


LATAM INTELLIGENT FILTER FOR EDUCATION

EDUCATIONAL MODULES

TABLE OF CONTENTS

TEACHER'S GUIDE

EDUCATIONAL SLIDES

- This slide deck may best be used as a learning aid to compliment your teaching
- Include or omit as much content as you feel is necessary
- You will also find additional Content Features to further engage with the materials: Activities, Let's talk about it, Try it later!, Fun Fact

CONTENT FEATURES

- Activity: Short engaging tasks to supplement the content
- Let's talk about it: Lead a short in-class discussion with these fun questions
- Try it later!: Activities and experiments to try later outside of class or as homework
- Fun Fact: A fun and interesting fact about the topic

TEACHER'S GUIDE

EXPERIMENTS

💧This slide deck also contains a series of complementary experiments in the form of worksheets that can be paired with the educational material at your discretion

💧 Most of the activities involve the LATAM Intelligent Filter for Education

💧 A "Teacher's Guide" to each experiment is also included to help lead the experiment and teach the scientific method

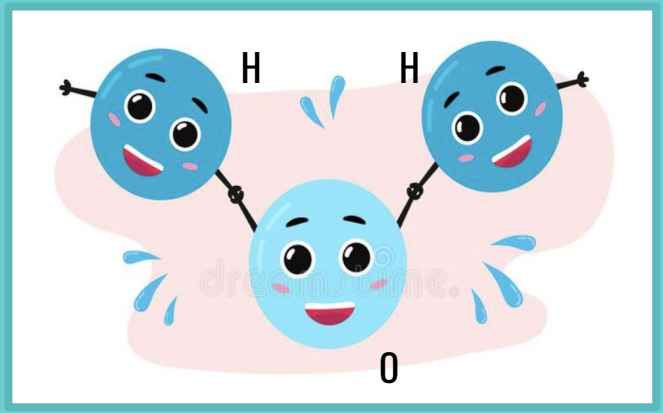
WATER IN THE HUMAN BODY

MODULE 2

WHAT IS WATER?

Water is made up of small particles

- The chemical formula for water is H_2O
  - 2 Hydrogen (H) particles
  - 1 Oxygen (O) particles



Water can exist in different forms!

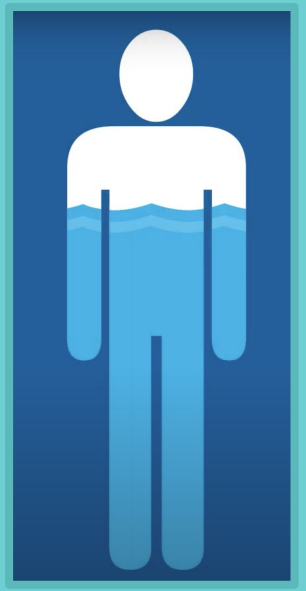
- Solid → Ice
- Liquid → Water
- Gas → Steam

Let's talk about it:
Where do you see these three forms of water?

WATER AND THE HUMAN BODY

60% of the adult human body is water!

- The percent of water in the body changes as you grow up!



60%

WATER AND THE HUMAN BODY

78%

65%

60%

50%

Infants:

- Infants have a lot of water in their bodies to help them grow, which is why they drink so much breastmilk and formula!

Kids, adults, and seniors:

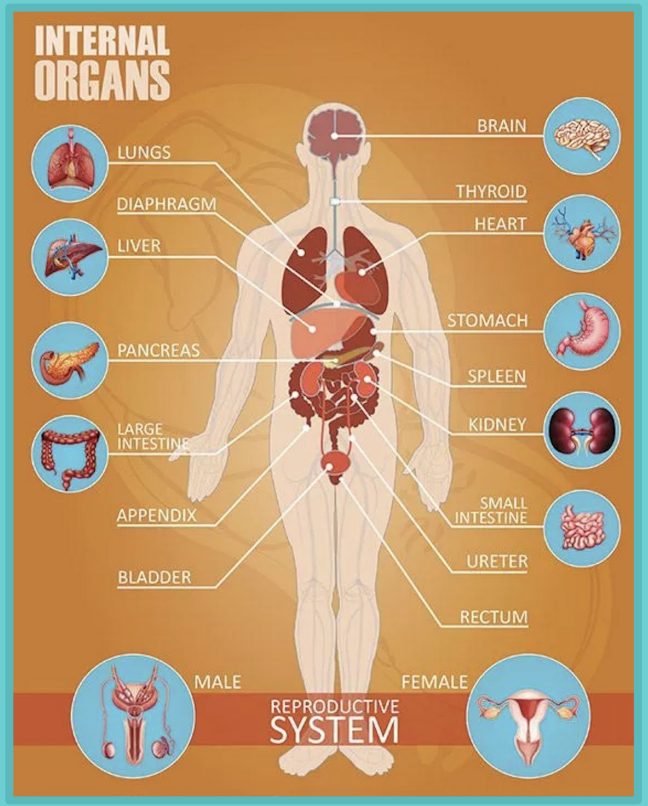
- As you age, you have less muscle and more fat, which lowers the amount of water in your body
  - Muscles have a lot of water
  - Fat does not have a lot of water

THE HUMAN BODY OVERVIEW

What are organs?

- Organs work together to carry out specific functions within the body to make your body work
- You will get to explore some of these organs and their functions later

Fun Fact: Did you know that we have over **75** different organs in our bodies?

