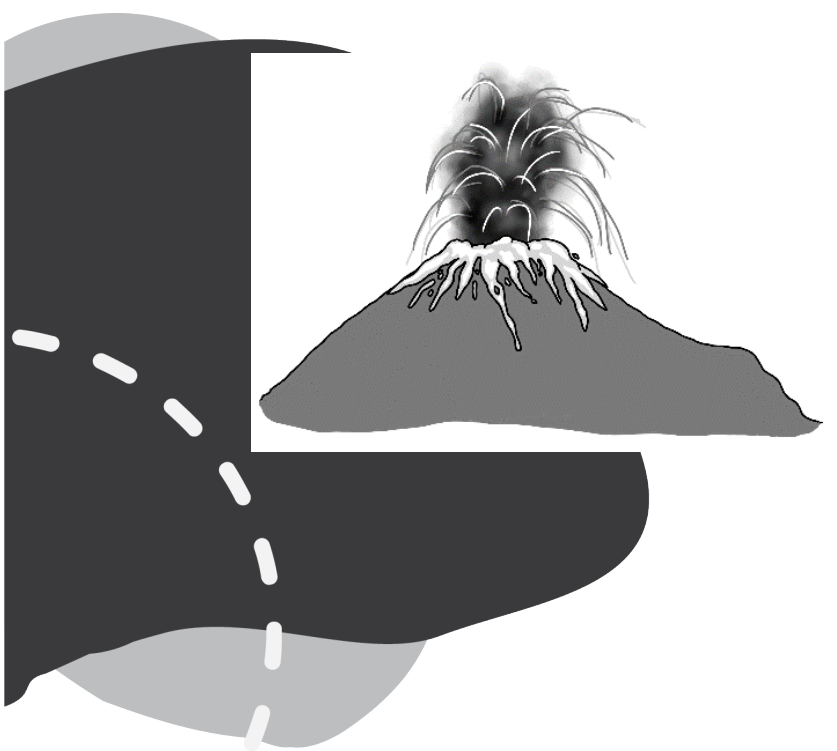
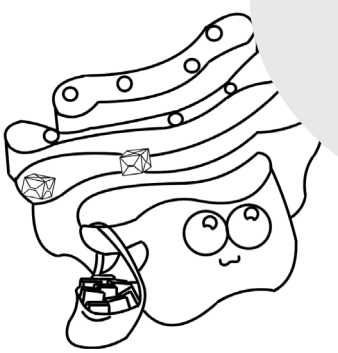
WISE Activity Booklets

A STEM activity booklet for fun on-the-go learning!

Made by WISE Kid-Netic Energy

DIY Activities
Puzzles
Challenges
... and more!





Grade 8
VOLUME 6

Cells & Systems - Optics
Fluids - Water Systems

University of Manitoba

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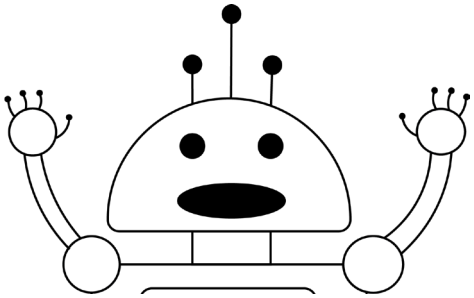


Hello there!

WISE Kid-Netic Energy is a not for profit STEM (Science, Technology, Engineering, and Math) outreach organization at the University of Manitoba. Our organization offers science and engineering workshops, clubs, camps and events to youth from Kindergarten to Grade 12 throughout the province of Manitoba. We reach on average 25 000 to 50 000 youth depending on funding levels. Our approach is simple – present STEM in messy, memorable and engaging ways so Manitoba youth feel motivated to learn more and more. We reach all Manitoba youth, and we particularly target underrepresented youth like girls, indigenous youth and youth facing socio-economic challenges.

All of us at WISE Kid-Netic Energy have been working hard to create these booklets to continue to bring our fun and educational STEM activities to Manitoba youth during these unprecedented times. We are disappointed that we cannot see you in person, and hope that these monthly booklets bring some STEM excitement to your life.

These booklets have been created by our student instructors who are all studying engineering, science, or in another STEM-related field at university. Peek the next page of this booklet to see who created the activities, experiments and recipes within.

All the activities in this booklet are based on the Manitoba Science curriculum. For any teachers viewing this booklet, all the SLO codes are listed at the bottom of each page.

