



HYDRATION STATION

This hands-on educational activity is based on the NASA Train Like an Astronaut series.

Educator Section

Introduction

Water is the largest single component of the human body. Our bodies are composed of 50–70% water. Drinking plenty of fluids keeps our bodies hydrated and healthy.

Water helps to keep our body in peak condition by supplying nutrients to the cells, muscles, joints, brain, skin, kidneys, and lungs. Water also regulates body temperature and helps the heart function properly.

Just as on Earth, astronauts in space must also maintain proper hydration levels. As they complete tasks on their exploration missions, whether inside or outside the spacecraft, they too must drink plenty of fluids in order to remain hydrated and maintain their healthy state.

Lesson Objectives

Students will:

- identify their own hydration levels by creating and analyzing simulated urine;
- research hydration and create a visual web about hydration and the human body;
- investigate simulated urine samples to determine the visual properties of urine during different levels of hydration; and
- learn the importance for astronauts to drink plenty of fluid while in space to maintain a hydrated state while returning to Earth.

Problem

How can I identify different levels of hydration?

Learning Objectives

The students will learn:

- the importance of staying hydrated, proper hydration methods, and how to identify signs of dehydration;
- how hydration keeps the body healthy; and
- the importance of hydration to the human body on Earth and in space.

Discovery Lesson

Grade Levels: 3–5

Connections to Curriculum:

Science, Technology, Writing, Mathematics, Health, and Physical Education

Science Processing Skills:

Predicting, observing, comparing, gathering, and recording data (American Association for the Advancement of Science)

Teacher Prep Time: 30 minutes

Lesson Duration:

Two 45-minute sessions

Prerequisites: Knowledge of the scientific method, science lab safety rules, and basic physical activity

National Education Standards:

Science, Technology, English, Mathematics, Health, and Visual Arts

This activity meets the needs of the federally-mandated National Wellness Initiative, and may also help meet the needs of your own local wellness plan.

Materials Required:

- Poster board or chart paper
- Markers or colored pencils
- LCD projector or overhead projector
- Permanent markers
- Computer with internet access
- Bandanas
- Liquid food coloring
- Clear plastic cups
- Toothpicks
- Water
- Masking tape
- Eye protection
- Graduated cylinders
- Index cards (optional)
- Printed copies of:
 - Educator appendices: A, F, G, H
 - Hydration Station Student Section

Materials

Per class:

- Computer with internet access
- LCD projector or overhead projector
- Printed, laminated copies of Hydrate the Astronaut Water Bottle (Appendix F) (minimum 2)
- Bandanas (1–2)
- Masking tape
- Access to water

Per group (consisting of 3–4 students):

- Poster board or a piece of chart paper
- Index cards (optional)
- Markers or colored pencils
- Clear 9 oz plastic cups (4)
- Toothpicks (at least 6)
- Liquid food coloring (yellow, red, and green)
- Printed, color copy of Hydration Level Test Chart (Appendix H)
- Printed copy of Hydration Level Labels (Appendix G)
- Graduated cylinder (100 ml)
- Permanent marker

Per student:

- Printed copy of Hydration Station Student Section
- Colored pencils
- Eye protection

Safety

Remind students of the importance of classroom and lab safety. Students should wear eye protection during this activity. Remind the students of the importance of proper internet use. This activity requires proper clean-up.

Pre-Lesson Preparation (To be completed the day before)

Hydration Web Poster (In groups of 3–4 students)

- Gather materials for each group to complete the poster:
 - One poster board or a piece of chart paper
 - Markers or colored pencils
 - Index cards (optional)
- Prepare a working space for each group containing group materials.
- For each group, provide a computer with internet access for research.
- To view a sample poster, see Sample Hydration Web Poster (Appendix E).

Hydrate the Astronaut Game

- Students should perform this activity individually rather than in groups.
- Gather non-printed materials for the class to complete the game:
 - LCD projector (connected to a computer) or an overhead projector
 - Bandanas (1–2)
 - Masking tape
- Print, cut out, and laminate at least two copies of Hydrate the Astronaut Water Bottle (Appendix F). (Printing one per student is optional.)
 - Place masking tape on the back of each water bottle picture for easier wall placement and removal from the wall during the game.
- Print the Hydration Station Student Section for each student. Students will use the Hydrate the Astronaut Game (Appendix A) found in the student section.
- Connect a computer to an LCD projector in your classroom to project the game on a screen or white wall for the whole class to view. (If an LCD projector is not available, make a transparency of the game to use with an overhead projector).

Simulated Urine Lab (In groups of 3–4 students)

- Gather non-printed materials for each group to complete the lab:
 - Clear 9 oz plastic cups (4 per group)
 - Liquid food coloring (yellow, red, and green per group)
 - Permanent markers (1 per group)
 - Toothpicks (at least 6 per group)
 - Access to water
 - Graduated cylinder (100 ml)
 - Eye protection (1 per student)
- Print and cut out Hydration Level Labels (Appendix G) for each group.
- In color, print the Hydration Level Test Chart (Appendix H) for each group.
- Prepare a working space for each group containing group materials.

Lesson Development

To prepare for this activity, the following educator resources are recommended.

- National Space Biomedical Research Institute’s online textbook *Human Physiology in Space* provides information about hydration in space (Focus 3 and 4):
<http://www.nsbri.org/HumanPhysSpace/index.html>.
- This NASA online article shares an astronaut’s preparation and experience of participating in the Boston marathon while on the International Space Station:
http://www.nasa.gov/mission_pages/station/expeditions/expedition14/exp14_boston_marathon.html.
- Read the following text taken from the observation section of the student section:

Observation

Dehydration can affect athletic performance and increase the risk of a medical emergency. During athletic events or physical activities, athletes must drink sufficient amounts of liquids to prevent dehydration. Athletes who know the importance of hydration are more likely to consume the needed amount of liquid. However, athletes are not the only ones who are at risk. Children, elderly, laborers, and individuals enjoying outdoor activities are also at risk of suffering from dehydration.