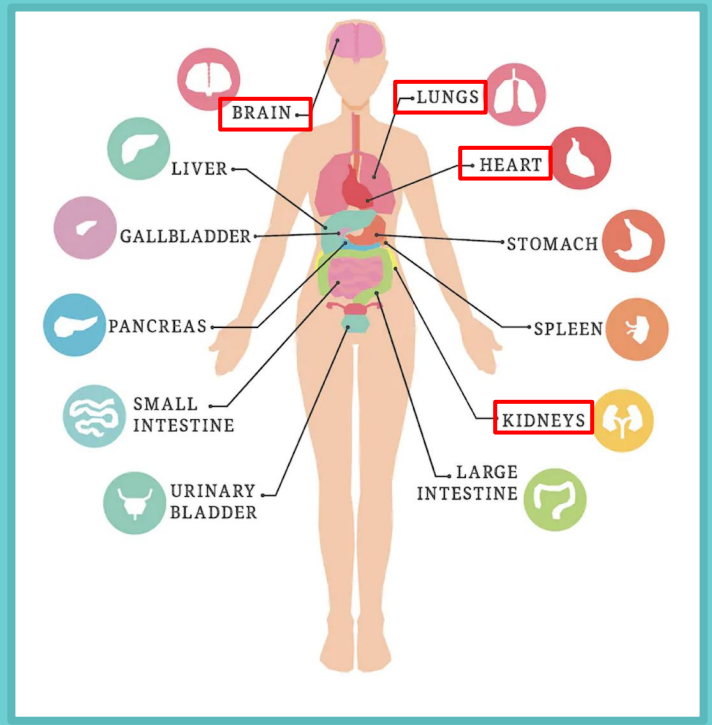


WATER AND THE HUMAN BODY

How much water is in our organs?

Brain & Heart	73% Water
Lungs	83% Water
Skin	64% Water
Muscles & Kidneys	31% Water
Bones	31% Water

We have A LOT of water in our bodies!



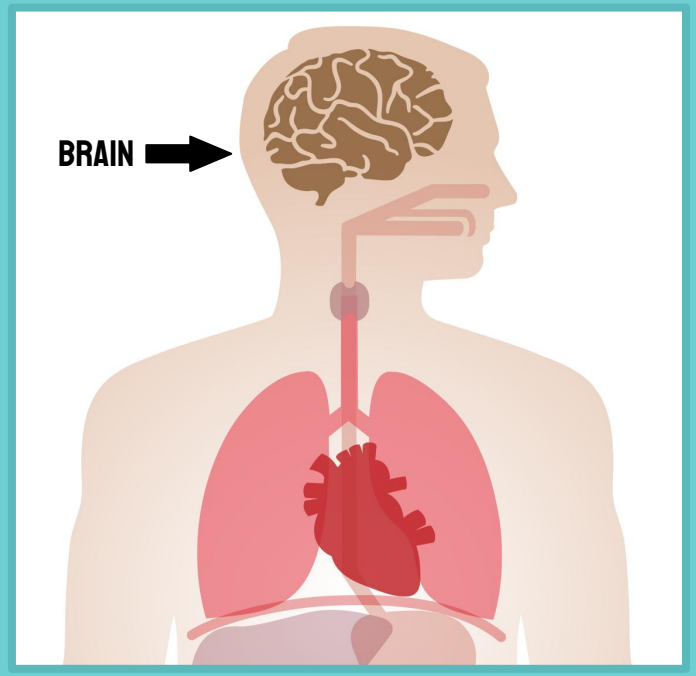
IMPORTANCE OF WATER IN THE HUMAN BODY

WATER AND BRAIN HEALTH

What is the brain?

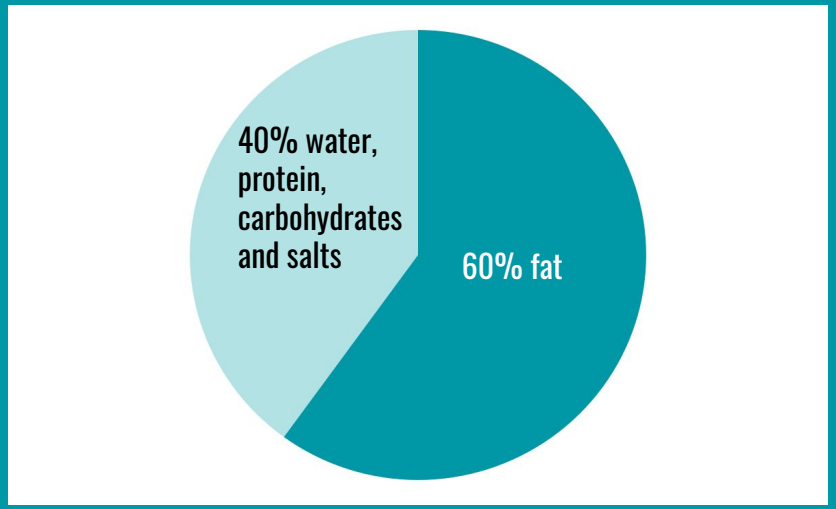
- The ultimate control center of the body
- A complicated organ that controls thought, emotions, touch, movements, vision, breathing, temperature, hunger, and more!