We hope that you enjoy doing the experiments and activities as much as we loved creating them for you.

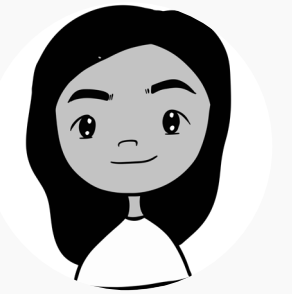
In this Grade 8 booklet, the science topics you will be exploring are: cells & systems, optics, fluids, water systems, and more!

Best of luck, and until we see you again,

the WISE Kid-Netic Energy Crew

P.S. If you have any suggestions for activities or experiments you would like us to try, contact us through our website, or social media accounts that are listed on the last page of this booklet.

Meet our Amazing Authors!



Gagan

Gagan is a fourth-year BSc Honours Student in the Department of Psychology. She enjoys being creative and loves to learn! In her free time, she likes to try new things, read, and grow plants.

Habiba

Habiba is a second year computer engineering student. In her free time, Habiba loves to learn about everything computer and internet related, but in her free time she likes to draw, go outside as well as cook.

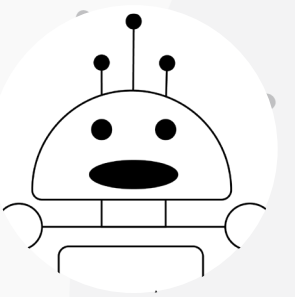
Katy

Katy has completed her second year of Biosystems Engineering at the University of Manitoba and is passionate about environmental sustainability and working with kids. In her spare time she enjoys running, painting, and spending time outside.

Zoë

Zoë just finished her first year of Engineering, and is entering the department of Civil Engineering in the fall. She loves math, and in her free time enjoys walking her dog, as well as playing volleyball and ultimate frisbee.

Esiw the Robot



Esiw is a friendly robot that loves to help kids learn about computers & coding! Esiw loves to do math, solve problems and make people laugh!

... and our Incredible Editors!

Alex

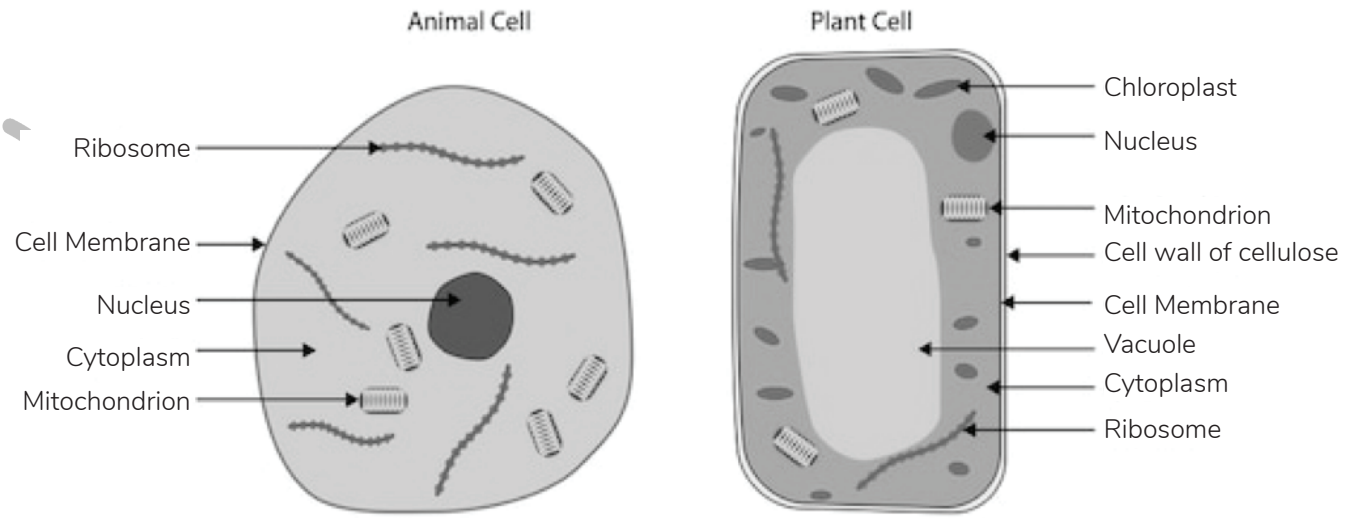
Bea

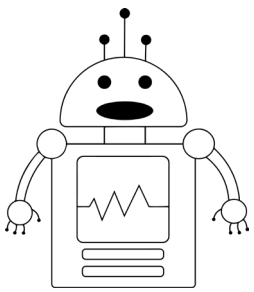
Mahalia

Michelle

Plant vs. Animal Cells

Observe the following pictures of the animal and plant cells and fill out your observations on which organelles exist in plant cells, and which ones are in animal cells. There are organelles that are in both plants and animals.

