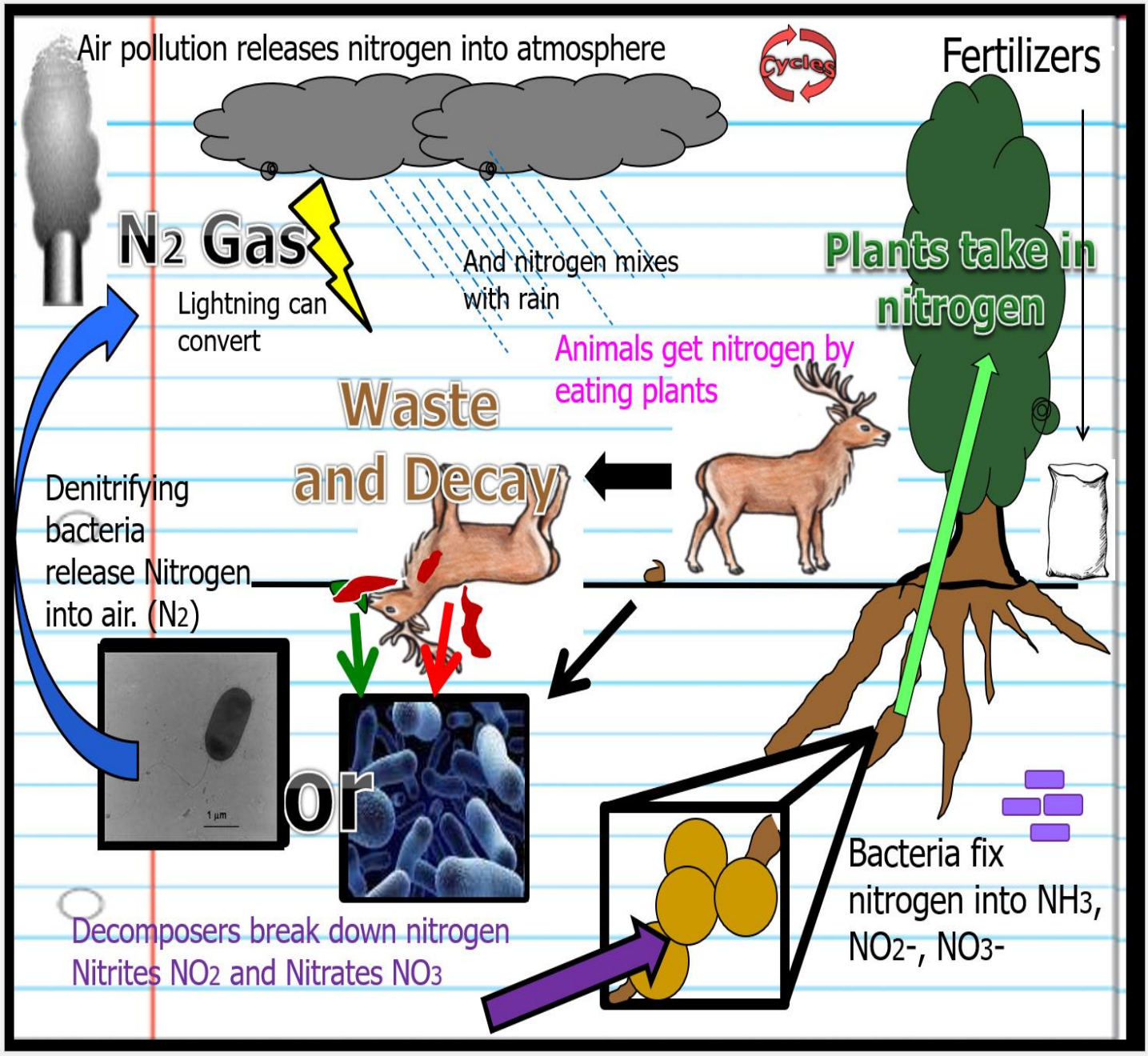


Which of the following is the correct equation for cellular respiration?

1. A) $C_6H_{12}O_6 + 6H_2O$ = Released energy + $6CO_2 + 6H_2O$.
2. B) $C_6H_{12}O6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
3. C) $C_6H_{12}O_6 + 6O_2$ = Released energy + $6O_2 + 6H_2O$.
4. D) $C_{12}H_6O_6 + 6O_2$ = Released energy + $6CO_2 + 6H_2O$.
5. E) $C_6H_{12}O_6 + 6CO_2$ = Released energy + $6O_2 + 6H_2O$.

Part 2 Lesson 10 Nitrogen Cycle

Nitrogen Cycle: The circulation of nitrogen; nitrates from the soil, absorbed by plants, eaten by animals that die and decay returning the nitrogen back to the soil.



Nitrogen in atmosphere is inert (N_2 Gas) which is not reactive. (Can't use)
Nitrogen fixing bacteria on plant roots convert nitrogen in atmosphere into
nitrate ions (NO_3^-) (NO_2^-)
ammonia (NH_4)

Nitrogen fixing bacteria in the soil and on the root nodules of plants can fix the nitrogen.
- Fix means change its form so a plant can use it.

Plants can now use this new molecule to get the nitrogen they need to build proteins so they can grow, repair, and reproduce.

All life requires nitrogen-compounds, e.g., proteins and nucleic acids.
Animals get their nitrogen from eating plants or eating animals that ate plants.
Eventually, plants and animals die. Ammonia (NH_3) / Decay / Waste

When plants and animals die.

Nitrifying bacteria break down the nitrogen in their tissues. (Nitrites NO_2)

Denitrifying bacteria can also change the NH_3 Nitrate back to N_2 Nitrogen gas

When the nitrogen is denitrified, it then bonds with another nitrogen to form inert N_2 gas in the atmosphere until the cycle repeats.

Part 2 Lesson 11 Nitrogen Cycle Review

All life requires nitrogen-compounds, e.g., proteins and nucleic acids.