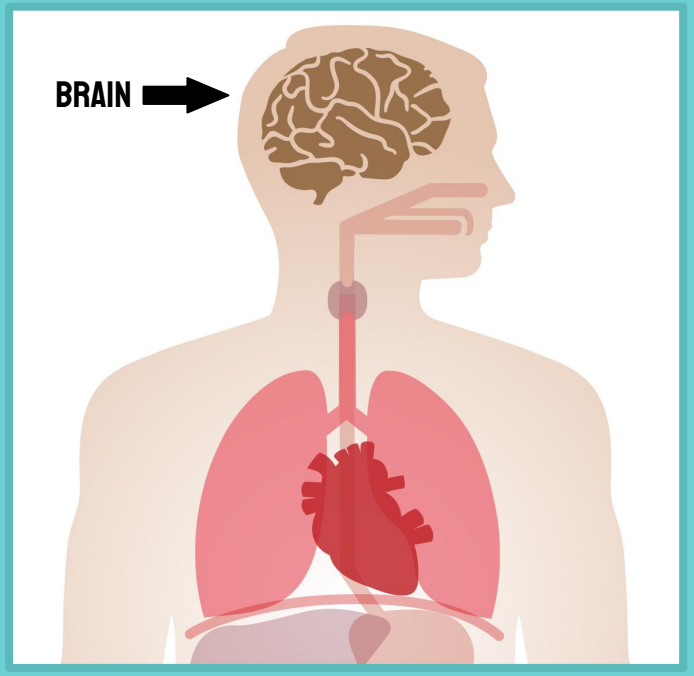
BRAIN



WATER AND BRAIN HEALTH

What is the brain made of?





WATER AND BRAIN HEALTH

How does water help the brain?

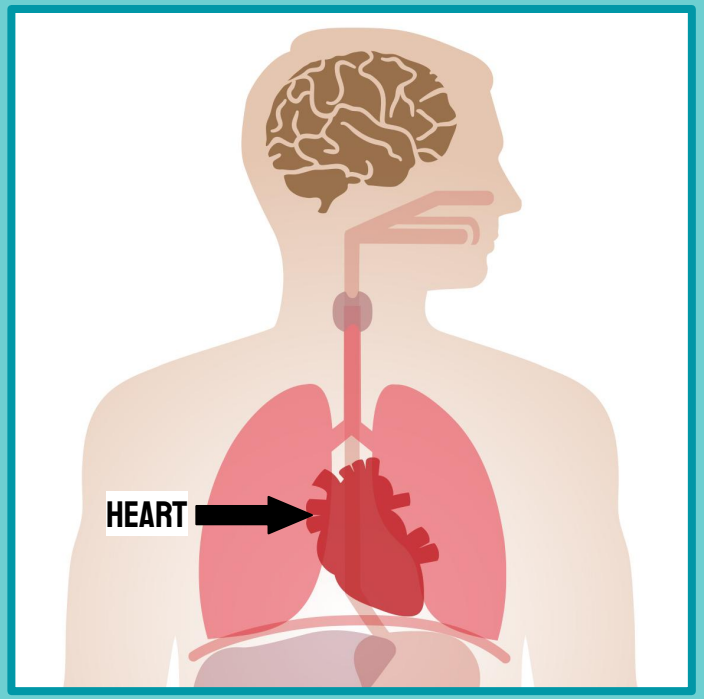
- Drinking LOTS of water is important to keep your brain healthy
- Cells in your brain require a balance between water and other biological molecules like salts and sugars
- When our bodies lose too much water, this balance is thrown off and we may have a harder time thinking!

WATER AND HEART HEALTH

What is the heart?

- An important organ that pumps blood throughout your body to keep you alive
- It is the center of circulatory system that delivers oxygen and nutrients to the rest of your body

Let's try it: Place your hand over the left side of your chest and breathe in deeply. See if you can feel your heartbeat! That's that sound of it pumping blood!



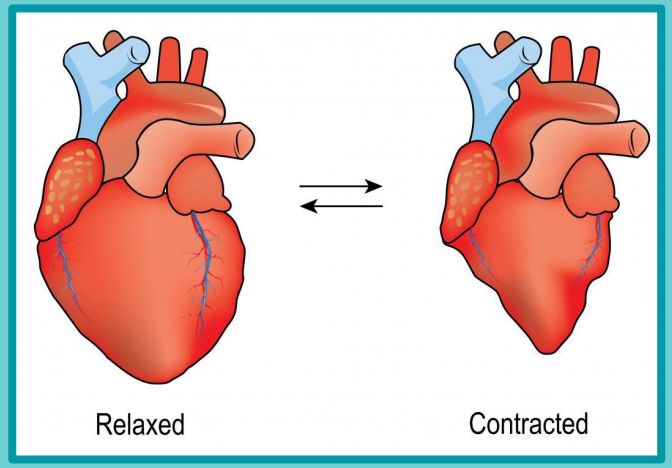
WATER AND HEART HEALTH

What is the heart made of?

- A heart (or cardiac) muscle

How does the heart muscle work?