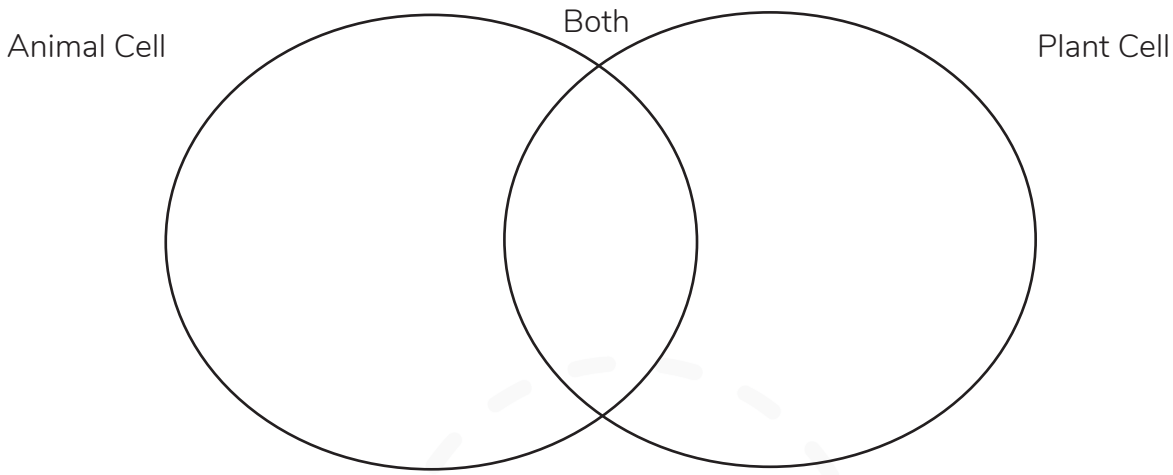




A **Venn Diagram** expresses the relationship between a set of different things virually. This is very important to computer science as classifying data and organizing it is important for good programming.

Sort the following into the Venn Diagram

Rectangular shape	Lysosomes	Cell wall	Small Vacuoles
Chloroplast	Nucleus	Plasma Membrane	Ribosomes
Cytoplasm	Mitochondrion	Large Vacuoles	



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SLO: 8-1-05

Specialized Cells

Cells don't all look the same, some cells found in animals and plants and have different shapes, structures and properties to adapt with their functions and to better perform in their bodies.

Read the following descriptions and draw a picture of what you think the specialized cell will look like. Fill in the blanks in the description.

A **Sperm Cell** is found in the human testis, it has a long tail to be able to swim to _____.

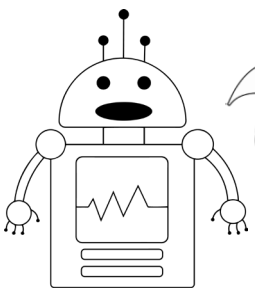
An **Egg Cell** is found in _____. It stores genetic information for formation of embryos.

A **Palisade Cell** is found in plant leaves. Palisade cells are composed of a large amount of _____ for photosynthesis.

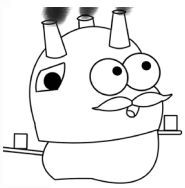
A **Red Blood Cell** is found in _____ and it does not have a nucleus, so they can have more space to carry _____.

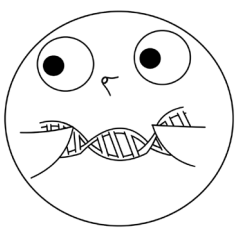
Cell Organelles

There has been a security breech and a virus has scrambled the following cell organelles. Match each organelle with its appropriate cell function by connecting them by a line.



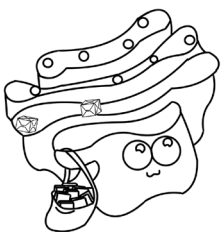
DNA acts like a computer program, it has a set of instructions that act like code to carry out certain cell functions.





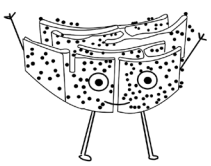
Rough Endoplasmic Reticulum: I am studded with ribosomes and play an important role in protein synthesis.