Children perspire (sweat) less than adults, making it harder for them to stay cool. Parents and coaches must take care to ensure that children are slowly acclimatized to the heat and humidity.

Dehydration is a major cause for hospitalization among the elderly. These aging adults are more susceptible to dehydration due to less fluid content in their body (approximately 10% less than the average adult). The elderly also have a reduced sense of thirst and loss of appetite which can trigger dehydration similar to what astronauts experience in space.

Space explorers must also maintain proper hydration levels while in space. As an astronaut reaches the space environment, he or she stops feeling the pull of gravity. The normal functions of the body begin to change as bodily fluids begin to shift toward the head. As this happens, the body tries to flush what it thinks are “extra fluids” from the upper body. This large loss of fluids (filtered through the kidneys as excess urine) can result in dehydration for astronauts as they return to Earth. In order to avoid dehydration, astronauts must drink plenty of fluids while in orbit. Astronauts must ensure they are not dehydrated while completing their mission tasks, whether inside or outside their exploration vehicle. Every person needs adequate hydration to maintain proper health in space and on Earth.

- If needed, additional research can be done on the following topics:
 - hydration
 - dehydration
- Physical activities which allow your students to expend energy by training like astronauts are available at the NASA Train Like an Astronaut website:
<http://www.nasa.gov/audience/foreducators/trainlikeanastronaut/home/index.html>

Instructional Procedure

Throughout this lesson, emphasize the steps in the scientific method. (These steps are identified in ***bold italic*** print throughout the instructional procedure section.)

1. Introduce the lesson objectives and learning objectives to the students.
2. Remind students of the importance of being properly hydrated. Suggestion: Do a first-hand activity showing students an orange in at least two different hydration levels (a dry orange and a regular orange).
3. Review the ***problem*** with the students: “How can I identify different levels of hydration?”
4. Review the Hydration Station Glossary (Appendix I) with your class. Post words for students to see on your science word wall.
5. Have the students read the observation section in their student section and discuss what they read with their group. Use your own technique to check for comprehension.
6. Have students watch the video, “Our World: Fluid Shift” to explain what happens to astronauts’ bodies while in Earth orbit. To access this video, click on the following link and select the video “Fluid Shift” from the Our World video collection.
<http://www.nasa.gov/audience/foreducators/nasaclips/search.html?terms=&category=1000>
7. Have students discuss and make ***observations*** about hydration needs by completing the first two columns in the KWL (KNOW/WANT TO KNOW/LEARNED) chart in their student section with their group. Use the KWL chart to help students organize prior knowledge, identify interests, and make real world connections. As students suggest information for the KNOW column, ask them to share how they have come to know this information.
8. Ask the students if they have predictions relating to this activity and the ***problem*** question. Help them refine their predictions into a ***hypothesis***. In their student section, they should re-state the problem question as a statement based upon their observations, materials, and predictions. As they formulate a hypothesis, have students include verbs from the learning objectives. Encourage the students to share their hypotheses with their group.

Hydration Web Poster

- 1) Ensure students have the proper group materials required for the hydration web poster provided in the pre-lesson preparation section.
- 2) Have students research hydration through the internet and/or with books.

While researching, assign a question to each student in the group and make him or her responsible for a part of the group's poster. For example, give each student an index card with one question on it. That student is responsible for answering that question and posting the information on their team poster. Once they have done their research, have students share the information with their team and discuss how they will represent it on the poster. Encourage students to be creative.

Questions could include:

- What is dehydration?
 - What are the causes of dehydration?
 - What are the signs of dehydration?
 - How can dehydration be prevented?
 - Why is it important to keep your body hydrated?
 - What are the best beverages to drink in order to stay hydrated?
 - Do you think hydration is important to astronauts while they are in space?
 - When should an astronaut be concerned about dehydration in space?
- 3) In their groups, have the students design and create a hydration web poster (see Sample Hydration Web Poster, Appendix E). Students will use this poster to help organize prior knowledge, identify interests, and make real world connections.

Hydrate the Astronaut Game

- 1) Ensure you have the proper materials required for the Hydrate the Astronaut Game (Appendix A) provided in the pre-lesson preparation section.
- 2) Project the game onto a screen or a white wall (large enough to project the graphic to approximately four feet in height).
- 3) Provide students with their own copies of the Hydrate the Astronaut Game found in the student section.
- 4) Near the projected game, blindfold a student with a bandana and spin the student three times. Direct him or her toward the screen.
- 5) Have the blindfolded student affix the laminated water bottle onto the projected astronaut.

Ask the following questions:

- Where was the water placed?
 - How is hydration helping this particular body part function properly?
 - How would dehydration affect your health if this organ or body system was not getting enough water to function?
- 6) On their own game print-outs, have students color in the organs that are being described and write a sentence about the hydration needs for that organ. Students should use the words located in the word bank to identify the organs. As the organs are discussed, students should write a sentence about the hydration needs of that organ next to its name.