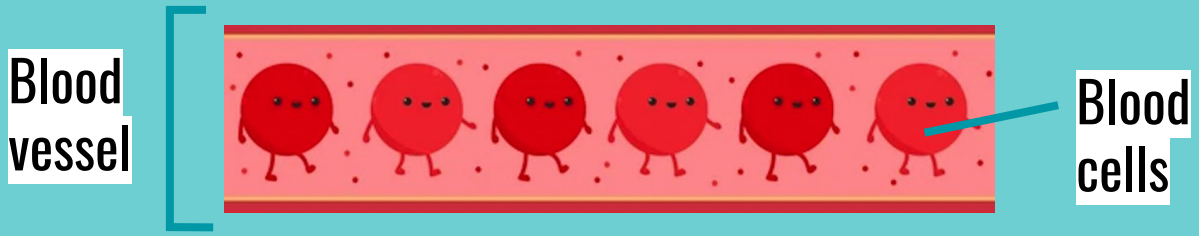
- This muscle squeezes (or contracts) tightly when your heart beats, allowing blood to pump through your body
- Blood is pumped through the circulatory system

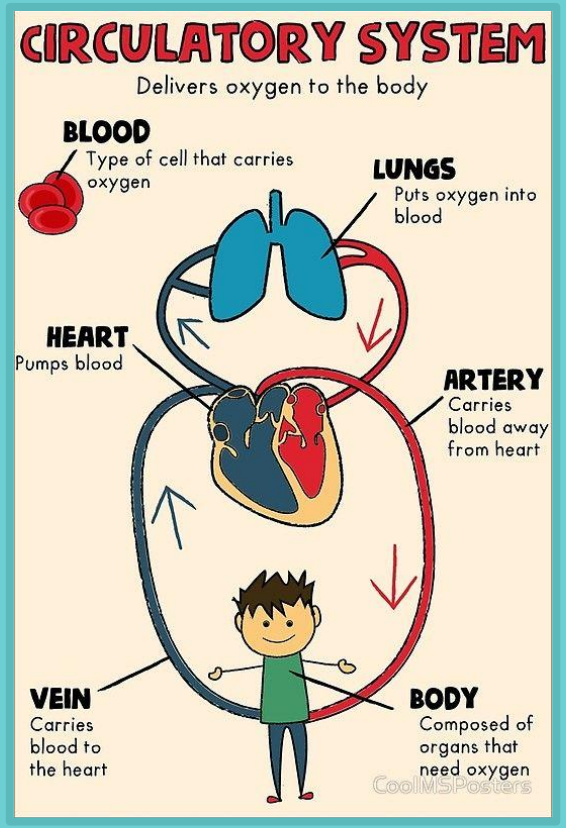


WATER AND HEART HEALTH

What is the circulatory system?

- An important collection of blood vessels made of arteries and veins that transport blood to and from your body's organs
- Think of these blood vessels as "tubes" that carry blood to different parts of your body!

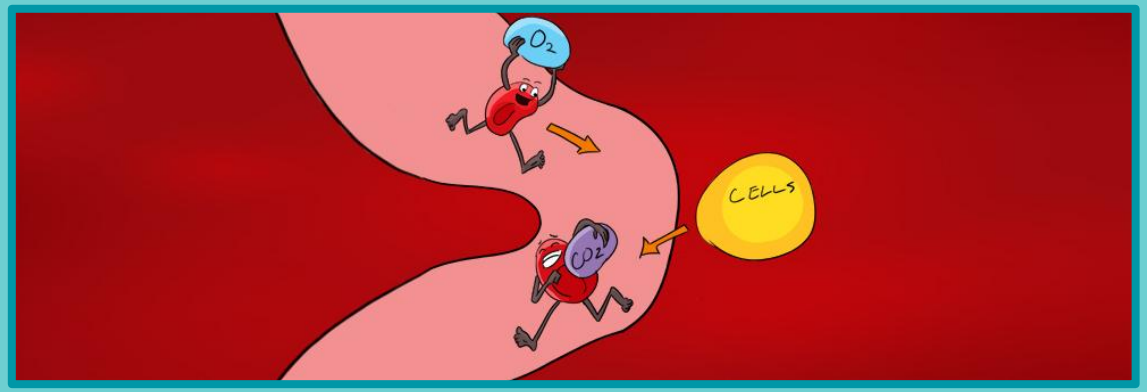


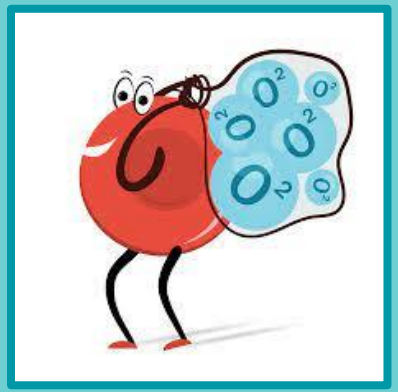


WATER AND HEART HEALTH

Why do our body parts need blood?

- Blood pumped from the heart carries oxygen (from the air you breathe in) and other nutrients to keep your body healthy
- The blood that travels in these tubes also carry carbon dioxide to your lungs so you can breathe it out

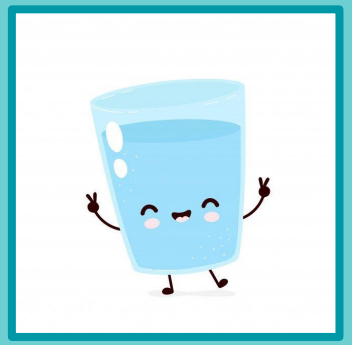




WATER AND HEART HEALTH

How does water help the heart?