Air, which is 78% nitrogen gas (N_2), is the major reservoir of nitrogen.

But most organisms can't use nitrogen in this form.

Plants must secure their nitrogen in "fixed" form, i.e., incorporated in compounds such as:

- nitrate ions (NO_3^-)
- ammonia (NH_3)
- urea (NH_2)2CO

Animals secure their nitrogen (and all other) compounds from plants (or animals that have fed on plants).

Four processes participate in the cycling of nitrogen through the biosphere:

-Nitrogen Fixation: Break apart N_2 so it can join to other atoms and be used.

-Plants with the help of bacteria take up nitrogen.

-Decay and waste passes on nitrogen

-Denitrification: Nitrogen returned to the air by bacteria.

- Happens with poor soil management.

Manmade Fertilizers also puts nitrogen into the soil. (Ammonia NH3)

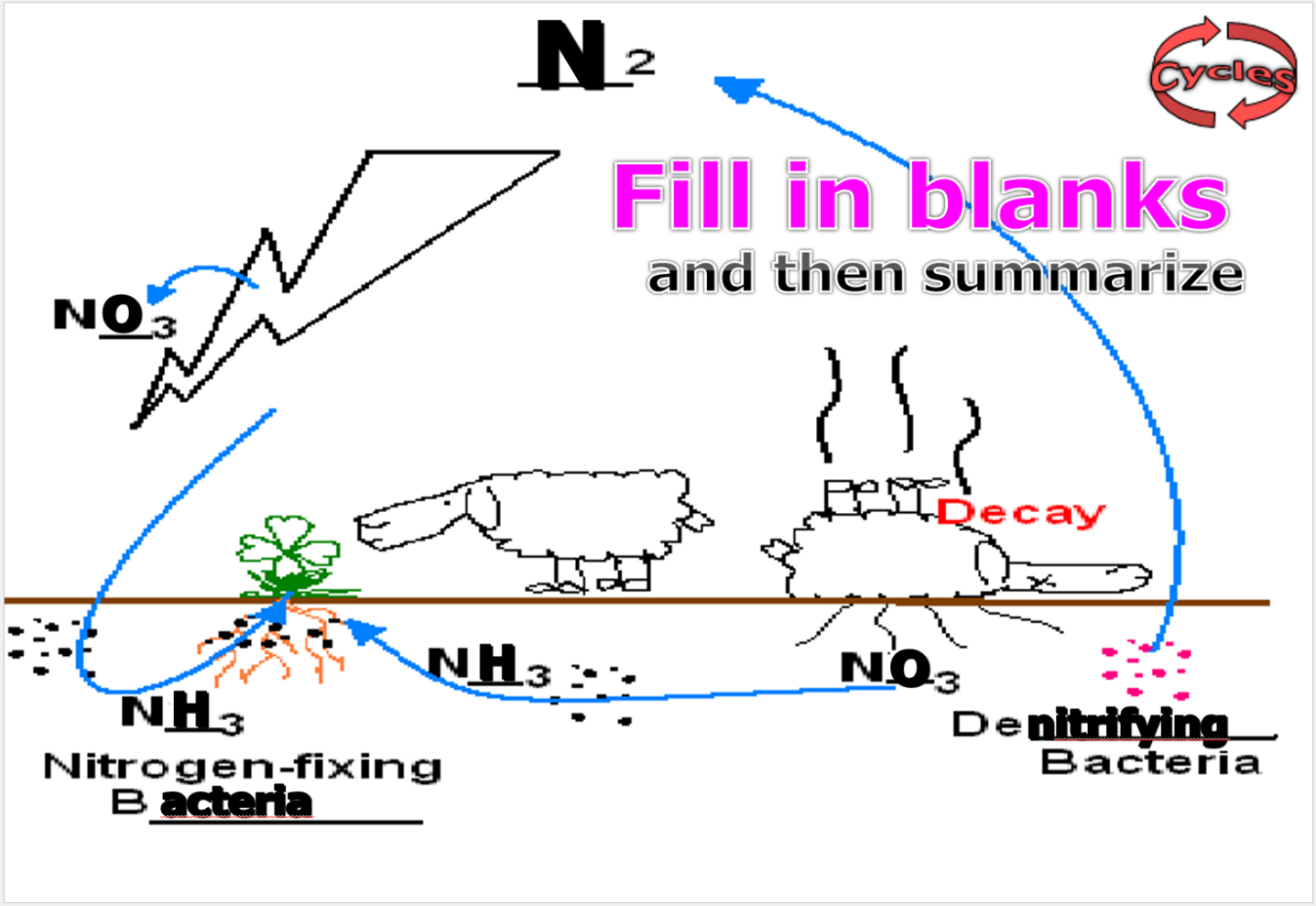
- Excess / poor management of nitrogen can result in pollution.

Nitrogen in atmosphere is inert (N_2 Gas) which is not reactive. (Can't use)

- Bacteria on plant nodules convert nitrogen in atmosphere into
  - nitrate ions (NO_3^-) (NO_2-)
  - ammonia (NH_4)

Which is a bogus statement below? Four processes participate in the cycling of nitrogen through the biosphere. A.) Nitrogen fixation: Break apart N2 so it can join to other atoms and be used. B.) Decay: Passes on through eating / waste. C.) Plants with the help of bacteria take up nitrogen. D.) Denitrification: Nitrogen is removed from air.	Which is a bogus statement below? Four processes participate in the cycling of nitrogen through the biosphere. A.) Nitrogen fixation: Break apart NO3 so it can join to other atoms and be used. B.) Decay: Passes on through eating / waste. C.) Plants with the help of bacteria take up nitrogen. D.) Denitrification: Nitrogen returned to the air.

Describe the nitrogen cycle below on the lines and fill in the blanks on the picture.