Proceed with this activity until you have addressed all the body systems and organs provided. Here are some organs or body systems that require water to function properly:

- **Brain:** Dehydration can impair the ability to concentrate. It may also affect the brain's processing abilities as well as impair short term memory.
- **Heart:** Fluids play a role in keeping blood pressure normal. Dehydration can decrease cardiac output (the amount of blood pumped out by the heart), which may lead to increased heart rate and reduced blood pressure.
- **Kidneys:** Hydration is essential for kidneys. Water helps remove waste, toxins, and excess nutrients from the body. A healthy, hydrated kidney filters approximately 180 L (190 qt) of water each day.
- **Digestive System:** Water aids in the digestion of food. It's found everywhere in the digestive track—from saliva to the solution of enzymes of the lower intestine. Water helps dissolve nutrients that are absorbed into the bloodstream and delivered to the cells.
- **Cells:** Hydration is critical for transporting carbohydrates, vitamins, and minerals to the cells and produce energy.
- **Muscles and Joints:** Muscles are made up of 70%–75% water. Water keeps muscles working properly and helps cushion joints.
- **Temperature:** Water dissipates heat which regulates overall body temperature. When the human body gets too hot, it releases water by perspiring, thus removing the heat. If the water lost through perspiration is not replaced, the body can become dangerously overheated.
- **Skin:** Staying well-hydrated helps to preserve the skin's elasticity, softness, and coloring.
- **Lungs:** Respiration (breathing in and out) is a continuous occurrence in which one loses water vapor with each breath. It has been estimated that humans can lose anywhere from 300 ml to several liters per day, depending on environment and type and level of activities.

7) Students will test their hypotheses using the following procedure.

The steps below in Simulated Urine Lab and 12–Hour Hydration Log were taken from the student section. Educator-specific comments are in italics.

Simulated Urine Lab

You should work in groups of 3–4 in this lab.

Ensure students have the proper group materials required for the Simulated Urine Lab provided in the pre-lesson preparation section.

- 1) Collect the following materials with your group:
 - Four 9 oz clear plastic cups
 - Yellow, red, and green food coloring
 - One permanent marker
 - Six toothpicks
 - Water
 - Hydration Level Test Chart

- Hydration Level Labels
 - Graduated cylinder (100 ml)
- 2) With a permanent marker, label your cups 1–4.
 - 3) Put on eye protection.
 - 4) Fill each cup with 60 ml (2 oz) of water using the graduated cylinder.
 - In cup 1, use a toothpick to add one dab of yellow food coloring. Use a clean toothpick to stir the liquid in the cup.

Have students roll the tip of a toothpick in a drop of food coloring and slightly touch the surface of the water to create a dab.
 - In cup 2, use a toothpick to add two dabs of yellow food coloring, and use a clean toothpick to stir the liquid in the cup.
 - In cup 3, add one drop of yellow food coloring and use a clean toothpick to stir the liquid in the cup.
 - In cup 4, add one drop of red food coloring, two drops of yellow food coloring, and one drop of green food coloring, and use a clean toothpick to stir the liquid in the cup.
 - 5) Testing: Compare your group’s simulated urine samples to the Hydration Level Test Chart and arrange the samples into the four levels of hydration:
 - Optimal Level
 - Well Hydrated Level
 - Dehydrated Level
 - Seek Medical Attention Level

Have students identify each sample’s hydration level by placing the Hydration Level Labels (Appendix G) next to the appropriate simulated urine sample. By making their own observations, students should now understand how to determine their own level of hydration.

12–Hour Hydration Log

Students will keep a hydration log for 12 hours to determine if they are drinking enough liquids to maintain a healthy hydration level (see 12–Hour Hydration Log, Appendix B). If your school district requires parent notification for this type of data collection, make sure to create and send home a letter with the students to inform the parents or guardians about the objectives of Hydration Station, the Simulated Urine Lab, and the 12–Hour Hydration Log.

You will keep a hydration log for 12 hours to determine if you are drinking enough liquids to maintain a healthy hydration level.

- 1) Using the 12–Hour Hydration Log found in your student section (Appendix B), document the following information for a 12–hour period:
 - Bathroom time
 - Observed urine color
 - Hydration level
 - What you previously drank
 - How much you previously drank

- Your previous physical activity level

For the hydration level, reference the Hydration Level Test Chart to determine the level your own urine color matches. (At no time should you collect or touch your urine or bring a urine sample into the classroom. You should only make observations by looking at the color.)

Students will make an observation of their own urine and determine what hydration level their own urine matches. Remind students that at no time should they collect or touch their urine, share their data with other students, or bring a urine sample into the classroom. They should only make observations by looking at the color.

- 2) Does your urine color indicate you are optimally hydrated, well hydrated, or dehydrated? Or should you seek medical attention?

If the color is of concern, students should share appropriately with their guardians or medical professionals.

- 3) Record the data on your 12–Hour Hydration Log. After making all your observations, study the data by answering the Study Data Questions (Appendix C). Using this information, determine if the data supports or refutes your hypothesis.

Conclusion

- In their groups, have students discuss the answers to the Study Data Questions (Appendix C) found in the student section.
- Have students update the LEARNED column in their KWL chart.
- Have students develop their conclusions by restating their hypothesis and explaining what happened during testing (including their results).
- Have students compare their group data to the class data. What patterns can be found?
- Ask students if there are any questions and encourage them to design their own experiments.
- Administer the Hydration Station Quiz (Appendix J). Use this quiz as an assessment tool. Answers can be found in Hydration Station Quiz Answer Key (Appendix K).
- Have students watch the NASA Brain Bites video, “How Do You Go to the Bathroom in Space?” To access this video, click on the following link: <http://brainbites.nasa.gov/#/bathroom-in-space>

Assessment

- Assess student knowledge through questioning.
- Assess student understanding by administering the Hydration Station Quiz (Appendix J).
- Observe and assess student performance throughout the activity using the Scientific Investigation Rubric [found in the student and educator sections (Appendix D)].