- Drinking water helps our heart to pump blood to different parts of our body easier
- Drinking water helps prevent heart damage and heart disease (when there are problems with the heart and it's blood vessels)



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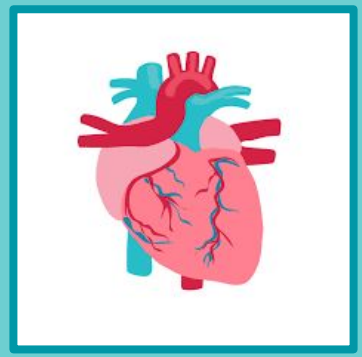
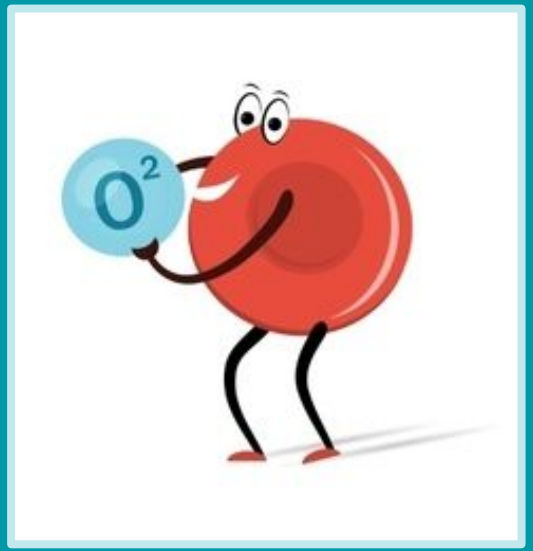


ACTIVITY

Let's try to find your pulse!

- Your pulse is the movement of your arteries (a type of blood vessel) as your heart pumps blood through them!
  - As this happens, blood carries oxygen to parts of your body!
- When you exercise, your body use a lot of energy and oxygen



ACTIVITY

Let's try to find your pulse!

- Do you think your pulse will be faster (increase), slower (decrease), or stay the same after you exercise?
  - Record your hypothesis below

Hypothesis: I think my pulse will be _____ because _____.

ACTIVITY

Let's try to find your pulse!

- Let's test your hypothesis!
  - Find a big artery by copying the picture to the right!
  - Press down gently
  - Can you feel your pulse: *Thump...thump...thump*

ACTIVITY

Let's try to find your pulse!

- Now let's count your pulse!
  - Watch a clock for 6 seconds and count how many thumps you feel for that time
  - Now multiply that number by ten to find how many thumps there are in a full minute (60 seconds)

___ x 10 = _____ beats per minute (bpm)

ACTIVITY

Does your pulse change when you exercise?

- Now let's exercise and count your pulse again!
  - Stand up and do 20 jumping jacks
  - Count your pulse again for 6 seconds and multiply by 10

___ x 10 = _____ beats per minute (bpm)

My pulse **increased** / **decreased** / **stayed the same** (circle one) because _____.

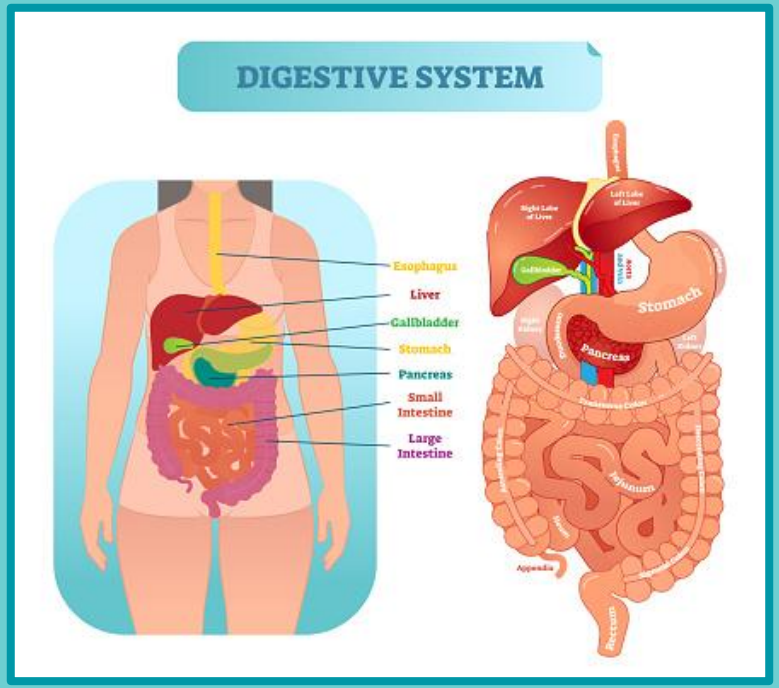
WATER AND DIGESTION

What is digestion?

- The physical and chemical process of breaking food down into nutrients that can be used by our bodies for energy and growth

Why is digestion important?

- Our bodies need a way to transform the food we eat and the liquids we drink into molecules our body needs to function



WATER AND DIGESTION

How does water help with digestion?

- Water is the number one component in spit (or saliva), that watery liquid produced by your mouth when you're hungry
- Saliva also contains digestive enzymes, small molecules that help break down our food
- Without water, we wouldn't have the main ingredient needed to make saliva which would make digesting food harder!

WATER AND DIGESTION

How else does water help with digestion?

- Water helps you poop (or defecate) out solid pieces of waste that your body doesn't need anymore!
- If you don't drink enough water, your poop will be hard and pooping may hurt!

Fun Fact: Did you know that **75%** of normal poop is made of **water**?

WATER AND DIGESTION

How else does water help with digestion?