Mitochondrion: I have a double membrane and provide energy to the cell.

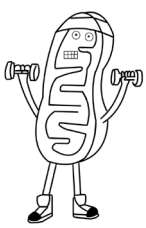


Lysosome: Anything I engulf will be broken down by digestive enzymes.

Ribosome: Found in cytoplasm, I synthesize protein using RNA.



Golgi: I pack, store, and transport proteins via vesicles.



Nucleus: I house DNA and other genetic materials.

Evolution of Electromagnetic Radiation

Cut the following code blocks below and put them in the correct order on the given timeline (on Page 9). Use the given dates to help you solve the puzzle!

X-rays first being used by battlefield physicians to locate bullets in wounded soldiers.

1800
Herschel discovers infrared light while testing how much heat is contained in the different colours of visible light.

Heinrich Hertz produces radio waves via sparks that are then picked up by a transmitter.

1895
Wilhelm Rontgen accidently discovers X-Rays while experimenting with vacuum tubes.

Scientists declare X-Rays are another form of light.

1960
The harmful effects of UV rays on DNA are established.

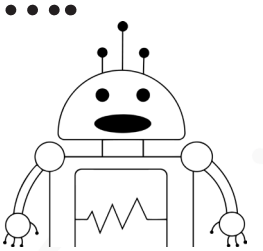
1900
Gamma-rays were first discovered while investigating radiation from radium.

Nuclear powerplant, Chernobyl blows up, releasing large doses of gamma radiation.

Similar to changes in skin colouring when tanning, ultraviolet light was discovered by measuring the darkening of the chemical silver chloride.

1946
The invention of the microwave.

Isaac Newton discovers the separation of white light into visible light via prisms.



A timeline is similar to sequencing in coding. This is when an event leads to the next pre-determined order of events.

SLO: 8-2-07, 8-2-08

This activity continues on the next page!

This page is intentionally left blank,

because the previous page is meant

to be cut up.


1
2
3
4
5
6
7
8
9
10
11
12

Identify the Light Source

Light helps us function and survive in our everyday lives. If we didn't have heat and light from the sun, we simply would not be alive! But do you know what type of light source the sun is? What types of light sources are there?

Incandescent vs Luminescent

Incandescent light is emitted from a substance after heat energy has been added to that substance. The energy is stored in the material and then released as light. Some examples of incandescent light include incandescent lightbulbs, the embers of a campfire, and molten metal/rock that has been heated up to a liquid state.

Luminescent light is emitted without heat being added to the material. Stars in the universe are examples of luminescent light because you do not have to add heat to stars for them to shine brightly. Chemiluminescence and bioluminescence are also examples of luminescent light scources because they are naturally occuring.

Types of Luminescent Light Sources

Fluorescent Light Source: A light is emitted from a substances that have absorbed energy and are then able to give off that energy as light.

Phosphorescent Light Source: A light slowly released after being stored in a substance as energy. Although like flourscent light, phosphorescent light is emitted over a longer period of time.

Chemiluminescent Light Source: Light caused by a chemical reaction.

Bioluminescent Light Source: Light made by living things through biological systems.

For this activity you will use the light source code to sort the following types of light. Beside each source image, list all numbers from the code that apply to the source.

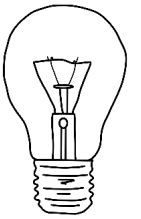
Light Source Code

Incandescent light = 0
Luminescent light = 1
Fluorescent light = 2
Phosphorescent light = 3
Chemiluminescent light = 4
Bioluminescent light = 5

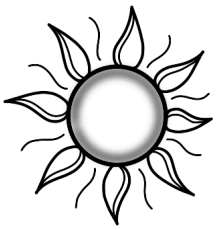
This activity continues on the next page!