Activity Alignment to National Education Standards

National Science Education Standards (NSES):

Content Standard A: Science as Inquiry

- Abilities necessary to do scientific inquiry (K–8)
- Understandings about scientific inquiry (K–8)

Content Standard E: Science as Inquiry

- Abilities of technological design (K–8)
- Understanding about science and technology (K–8)

Content Standard F: Science in Personal and Social Perspectives

- Personal health (K–8)
- Characteristics and changes in populations (K–4)
- Changes in environment (K–4)
- Science and technology in local challenges (K–4)
- Science and technology in society (5–8)
- Structure and function in living systems (5–8)
- Evidence models and explanation (5–8)
- Regulation and behavior (5–8)
- Science as a human endeavor (5–8)

National Mathematics Education Standards (NCTM):

Data Analysis and Probability Standard:

- Develop predictions that are based on data.

Measurement Standard:

- Apply appropriate techniques, tools, and formulas to determine measurements.

National Council of Teachers of English Standards (NCTE):

Students conduct research on issues and interests by generating ideas, questions, and posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and non-print texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience.

National Visual Arts Standards:

Content Standard 5: Reflecting upon and assessing the characteristics and merits of their work.

- Understand there are various purposes for creating works of visual art.

National Health Education Standards (NHES) Second Edition (2006):

Standard 1: Students will comprehend concepts related to health promotion and disease prevention to enhance health.

As a result of health instruction in grades 3 through 5, students will:

- 1.5.1 Describe the relationship between healthy behaviors and personal health.

Standard 5: Students will demonstrate the ability to use decision making skills to enhance health.

As a result of health instruction in grades 3 through 5, students will:

- 5.5.1 Identify health related situations that might require thoughtful decision.

Standard 7: Students will demonstrate the ability to practice health enhancing behaviors and avoid or reduce health risks.

As a result of health instructions in grades 3 through 5, students will:

- 7.5.1 Identify responsible personal health behaviors.
- 7.5.2 Demonstrate a variety of healthy practices and behaviors to maintain or improve personal health.

Curriculum Explorations

To extend the concepts in this activity, the following explorations may be conducted:

Science Exploration

Hydration is critical in sports performance; athletes require adequate hydration before, during, and after exercise and sports. Any activity done for twenty five minutes or longer involving intense physical exertion or sweating requires rehydration. Marathon runners and long distance runners, for example, need to hydrate at a higher level than someone exercising for an hour.

- Have students research and prepare a presentation about why rehydration is important to athletes. During their research they will learn the best liquids to drink before, during, and after physical activity for rehydration. Here are some key investigation questions:
 - What are the best liquids to drink for healthy hydration?
 - What liquids should be avoided when trying to maintain proper hydration?
 - What are some hydration guidelines athletes should follow to prepare for physical activity?
 - How much liquid should they drink pre-exercise, during exercise, and following exercise?
- Hydration was particularly important to astronauts Sunita “Suni” Williams (Captain, USN) and William “Bill” McArthur (Colonel, USA, ret.) as they ran and completed marathons while orbiting the Earth. During their stays on the ISS, Williams completed the Boston Marathon, running 42 km (26.2 miles) and McArthur ran 21 km (13.1 miles), as part of the Houston half-marathon. Even though these astronauts were physically 210 vertical miles away from the runners on Earth, they shared a common need—water. The length and intensity of marathons, both on Earth and in space, can take a toll on the human body and demands proper hydration. Thus, runners must continue to drink appropriate fluids throughout a race to avoid the dangers of dehydration.
 - Have students investigate the options that astronauts have to keep themselves hydrated while living and working in space.

Mathematics Exploration

Ask students to display their data in a graphic organizer of their choice. Ask them to explain why they have chosen to display their data in this format. Analyze the data, looking for patterns and trends.

National Mathematics Education Standards (NCTM):

Algebra Standard:

- Understand patterns, relations, and functions.
 - Represent and analyze patterns and functions, using words, tables, and graphs.

Data Analysis and Probability Standard:

- Develop and evaluate inferences and predictions that are based on data.
 - Propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.

Language Arts Exploration

As an extension to the earlier lessons on hydration, have the students write a children’s book or poem about hydration. Have them write the story or poem from the point of view that liquids should prepare a human for optimal hydration.

Fine Arts Exploration

Have students design a poster on hydration to educate the school and community on the importance of hydration health. The students can also record a class video on the importance of hydration to the human body to educate the school and community.

Sources and Career Links

Thanks to subject matter expert Dr. Scott Smith for his contribution to this NASA Train Like an Astronaut activity.

Dr. Scott M. Smith is the Scientific Lead for the Nutritional Biochemistry Lab at NASA Johnson Space Center in Houston, Texas. You can find out more about Dr. Smith and his work here:

http://www.nasa.gov/audience/foreducators/stseducation/stories/Scott_Smith_Profile.html.

Educator and Student Resources

Web resources:

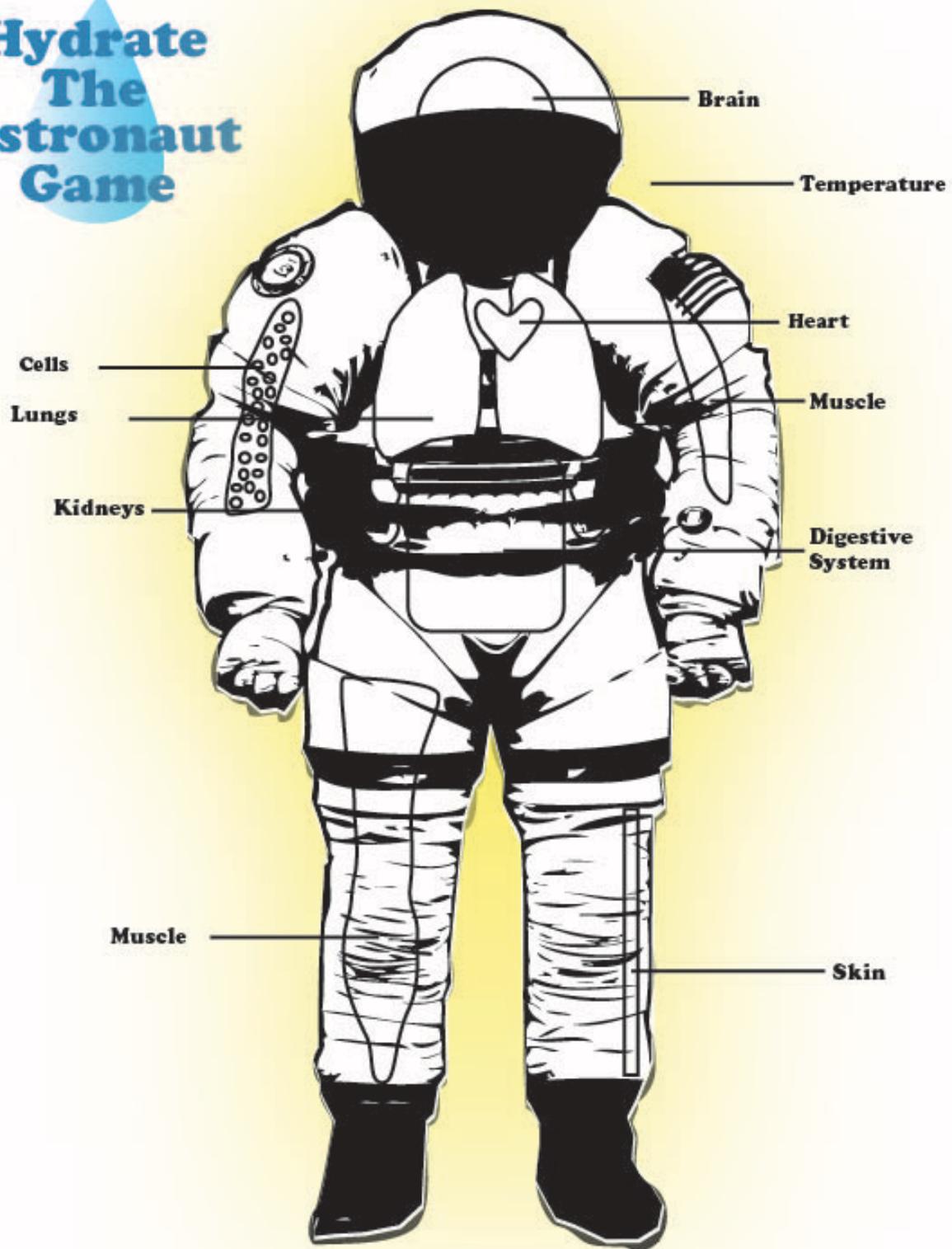
- The Healthy Kids website teaches your students good health practices with correct food choices and exercise. http://www.kidshealth.org/parent/nutrition_fit/index.html
- The Learn to Be Healthy website offers activities and lesson plans on nutrition and physical activity. <http://www.learntobehealthy.org>
- This NASA resource from the Nutritional Biochemistry Lab at NASA Johnson Space Center provides the Space Nutrition Newsletter for kids. <http://www.nasa.gov/centers/johnson/slsd/about/divisions/hacd/education/kznewsletters.html>
- The National Space Biomedical Research Institute has a variety of space related educational materials ready for download. http://www.nsbri.org/Education/Elem_Act.html
- For fluid replacement and exercise guidelines, visit the National Athletic Trainer's Association (NATA) website and read their response statement regarding new hydration advice from the Institute of Medicine's report on water and electrolytes. <http://www.nata.org/NR021204>

Books and articles:

- *From Head to Toe: The Amazing Human Body and How It Works* by Barbara Seuling
- *The ABC's of Hydration and Breathing* (CD Audio Book) by Patty Kondub
- *The Magic School Bus Inside the Human Body* by Joanna Cole
- *Water and Fiber for a Healthy Body (Body Needs)* by Angela Royston
- *Your Body's Many Cries for Water* by Fereydoon Batmanghelidj

Lesson development by the NASA Johnson Space Center Human Research Program Education and Outreach team.

Hydrate The Astronaut Game



Study Data Questions

Study the recorded data on the 12–Hour Hydration Log (Appendix B) and answer the following questions:

1. Based on the data you collected, are you well hydrated? Explain why or why not.
2. Would you change any of your drink choices based on your data?
3. How is the amount of liquids you drank related to the color of your urine?
4. Was the amount of liquids that you drank affected by your level of physical activity?
5. What are some methods of hydration?
6. What are signs of dehydration?
7. What can you do throughout the day to help keep yourself hydrated?
8. Do astronauts become easily dehydrated?
9. Why is it important for an astronaut to stay hydrated while working in space?
10. Do you see any patterns in your data?
11. Does this data support your hypothesis? Why or why not?