- Water also helps you pee (or urinate)!
- Peeing (or urinating) is another way that your body gets rid of waste and extra water that it doesn't need!

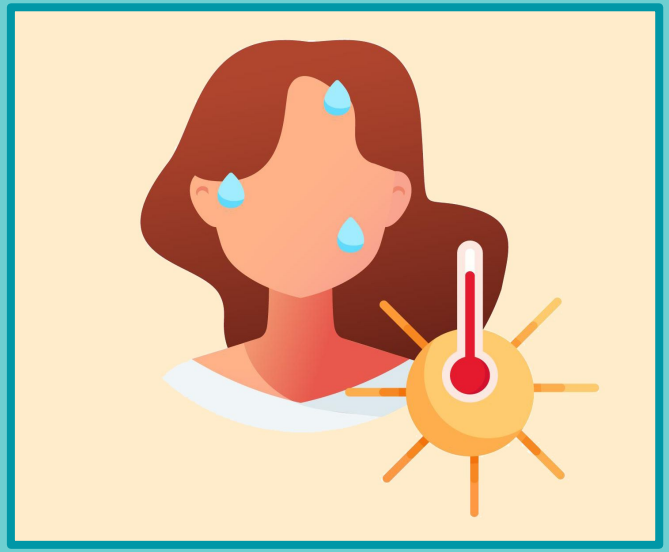
Fun Fact: Did you know that **95%** of normal pee is made of **water**?

WATER AND SWEATING

What is sweat?

- Sweat (or perspiration) is made almost completely out of water and is released from our body when we get hot!
- When our body comes too hot, we lose water through sweat. Then the evaporation of the sweat removes heat from our body!

Evaporation is when a liquid changes into a gas. Think of a puddle drying up when the sun comes out. Likewise, the sun's heat helps the sweat evaporate off of your skin and return into the atmosphere.



TRY IT LATER!

Let's sweat!

- Go outside and play a game of fútbol with your friends!
- When you start feeling hot, feel your skin to see if it's wet with sweat!
- That's your body trying to cool off! At this point, even a slight breeze will feel nice on your skin and help to cool you off.
- Also, sweat is salty. Sometimes you may taste the saltiness of the sweat as it runs down your face!

HEALTHY WATER-DRINKING HABITS

HOW MUCH WATER SHOULD YOU DRINK A DAY?

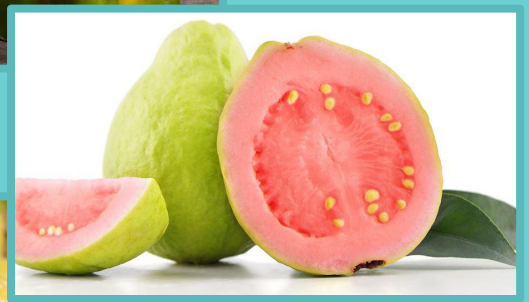
Girls and boys 4-8 years old	Girls and boys 9-13 years old	Girls 14-18 years old	Boys 14-18 years old	Adult Women	Adult Men
5 cups (40 oz)	7-8 cups (56-64 oz)	8 cups (64 oz)	11 cups (88 oz)	11.5 cups (91 oz)	15.5 cups (125 oz)

HOW DOES WATER ENTER THE BODY?

Fruit is a source of water for your body!

Fruits highest in water content:

- Sandia (watermelon) → 91% water
- Fresas (strawberries) → 91% water
- Papaya → 88% water
- Guava → 80% water
- Mburucuya (passion fruit) → 73% water



VEGETABLES HAVE WATER TOO!

Water enters the body by eating vegetables

Vegetables highest in water content:

- Aji amarillo (Orange Chile Pepper) → 88% water
- Jicama → 85% water
- Maca (radish) → 80% water
- Papa (Potato) → 80% water
- Cassava → 60-70% water

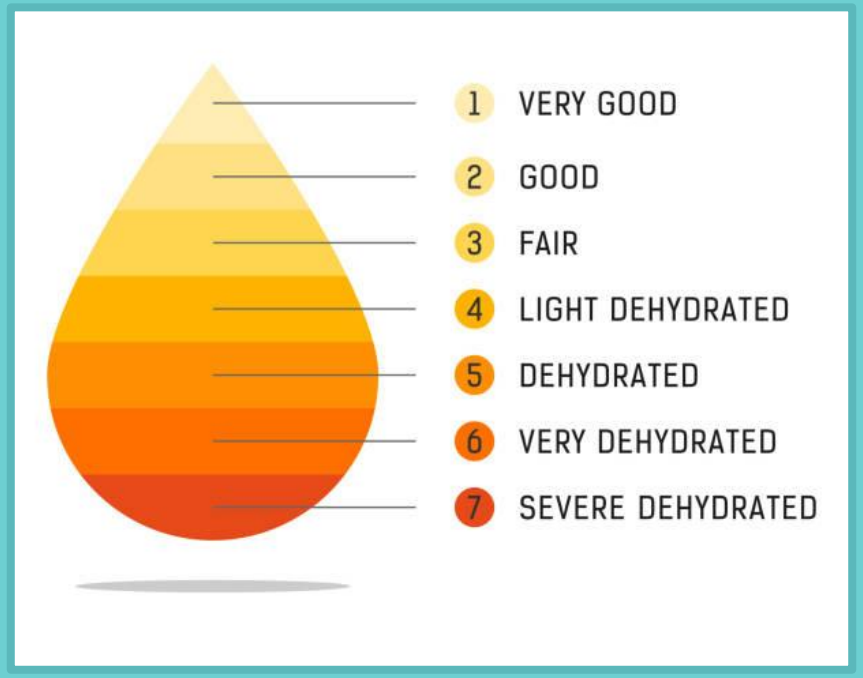
WHAT COLOR IS YOUR URINE?