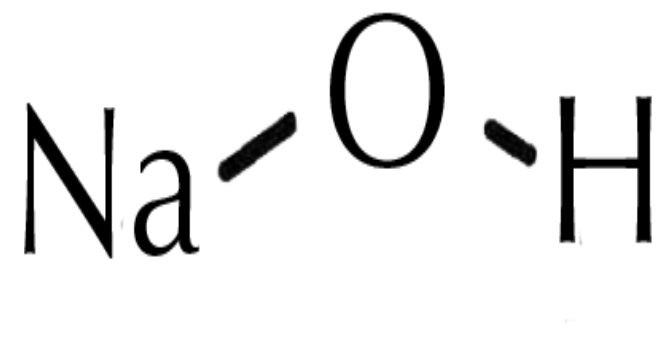
Part 2 Lesson 12 Acids and Bases (pH)

An acid is any hydrogen-containing substance that is capable of donating a proton (hydrogen ion) to another substance.

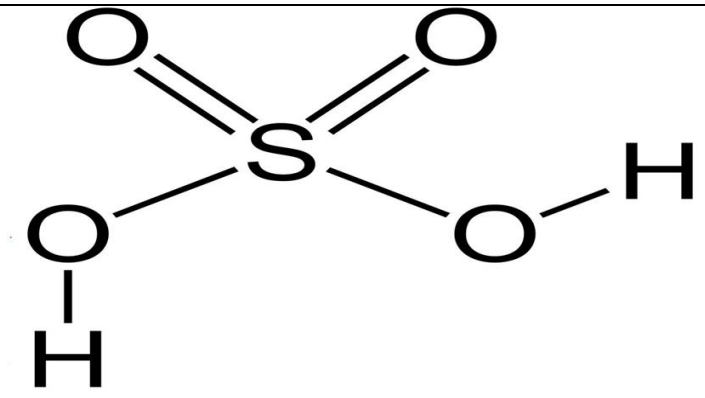
Acidic substances are usually identified by their sour taste. ... Acids are known to turn litmus red.

A base is a molecule or ion able to accept a hydrogen ion from an acid.

Which is the acid and which is the base?



Answer= Base

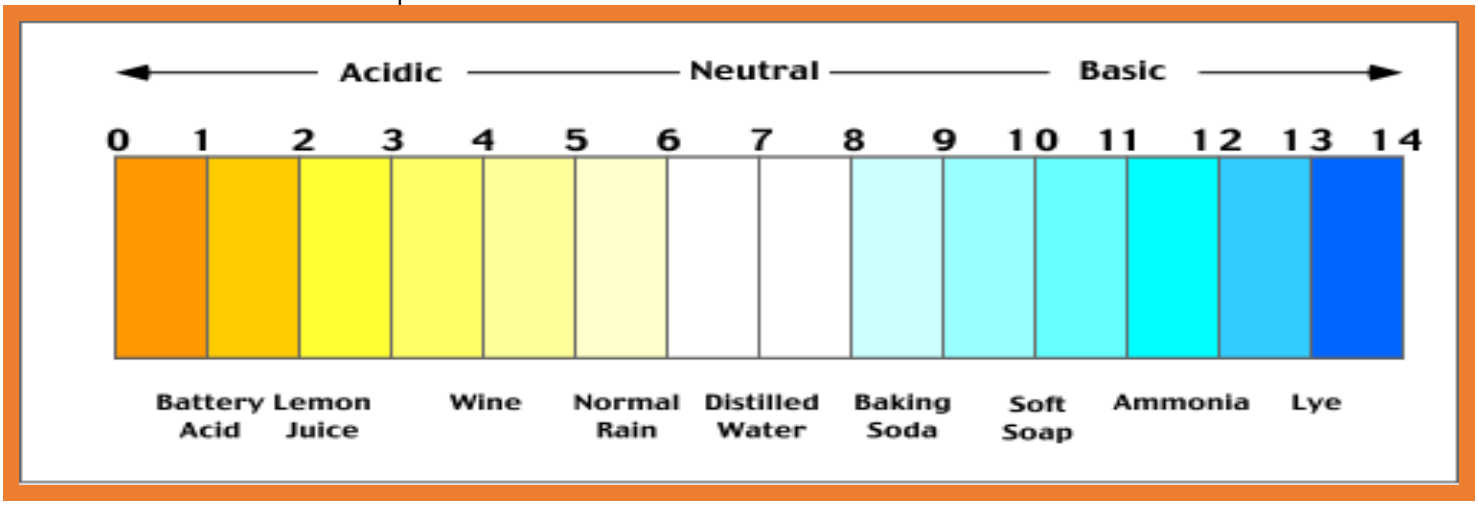


Answer= Acid

Water in a pure state has a neutral pH.

- Pure water is neither acidic or basic.

Provide some info on the pH scale below as described in the slideshow.