Scientific Investigation Rubric

Experiment: Hydration Station

Performance Indicator	0	1	2	3	4
Developed a clear and complete hypothesis	Made no attempt at developing a clear and complete hypothesis	Made very little attempt at developing a clear and complete hypothesis	Developed a partial hypothesis	Developed a complete (but not fully developed) hypothesis	Developed a clear, complete hypothesis
Followed all lab safety rules and directions	Followed no lab safety rules	Followed one lab safety rule	Followed two or more lab safety rules	Followed most of the lab safety rules	Followed all of the lab safety rules
Followed the scientific method	Followed none of the steps in the scientific method	Followed one of the steps in the scientific method	Followed two or more of the steps in the scientific method	Followed most of the steps in the scientific method	Followed all of the steps in the scientific method
Recorded all data on the data sheet and drew a conclusion based on the data	Showed no record of data and no evident conclusion	Showed one record of data collection and did not complete the conclusion	Showed two or more records of data collection and showed a partial conclusion	Showed most data recorded conclusion nearing completion	Showed all data recorded and a complete conclusion
Asked engaging questions related to the study	Asked no engaging questions relating to the study	Asked one engaging question relating to the study	Asked two engaging questions relating to the study	Asked three engaging questions relating to the study	Asked four or more engaging questions relating to the study
Point Total					

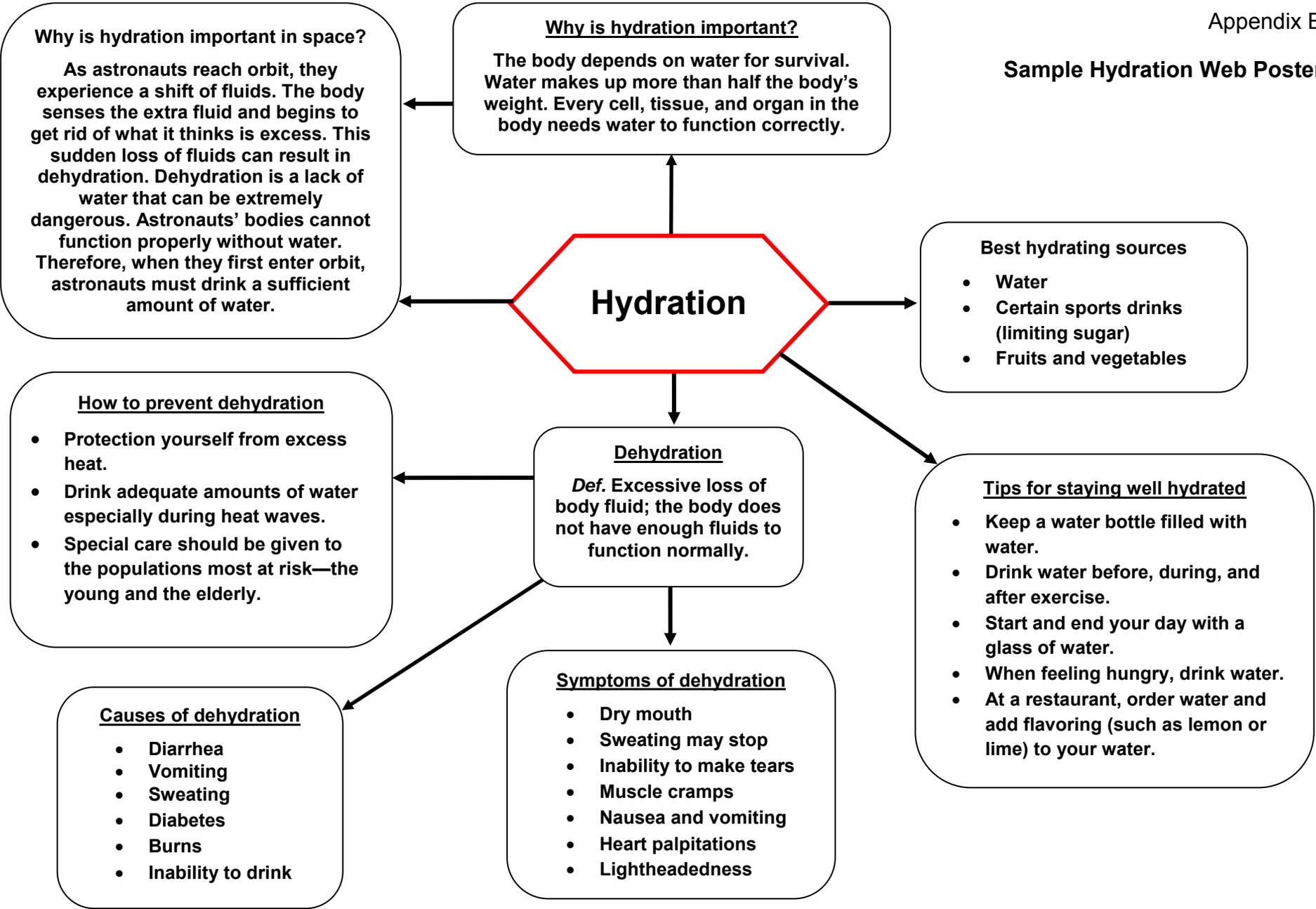
Grading Scale:

A = 18–20 points B = 16–17 points C = 14–15 points D = 12–13 points F = 0–11 points