SLO: 8-2-02

A Fluorescent Lamp: _1, 2_

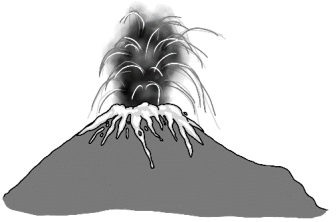


A Light Bulb: _____



The Sun: _____

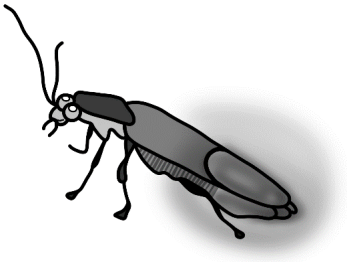
A Lightning Bolt: _____



Lava from a Volcano: _____

A Glow Stick: _____

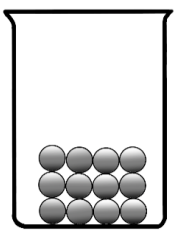
'Glow in the Dark' Stars: _____

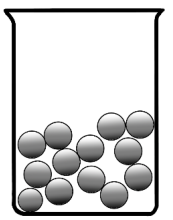


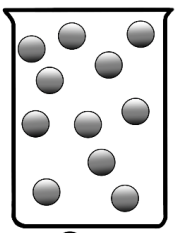
A Firefly: _____

Density and Temperature Changes

Solids, liquids, and gases all consist of particles. A solid is made up of particles that are tightly packed together (very dense), a liquid is made up of particles that are not as tightly compressed as a solid (less dense), and a gas is made up of particles that are even less compressed together than a solid or liquid (not very dense).







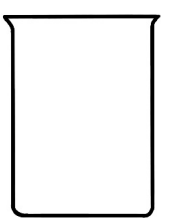
These three states, along with their densities, can be changed by the effect of temperature. For example, if a solid ice cube is heated, it turns into a less-dense liquid.

Use the terms “more dense” and “less dense” to fill in the if/else-statements below. Include whether the substance is now in a “solid”, “liquid”, or “gas” state . For each one, draw in what the densities would be using circles to represent particles. Else statements refer to what the original state is before it was heated or cooled.

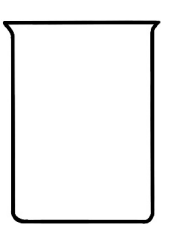
Hint: More particles = more dense, and less particles = less dense.

1. solid = particles very condensed
2. liquid = particles slightly condensed
3. gas = particles not condensed
4. heat = substance is being heated up
5. cool = substance is being cooled down

6. if (solid) {
7. if (heat) { }
8. density = _____ and _____}
   (particles) (state)

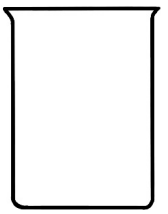


9. else {
10. density = _____ and _____}
    (particles) (state)

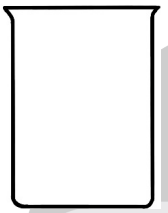


This activity continues on the next page!

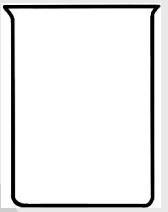
11. if (liquid) {
12. if (heat) { }
13. density = _____ and _____}
(particles) (state)



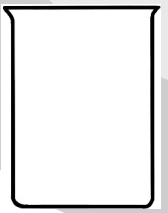
14. else {
15. density = _____ and _____}
(particles) (state)



16. if (gas) {
17. if (cool) { }
18. density = _____ and _____}
(particles) (state)



19. else {
20. density = _____ and _____}
(particles) (state)



Experimenting with Buoyancy

The buoyant force comes from the pressure that is pushing on an object by a fluid. When an object floats, the buoyant force balances with the force of gravity. When an object sinks, the force of gravity is greater than the buoyant force.

Density is also a factor in whether an object floats or not. If an object is less dense than a fluid, for example water, it will float. If it is denser than water, it will sink.

In this activity, you will be testing out the buoyant force of liquids that have different densities on a tinfoil canoe. To make a tinfoil canoe, take a 15 cm x 15 cm square sheet of aluminum foil and design your own canoe that you think will hold as many coins as possible before it sinks.

Before you start the full experiment, test your boat with water only.

Fluid	Maximum # of coins held before the boat sinks
Water	

Now, make your predictions about the other liquids compared to water in the chart below. Make sure to dry off your canoe before you test it again.

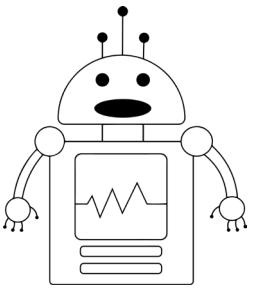
Fluid	Prediction of maximum # of coins held before the canoe sinks	Comparison prediction (circle either less dense or more dense)	Comparison prediction (circle either less dense or more dense)
Syrup		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Milk		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Oil		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.

This activity continues on the next page!

Dish Soap		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Water mixed with salt		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.

Now that you've predicted your results, test out your boat with all the other liquids. Don't forget to record your results!