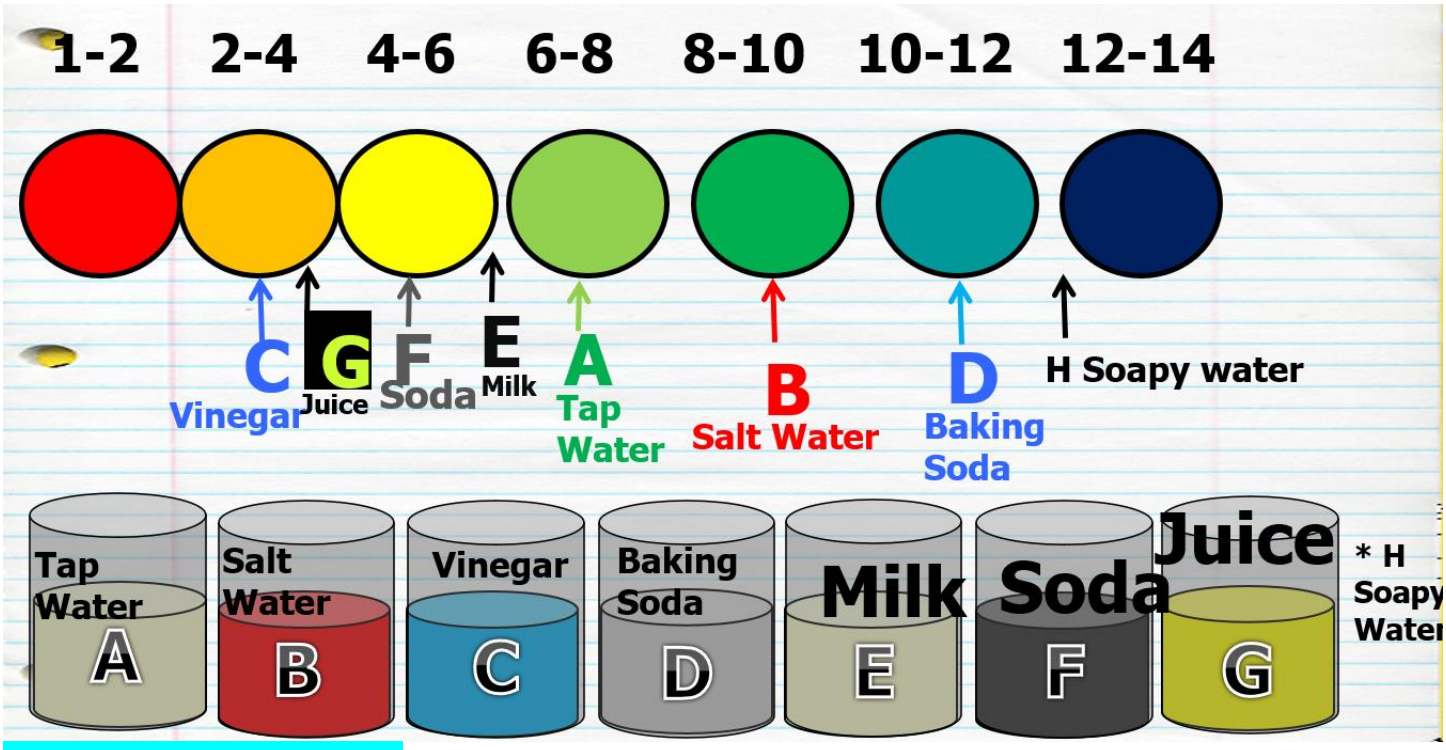
Use the diagram below to assist you in writing a short paragraph that describes the differences between acids and bases?

Acids usually have a pH between 0 and 7, they donate protons and a solution that has H+ is usually acidic. Acids have sour taste such as lemons, vinegar, and the dangerous HCL. Bases, on the other hand are proton receivers. They have a pH of 8 to 14 and turn litmus paper blue. They are slippery and a solution that has an excel of OH- ions is basic. Acids and bases are different, there ability to donate or accept a proton creates these differences.

Which is an acid? And which is a base?

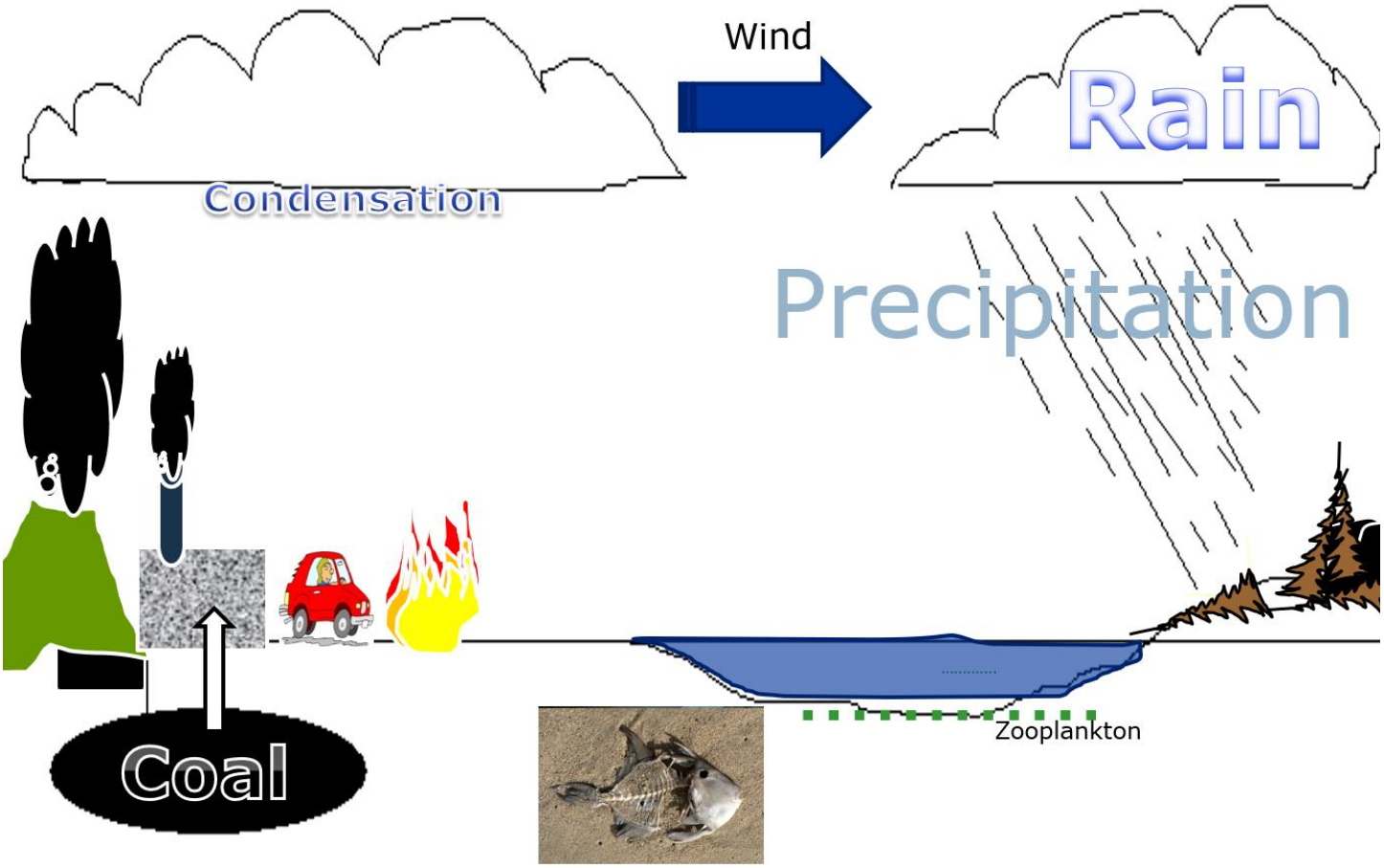
Base	Acid
A substance which when added to water produces hydroxide ions [OH^-]. Turns litmus blue. They react with most cations to precipitate hydroxides. Taste bitter Do not taste in the lab.	A substance which when added to water produces hydrogen ions [H^+]. React with zinc, magnesium, or aluminum and form hydrogen ($H_{2(g)}$). React with compounds containing CO_3^{2-} and form carbon dioxide and water. Turns litmus red. Taste sour (lemons contain citric acid, for example). Tasting Acids in the lab would be unsafe.