What color is normal urine?

- If you're drinking enough water throughout the day, your urine should be pale yellow in color!

Why is my urine bright yellow?

- If your urine is yellow, you should drink more water! Bright yellow urine indicates that your body may be dehydrated.



ACTIVITY

How does water affect your pee?

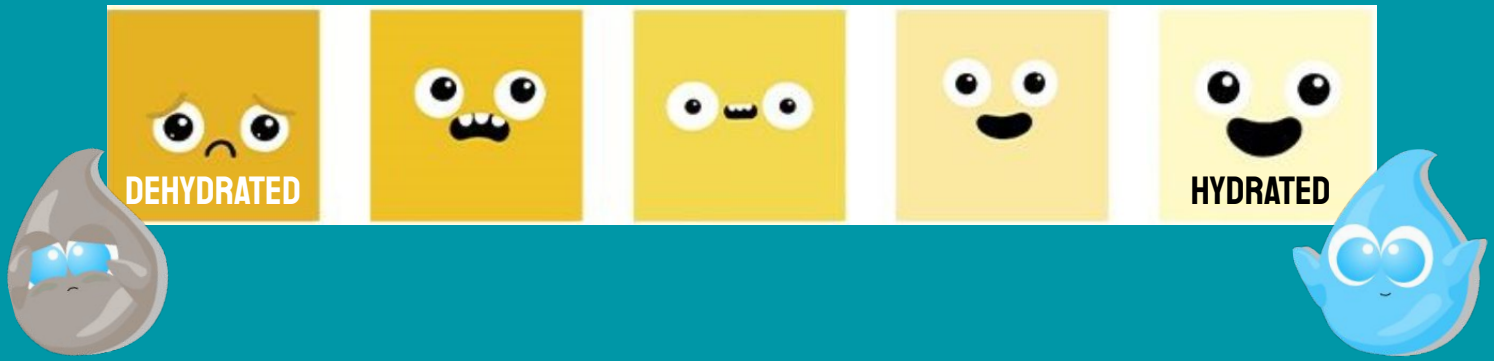
- What color is your urine (pee) normally?
  - Maybe it's yellow? Clear?
- Try taking a look at the color of your pee then drink a lot of water for a few hours and check the color of your pee again.
  - Make a hypothesis: Do you think the color of your pee will change? Did the color actually change?

Hypothesis: I think my the color of my pee will **change** / **not change** (circle one) because _____.

ACTIVITY

How does water affect your pee?

- The color of your pee actually tells us a lot about if you are drinking enough water!
  - If your pee is very dark yellow, that might mean you are not drinking enough water
  - If your pee is close to clear, you are getting a good amount of water!



EXPERIMENTS

1. HOW CLEAN IS MY WATER
2. HOW MANY FILTERS WORK BEST

EXPERIMENT

HOW CLEAN IS YOUR WATER?

Let's learn about the Scientific Method!

- What is the scientific method?
  - The scientific method is a way to solve problems using data and experimentation
  - It can be used to test a hypothesis (guess) to see if it is right or wrong

ASK A QUESTION!	FORM A HYPOTHESIS	EXPERIMENT	COLLECT DATA	FORM A CONCLUSION
- Identify a problem that you would like to investigate or solve -Ask a specific question about that problem -Example: Is the water at my school clean?	-A hypothesis is a guess at an answer to your question -Use your knowledge to make an educated guess, you don't need to be right!! -Example: I think the water at my school is clean.	-Collect materials and conduct an experiment to test your hypothesis -be sure to stay safe and ask an adult for help if you need it - Example: Using an intelligent filter to find how dirty water could be	-While you conduct your experiment, make observations and write down findings -Use your senses (sight, hearing, smell, taste, and touch) to gather information -Be sure to be safe! (don't taste everything)	-Use your data to determine if your hypothesis was correct -make a statement that communicates your findings -Example:

EXPERIMENT

HOW MANY FILTERS WILL WORK BEST?

How many layers of filter will work best?

- Think about the intelligent filter
  - How many layers of the sediment filter do you think will filter water the best?
  - Why do you think that?
    - Use your thoughts to make a hypothesis on your worksheet

EXPERIMENTS

TEACHER GUIDE

MODULE II: EXPERIMENT

HOW CLEAN IS YOUR WATER?

1. HYPOTHESIS: I think the water at my school is _____ because _____.

After we filter the water, I think that the water will be cleaner/the same/dirtier because _____.

2. EXPERIMENT:

Materials:

- ☐ Intelligent filter
- ☐ Cups
- ☐ Water (from somewhere at your school)

Instructions:

1. Gather materials
2. Collect cups of water from different places at your school (bathroom, water fountain, etc.)
3. Record where you got the water from in the data table below
    a. Record any observations about the water in the table below too
        i. What color is the water? Are there particles floating in the water? Does it have a smell?
4. Put together the intelligent filter
5. Pour the first cup of water into the intelligent filter and wait
6. Record the sensor reading in the data table below
    a. Make new observations for the filtered water
7. Repeat steps 2a through 5

3. DATA:

Water Source	Observations (before)	Filter reading	Filter reading	Observations (after)

4. CONCLUSION:

The water from _____ was **dirty / clean.** I know this because _____.