NOTE: It is very important that you use the same size of coin for all the different fluids, so your results are consistent.



Following similar steps in a specific order like in this experiment is very similar to how a function in coding works!

Fluid	Maximum # of coins held before the canoe sinks	Comparison prediction (circle either less dense or more dense)	Comparison prediction (circle either less dense or more dense)
Water			
Syrup		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Milk		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Oil		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Dish Soap		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.
Water mixed with salt		This liquid is **less dense / more dense** than water.	This liquid is **less dense / more dense** than water.

This activity continues on the next page!

Now that you have completed this experiment, use the knowledge you obtained about density and buoyancy to answer the following questions:

Imagine two tinfoil canoes are in a race. One canoe is racing in a syrup river, and the other is racing in an oil river.

1. Which canoe do you think would win the race, and why?

2. What problems would each canoe face? Are there different problems for each canoe based on the type of liquid they are racing in? What are those problems?

3. What physical aspects of each canoe would you change in order for each canoe to be the fastest it can be?

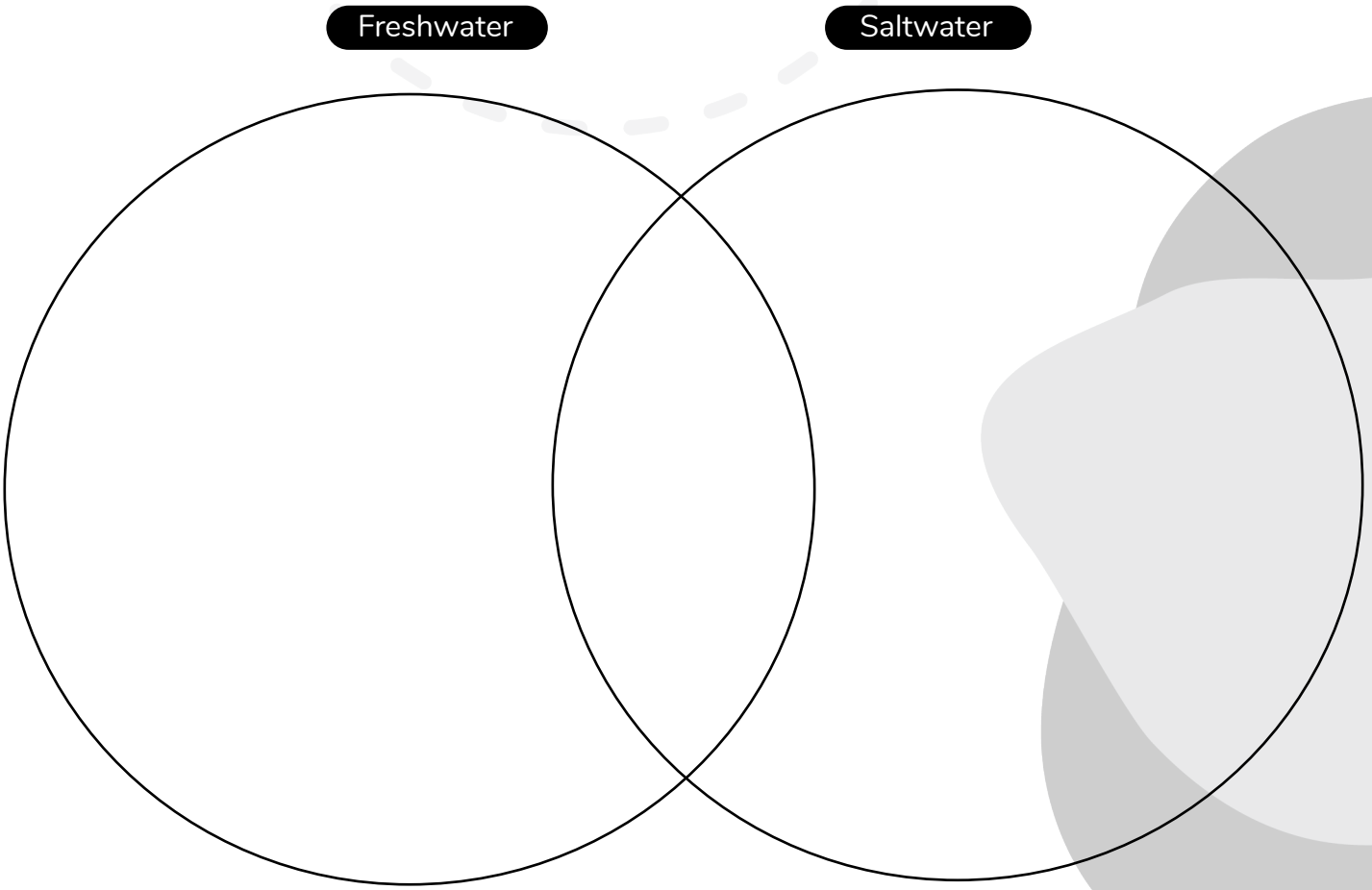
4. Do you think the winner of the race would change based on the physical changes you made to each canoe? Why?