Please complete as described in the slideshow? What are some of the mystery solutions.



Part 2 Lesson 13 Acid Rain

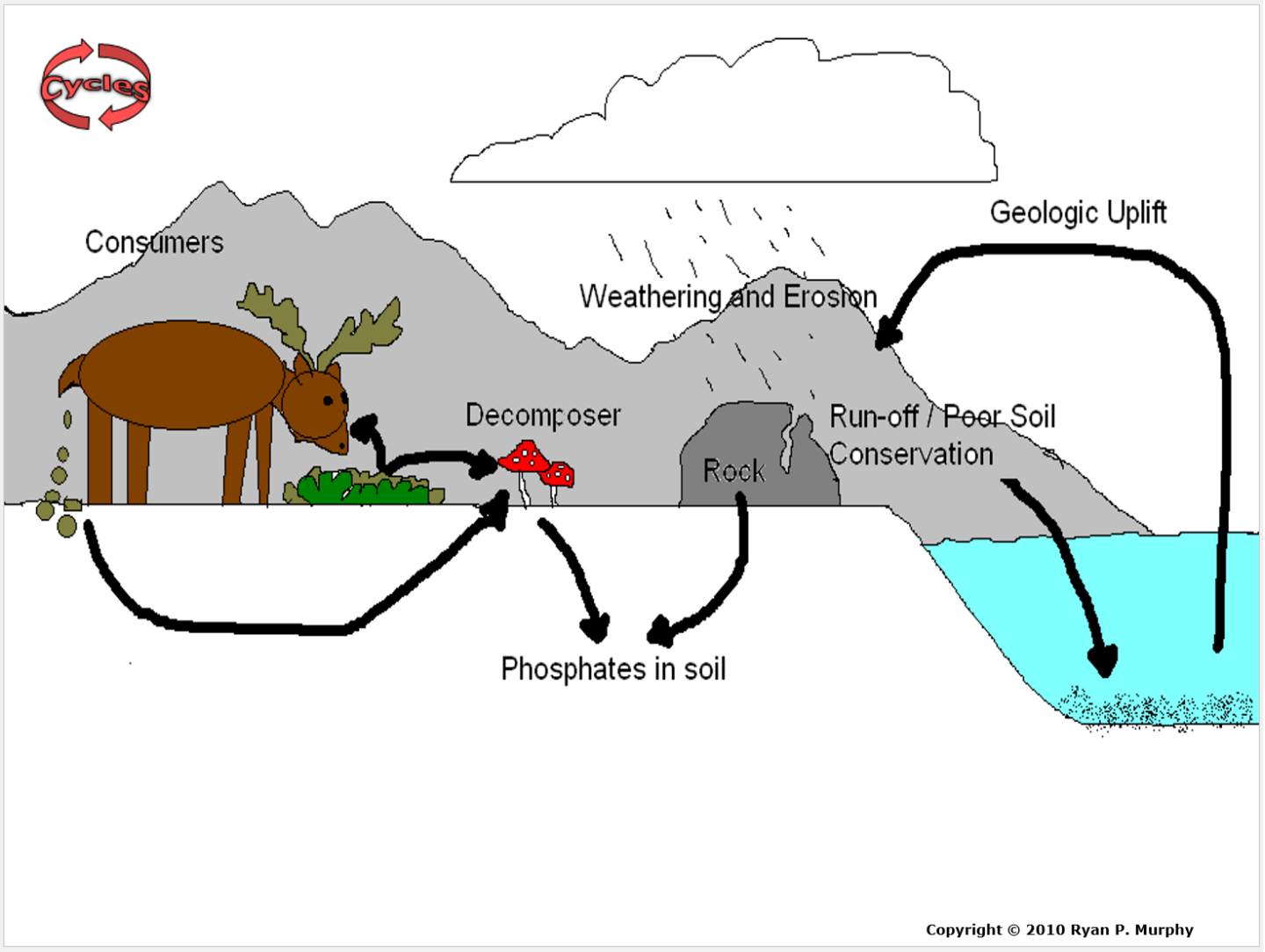
Acid Rain is caused by Nitrogen and Sulfur dioxides. aka – Air pollution (smog) causing the rain to become slightly more acidic. This has a negative impact on plants and micro-organisms. Sketch out the diagram of acid rain below as described in the slideshow.



Part 2 Lesson 14 Phosphorous Cycle

Phosphorus cycle: The biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and ecosphere. (No Atmosphere!)