The water from _____ was **dirty / clean.** I know this because _____.

The water from _____ was **dirty / clean.** I know this because _____.

Introduction to the Scientific Method:

QUESTION

- Ask a question: something to explore in the experiment
  - Ask students to think about what problems are relevant in their lives
    - Examples could include
  - For this experiment: how clean is the water at your school?

HYPOTHESIS

- Make a hypothesis: Use observations to guess what the answer to the question is. Emphasize to students that they do NOT need to get the correct answer!
  - Examples:
    - I think the water at my school is dirty because it is not clear.
    - After we filter the water, I think the water at my school will be cleaner/the same/dirtier because the filter will catch the dirt.

EXPERIMENT

- Test students' hypothesis: this is the experiment!
  - Highlight that an observation is using your senses (sight, hearing, smell, taste, and touch) to gather information about something.
    - Observations section could include things like the color of the water, are there particles present in the water, etc.

EXPERIMENTAL PROCEDURE

1. Gather materials
2. Collect cups of water from different places at your school (bathroom, water fountain, etc.)
3. Record where you got the water from in the data table below
    a. Record any observations about the water in the table below too
        i. What color is the water? Are there particles floating in the water? Does it have a smell?
4. Put together the intelligent filter
5. Pour the first cup of water into the intelligent filter and wait
6. Record the sensor reading in the data table below
    a. Make new observations for the filtered water
7. Repeat steps 2a through 5 with water from other locations

SAMPLE DATA TABLE

Water Source	Observations (before)	Filter reading	Filter reading	Observations (after)
Bathroom sink	slightly yellow, small specks	100	30	clear, less specks
Water fountain	clear, few specks	90	49	clear, no specks
Water pump	yellow, lots of dirt	160	40	clear, less specks

CONCLUSION

- Students will fill in the blanks to make a conclusion sentence.
  - Explain that this could help them share their findings with other people to help them

  - Number 4 on student worksheet (fill in the blank)
  - Example: The water from the water fountain was clean. I know this because the filter

MODULE II EXPERIMENT 2 - TEACHER GUIDE

MODULE II: EXPERIMENT

HOW MANY FILTERS WORK BEST?

1. HYPOTHESIS: I think that using **1 / 2 / 3** filters will work best because

_____.

2. EXPERIMENT:

Materials:

- ☐ Intelligent filter
- ☐ Cups
- ☐ Water (from somewhere at your school)

Instructions:

1. Gather materials
2. Collect 3 cups of water from somewhere at your school
    a. Record observations about the water below
        i. Think about the color, smell, if anything is in the water
3. Assemble the intelligent filter with one section of sediment filter
4. Pour the first cup of water into the intelligent filter and wait for it to pump
5. Record the sensor reading in the data table below
    a. Make new observations for the filtered water
6. Repeat steps 4-5 using the second section of the sediment filter, and then again with all three sections of the sediment filter.

3. DATA:

Before filter: Observations:

Color:

Anything in the water:

	Filter reading		
	1 sediment filter	**2 sediment filters**	**3 sediment filters**
Before			
After			

After filter: Observations:

Color:

Anything in the water:

4. CONCLUSION:

The water was filtered best with **1 / 2 / 3 layers of sediment filters** because

_____.

BACKGROUND

- In this experiment, students will explore the efficiency of the intelligent filter using one, two, and three layers of the sediment filter as seen below:

Images of filter with 1, 2, and 3 layers of the filter

HYPOTHESIS

- Students are asked to hypothesize (guess) how many layers of sediment filter will filter the water the best.
  - Ex. I think that using **1** / **2** /**③** layers of sediment filter will work the best because more dirt will get caught.
- Encourage students to consider the type of contaminant that will be caught in the sediment filter

EXPERIMENT

- Filter three cups of water using 1, 2 , or 3 layers of sediment filter and record results.
  - Highlight that an observation is using your senses (sight, hearing, smell, taste, and touch) to gather information about something.
  - Observations section could include things like the color of the water, are there particles present in the water?, temperature, etc.

EXPERIMENT

- Filter three cups of water using 1, 2 , or 3 layers of sediment filter and record results.
  - Highlight that an observation is using your senses (sight, hearing, smell, taste, and touch) to gather information about something.
  - Observations section could include things like the color of the water, are there particles present in the water?, temperature, etc.

EXPERIMENTAL PROCEDURE

1. Gather materials
2. Collect 3 cups of water from somewhere at your school
    a. Record observations about the water below
        i. Think about the color, smell, if anything is in the water
3. Assemble the intelligent filter with one section of sediment filter
4. Pour the first cup of water into the intelligent filter and wait for it to pump
5. Record the sensor reading in the data table below
    a. Make new observations for the filtered water
6. Repeat steps 4-5 using the second section of the sediment filter, and then again with all three sections of the sediment filter.

SAMPLE DATA TABLE

	1 sediment filter	2 sediment filters	3 sediment filters
Before	110	112	108
After	77	52	22

CONCLUSION

- Ask students to look at which amount of filters cleaned water the best
  - They should consider the sensor data and their own observations
- Example: The water was filtered best with **1** / **2** /**③** layers of sediment filters because there was more filters to catch the dirt.