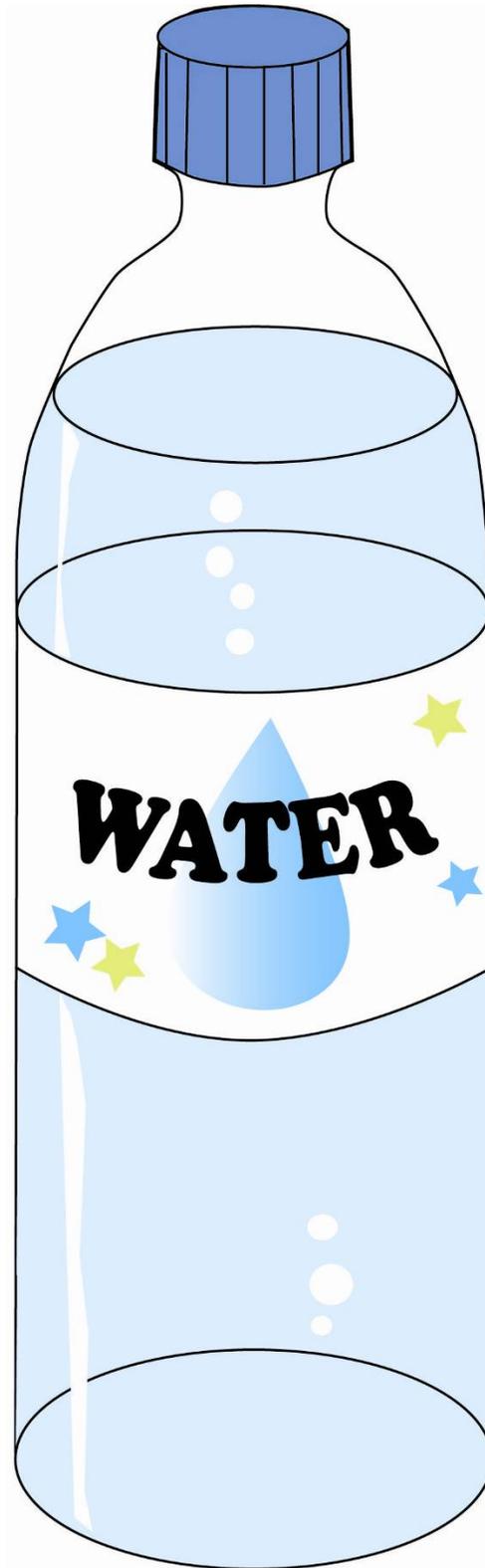
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Grade for this investigation: _____

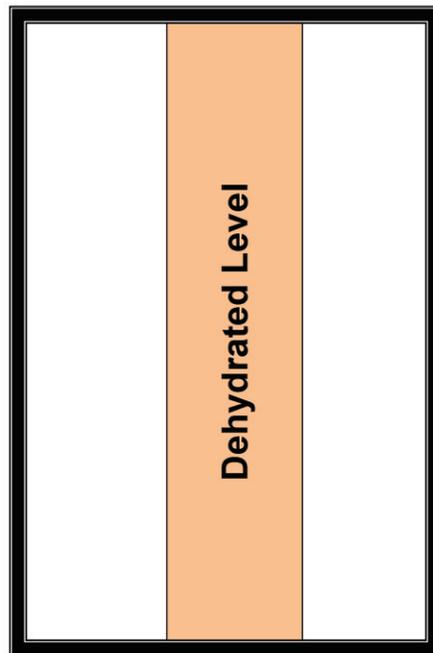
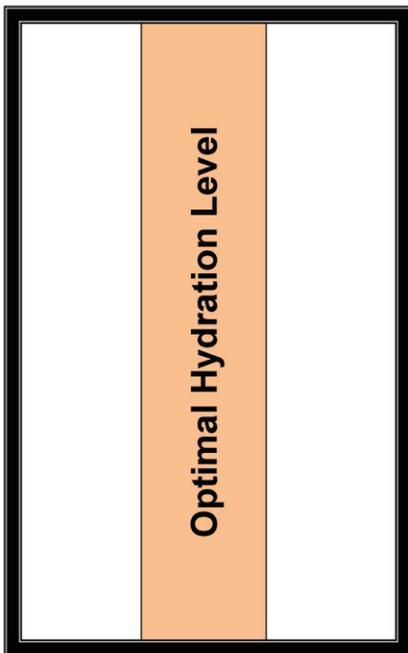
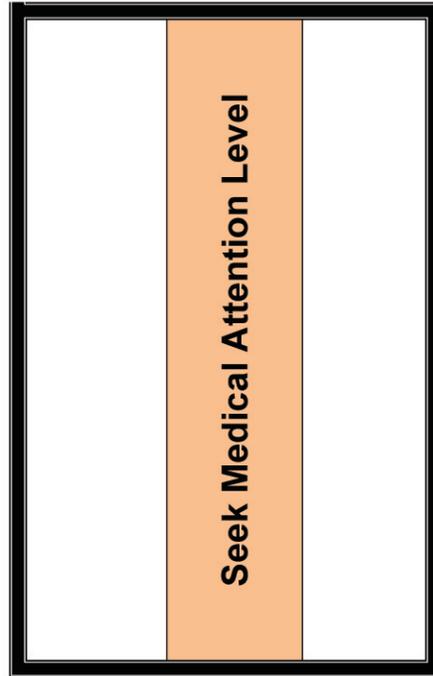
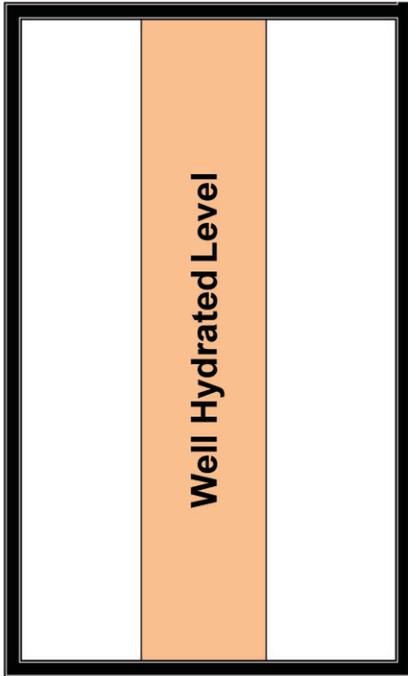
Sample Hydration Web Poster