Complete the diagram of the phosphorous cycle as described in the slideshow below.

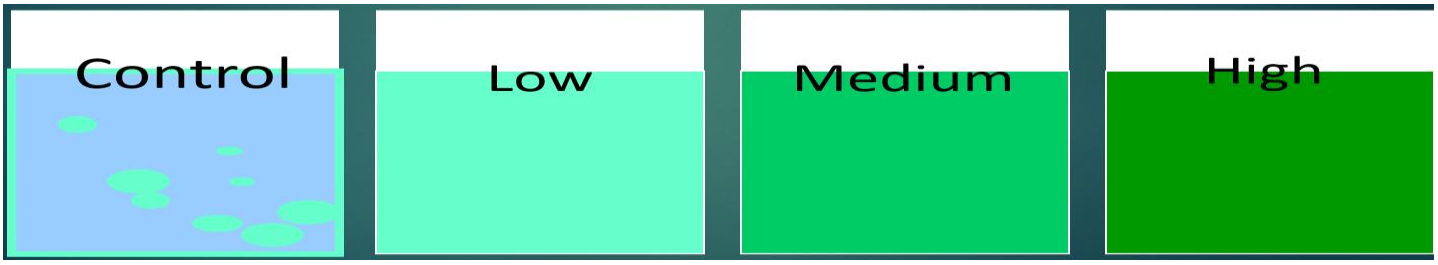


Importance of phosphorus

Important nutrient for plants and animals.
Part of DNA molecule in our cells.
In the fats of our cell membrane.
Part of our bones and teeth.

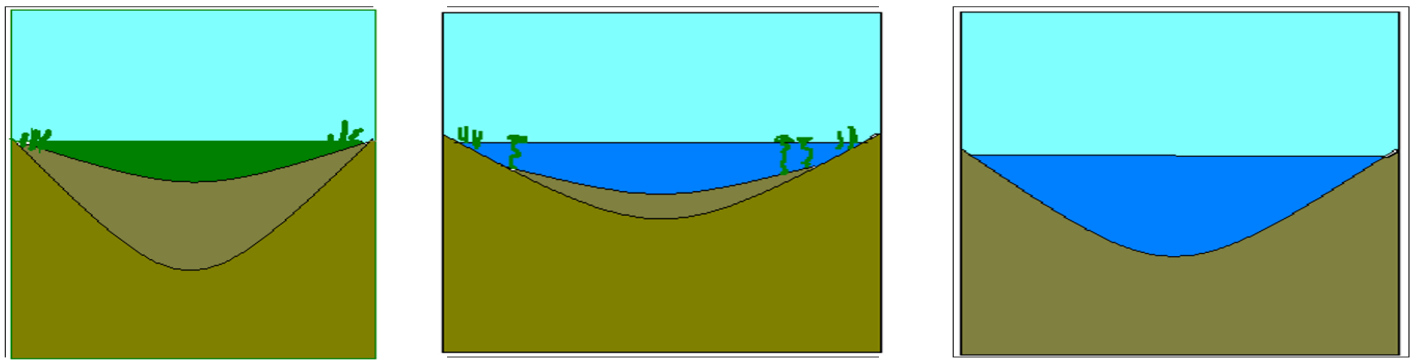
Sketch the container

- Experiment from two weeks ago.
  - Please sketch what the four containers look like now.
  - What does fertilizer do to an aquatic system?



Draw three Lakes – Add the appropriate colors and vegetation to each box.

Eutrophic Mesotrophic Olgiotrophic



Olgiotrophic

Describes a lake or river with low productivity.

Mesotrophic

Production is considered moderate.

Eutrophic

Having concentrations of nutrients optimal or for plant or animal growth. It is used to describe nutrient or soil solutions.

Which one is Olgiotrophic and which is Eutrophic?

Answer= Olgiotrophic Describes a lake or river with low productivity.	Answer= Eutrophic Having concentrations of nutrients optimal or for plant or animal growth. It is used to describe nutrient or soil solutions.

Part 2 Lesson 15 Eutrophication

Please sketch below ad described in the slideshow.