Bonus Activity!

If you have time, use the knowledge you have from your first tinfoil canoe design, and design a different type of canoe. Repeat the prediction and testing process. Try to make changes you think will improve your canoe's ability to stay afloat.

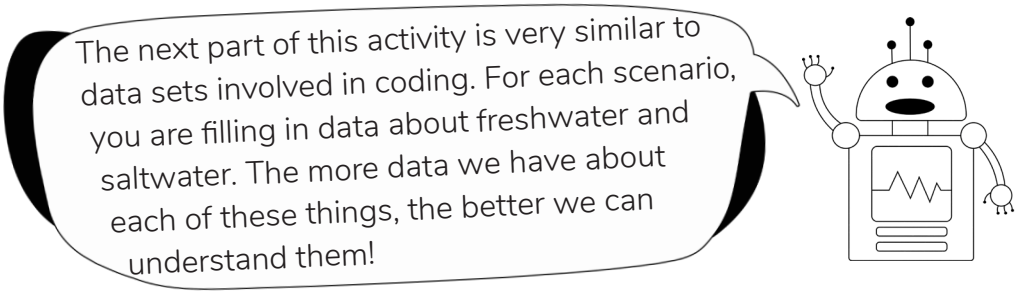
Fresh Water vs Salt Water

Use the word bank below to write each trait in the correct category in the Venn Diagram. Don't forget to write in each similarity in the space where the circles overlap!



Word Bank

High amount of salt	Drinkable	Dissolved salt concentration less than 1%
Has the ability to freeze	1% of the earth is covered in it	Risk of dehydration if you drink it
Higher conductivity	Lakes and Rivers	71% of the earth is covered in it
Wetlands	Almost half of all known fish species live in this water	
Atlantic Ocean	Higher density	Freezing point is 0°C
Pacific Ocean	Freezing point is -2°C	Has the ability to boil
Ponds	Lower density	Home to aquatic life



SLO: 8-4-03

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After reading each scenario, answer each one using either “saltwater” or “freshwater”.

1. You and your friend are going on a boat ride with a guide to catch lobster. What is the type of water you would be catching lobster in? *Fun fact: lobsters have a high enough salt level within their cells to tolerate the type of water they live in.*

_____

2. Now, you and your friend want to catch crayfish. What type of body of water should you go to catch them in?

_____

3. Xavier goes on a camping trip with his family. They are able to filter and drink from the body of water they are next to. What type of water is this?

_____

4. Sam and her friend are going scuba-diving because they really want to see a coral reef. What type of water would they have to scuba-dive in to find a coral reef?

_____

5. You and your friends are doing an experiment to see who can float the longest in freshwater compared to saltwater. What type of water has more buoyancy allowing you to float the maximum amount of time?

_____

6. The leaves of a _____water plant are a very important aspect to their survival. Floating leaves are very common and are typically very broad. They have something called lacunae, which are unfilled spaces that contain gas which makes the leaves more buoyant. What type of water do floating leaves live/grow in?

_____

7. Fish that live in saltwater have the ability to drink it, and then eliminate the salt through their gills and kidneys. An example of a fish that can do this is a salmon. However, a salmon is different than most saltwater fish, because it can change its metabolism in order to survive in various water conditions. What type(s) of water can a salmon survive in?

_____

8. Ted and Anna are conducting an experiment to test the boiling points of freshwater vs saltwater. Ted thinks the saltwater will boil faster, but Anna thinks the freshwater will boil faster. Who is correct in their prediction? Which type of water will boil faster? *Hint: water with higher concentrations of “stuff” in it generally takes longer to boil.*

_____

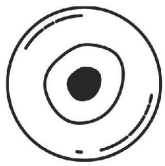
Answer Keys

4-5 - Animal vs. Plant Cells

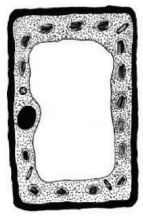
Venn Diagram
Animal Cell - Lysosomes,
Both - Ribosome, Cytoplasm, Mitochondrion, Nucleus, Plasma membrance
Plant Cell - Rectangular shape, Chloroplast, Cell wall, Small Vacuoles, Large Vacuoles

Specialized cells:
Sperm cells: Egg cell.