Eutrophication

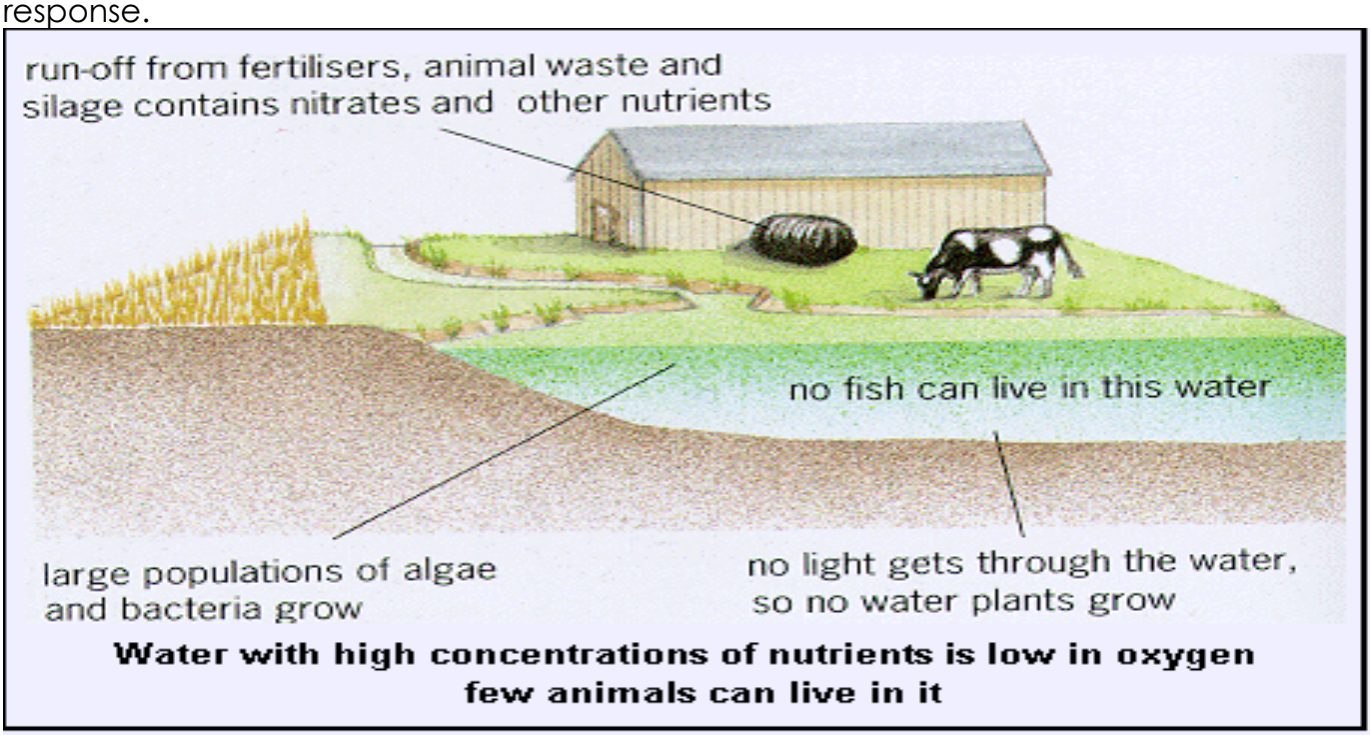
Aquatic plants use Phosphorus and Nitrogen and grow out of control
Aquatic plants overpopulate and die
Bacteria break down dead plants and use oxygen in water (respiration).
No oxygen left for fish / other aquatic life and they die.

Activity 1-10 – Olgiotrophic, Mesotrophic, or Eutrophic or Eutrophication

1)Eutrophic	2) Eutrophication	3) Eutrophic
4)Eutrophic	5)Olgiotrophic	6) Eutrophication
7)Meso/Olgiotrophic	8)Meso or Eutrophic	9)Olgiotrophic
10) Eutrophic	*11)Happy Gilmore	Score=

Please label the following pictures as olgiotrophic, mesotrophic, eutrophic, or eutrophication.

Please describe Eutrophication below. Use the pictures with text as a resource in your response.



1. Excess nutrients (mainly nitrates and phosphates) enriched water runoff to the water bodies.
2. Extensive growth of algae causing algal bloom.
3. Depletion of dissolved oxygen and production of toxins.
4. Due to the depletion of oxygen required to support aquatic life and harmful toxins produced, aquatic organisms fail to survive and the lake chokes to death, which no longer can support life.

Across

1. In chemistry, any substance that in water solution is slippery to the touch, tastes bitter, changes the colour of indicators (e.g., turns red litmus paper blue), reacts with acids to form salts, and promotes certain chemical reactions (base catalysis).
3. The Water Cycle also known as the _____ cycle
4. Nitrifying _____ break down the nitrogen in their tissues. (Nitrites NO2)
7. _____ Water Body: Having concentrations of nutrients optimal or for plant or animal growth. It is used to describe nutrient or soil solutions.
11. n ecology and Earth science, a _____ cycle is a pathway by which a chemical substance is turned over or moves through the biotic and the abiotic compartments of Earth
15. Water that is so heavy it falls as liquid / solid.
17. _____ Cycle: The circulation of carbon into organisms (biotic) and back again (abiotic). Atmosphere, Land, Water, Oceans.
18. The energy flow of life occurs because of _____. Plants harness the energy from the sun, and pass it on to all other life forms.
20. Evaporation – Substance changes from a liquid state to gas state (requires energy).
22. The process by which light energy is utilized to convert water and carbon dioxide into food to be used by plants.
24. Water vapor (gas) turns back to a liquid. (energy required/cold) -cloud formation.

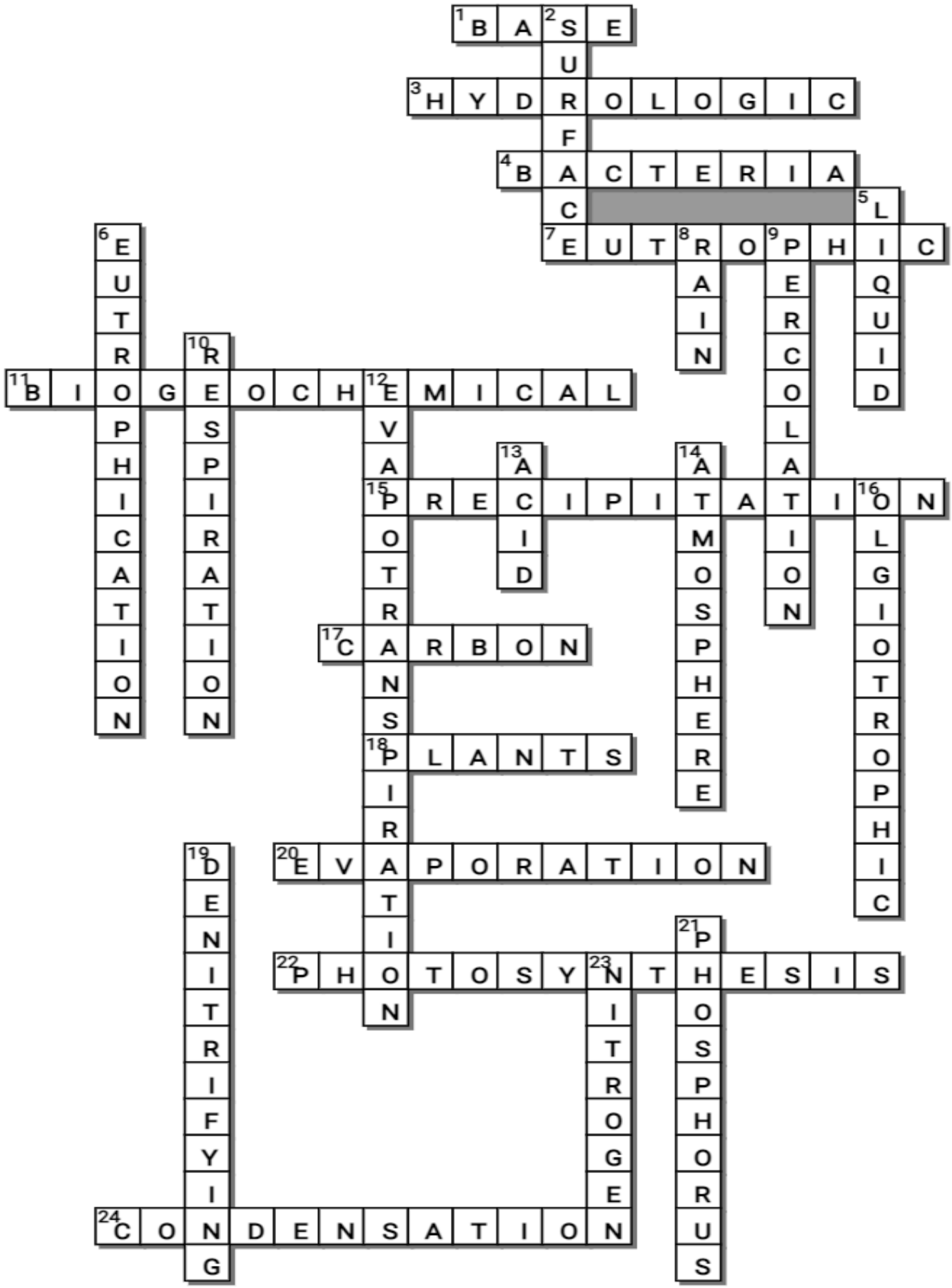
Down

2. _____ run-off: The water flow which occurs when soil is full to capacity and excess water travels over the land_.
5. Water can exist on earth as a solid, _____ , and gas.
6. This occurs with an excessive richness of nutrients in a lake or other body of water, frequently due to runoff from the land, which causes a dense growth of plant life and death of animal life from lack of oxygen.
8. Acid _____ is a rain or any other form of precipitation that is unusually acidic, meaning that it has elevated levels of hydrogen ions. It can have harmful effects on plants, aquatic animals, and infrastructure.
9. The slow movement of water through the soil.
10. Cellular _____: Processes whereby certain organisms obtain energy from organic molecules.
12. Evapotranspiration – Water released by plants and animals back into air.
13. A chemical substance that neutralizes alkalis, dissolves some metals, and turns litmus red; typically, a corrosive or sour-tasting liquid of this kind.
14. When the nitrogen is denitrified, it then bonds with another nitrogen to form inert N2 gas in the _____ until the cycle repeats.
16. Describes a lake or river with low productivity.
19. _____ bacteria can also change the NH3 Nitrate back to N2 Nitrogen gas
21. _____ cycle: The biogeochemical cycle that describes the movement of phosphorus through the lithosphere, hydrosphere, and ecosphere. (No Atmosphere)
23. _____ Cycle: The circulation of nitrogen; nitrates from the soil, absorbed by plants, eaten by animals that die and decay returning the nitrogen back to the soil.

----------teacher can remove this word bank to make puzzle more challenging----------

Possible Answers

ACID, BASE, CARBON, CONDENSATION, DENITRIFYING, EUTROPHIC, EUTROPHICATION, NITROGEN, OLGIOTROPHIC ,PERCOLATION, PHOSPHORUS , PHOTOSYNTHESIS, PLANTS, PRECIPITATION, RAIN, RESPIRATION, SURFACE, ATMOSPHERE, BACTERIA, BIOGEOCHEMICAL, EVAPORATION, EVAPOTRANSPIRATION, HYDROLOGIC, LIQUID


1 BASE
2 SURFACE
3 HYDROLOGIC
4 BACTERIA
5 LIQUID
6 EUTROPHICATION
7 EUTROPHIC
8 RAIN
9 PERCOLATION
10 RESPIRATION
11 BIOGEOCHEMICAL
12 EVAPOTRANSPIRATION
13 ACID
14 ATMOSPHERE
15 PRECIPITATION
16 LIGNIOTROPHIC
17 CARBON
18 PLANTS
19 DENITRIFYING
20 EVAPORATION
21 PHOSPHORUS
22 PHOTOSYNTHESIS
23 NITROGEN
24 CONDENSATION

Part 2 Review Game

Name:

1-10 = 10 pts * = Bonus + 1 pt, Part 4 Lesson 16

(Secretly write owl in correct space +1 pt)

Score ____ / 100

Final Question = 5 pt wager

WATER CYCLE	CARBON CYCLE	NITROGEN CYCLE	PHOSPHOROUS CYCLE	CYCLES Bonus round 1 pt each
1) Bio=Life Geo=Earth	6) Photosnythesis	11) False -It Needs to be fixed First	16) Letter E (A, B, C Only)	*21) Evil Kenevil
2) Evaporation (Liquid to Gas)	7) Cellular Respiration	12) Nitrogen Fixing Bacteria	17) Surface Run-Off	*22) Pastrana
3) Condensation (Gas to Liquid)	8) Carbon Cycle (Fossil Fuels)	13) By eating Plants or Animals	18) Geologic Uplift	*23) Speeder Bikes
4) Precipitation	9) Cellular Respiration	14) Denitrifying Bacteria	19) Eating Plants Or Animals	*24) OCC
5) Transpiration	10) Photosynthesis	15) Acid Rain	20) DNA	*25) Dumb and Dumber

Final Question Wager ____ /5 Answer: Eutrophication