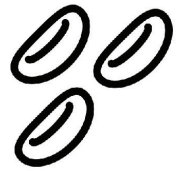
Egg cell: Ovaries.



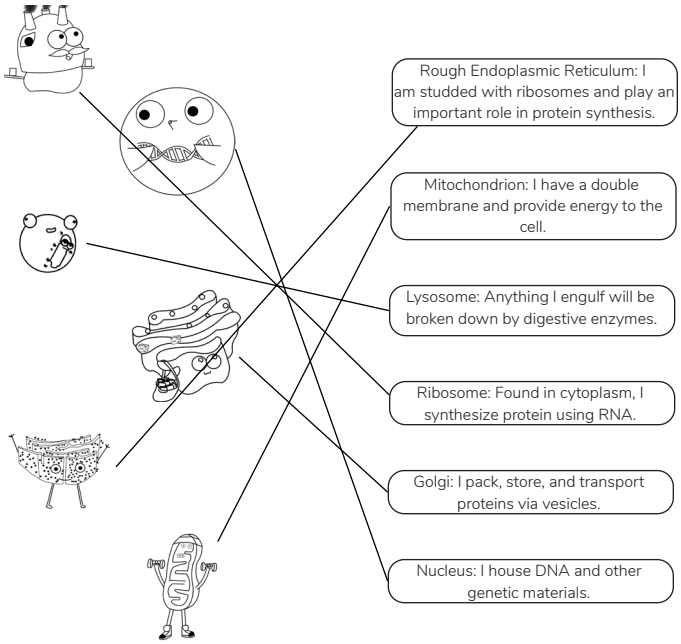
Palisade cell: Chloroplasts.



Red blood cell: Blood/veins; Oxygen.



6 - Cell Organelles



7-9 - Evolution of Electromagnetic Radiation

1. Isaac Newton discovers the separation of white light into visible light via prisms.
2. 1800 Herschel discovers infrared light while testing how much heat is contained in the different colours of visible light.
3. Similar to changes in skin colour when tanning, ultraviolet light was discovered by measuring the darkening of the chemical, silver chloride.
4. Heinrich Hertz produces radio waves via sparks that are then picked up by a transmitter.
5. 1895 Wilhelm Rontgen accidently discovers X-rays while experimenting with vacuum tubes.
6. X-rays first being used by battlefield physicals to locate bullets in wounded soldiers.
7. 1900 Gamma-rays were first observed when investigating radiation from radium.
8. Scientists declare X-rays are another form of light.
9. 1920 radio becomes commercially popular.
10. 1946 the invention of the microwave.
11. 1960 the harmful effects of UV rays on DNA are established.
12. Nuclear powerplant, Chernobyl blows up, releasing large doses of gamma radiation.

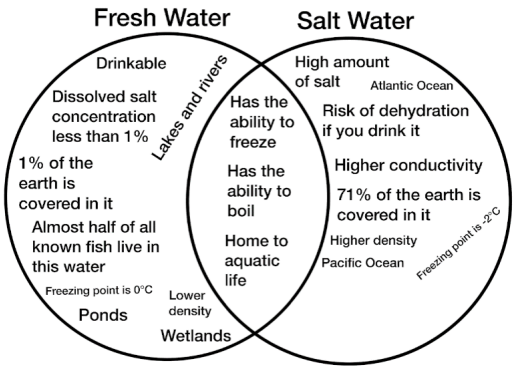
10-11 - Identify the Light Source

A Light Bulb: 1,3
The Sun: 1
A Lightning Bulb: 1
Lava from a Volacno: 0
A Glow Stick: 1,4
'Glow in the Dark' Stars: 0
A Firefly: 1,5

12-13 - Density and Temperature Change

8. less dense, liquid
10. more dense, solid
13. less dense, gas
15. more dense, solid
18. more dense, liquid
20. less dense, gas

17-18 - Freshwater vs Saltwater



1. Saltwater
2. Freshwater
3. Freshwater
4. Saltwater
5. Saltwater
6. Freshwater
7. Saltwater and Freshwater
8. Freshwater

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