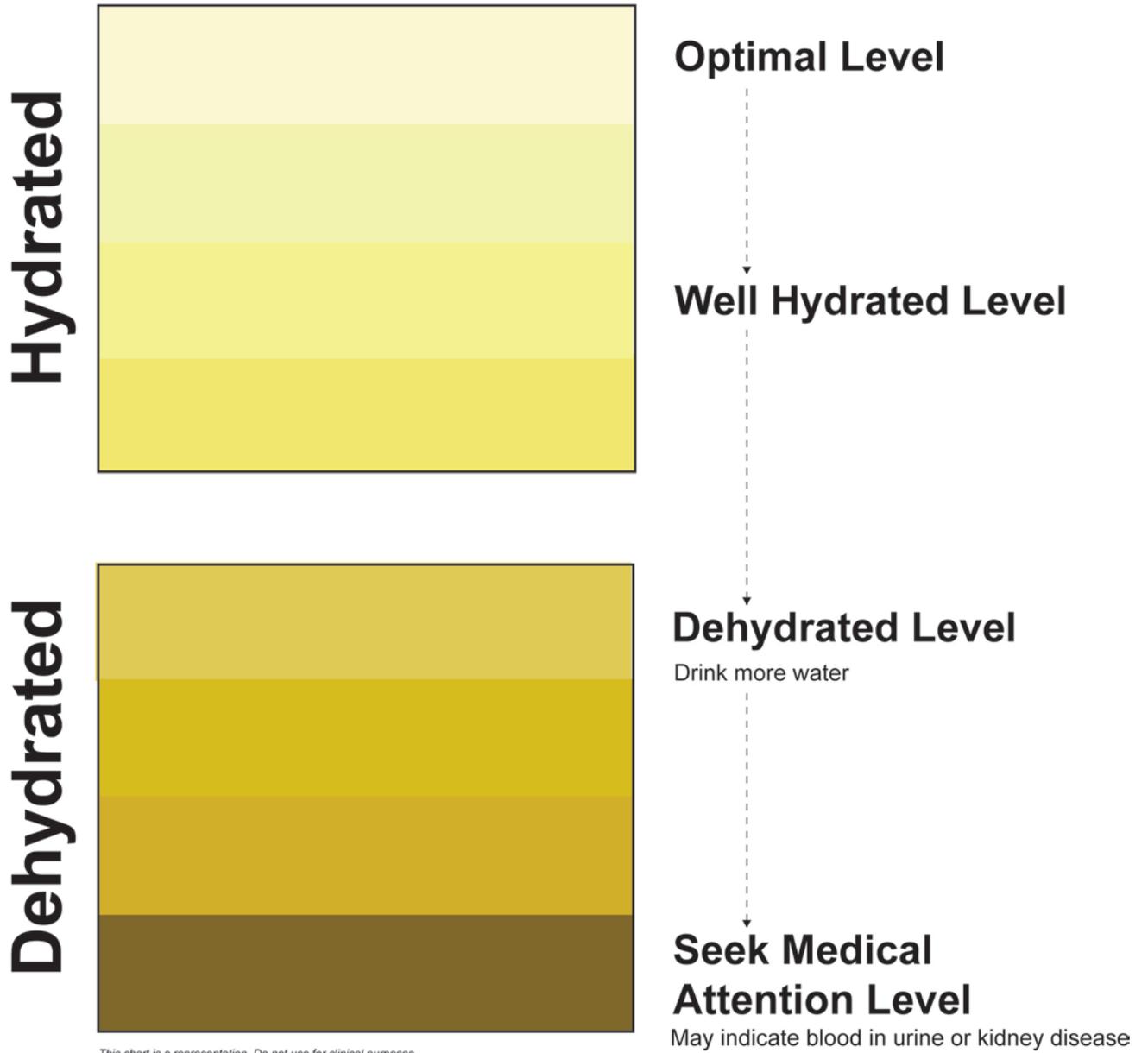
Hydrate the Astronaut Water Bottle



Hydration Level Labels



Hydration Level Test Chart



Hydration Station Glossary

athletic performance	Characterized by or involving physical activity or exertion.
dehydrate	To deplete bodily fluids, leaving the body without enough water or other fluids to carry out normal functions.
heat illness	Under certain circumstances (such as unusually high temperatures, high humidity, or vigorous exercise in hot weather), the body's natural cooling system may begin to fail, allowing internal body temperature to reach dangerously high levels. The result may be heat illness, which can lead to heat cramps, heat exhaustion, or heatstroke.
hydrate	To give water to somebody or something; to provide water in order to maintain a correct fluid balance.
rehydrate	To replenish and restore bodily fluids to a normal or healthy level.

Hydration Station Quiz

Answer the following questions about the Hydration Station activity.

1. Name the best source for hydration. Create a list of different types of beverages and categorize the hydration drinks as “healthy” or “unhealthy”.
2. Explain the importance of proper hydration.
3. What are the symptoms of dehydration, and how can dehydration be prevented?
4. After observing your own hydration levels for 12 hours, what time of the day did you find you were the most dehydrated?
5. What actions did you take during the day to change your hydration levels?
6. Explain why hydration is important for athletes who participate in physically demanding sports, such as football, basketball, and marathons.
7. Must astronauts in space be concerned about their hydration levels? How do they ensure they stay hydrated while in space?
8. How many astronauts have run marathons while living on the International Space Station (ISS)? List the astronaut(s) and the participating marathon(s). Was hydration an important factor?

Hydration Station Quiz Answer Key

1. Name the best source for hydration. Create a list of different types of beverages and categorize the hydration drinks as “healthy” or “unhealthy”.

The best hydration source is water. Healthy hydration drinks include water, sports drinks, and fortified waters. Unhealthy hydration drinks include sodas, coffee or tea, alcohol, and flavored sugar drinks.

(Note to teacher: When water is combined with foods naturally high in moisture, such as fruits and vegetables, lost liquids and electrolytes are replaced after most workouts.)

2. Explain the importance of proper hydration.

The body depends on water for survival. Water makes up more than half the body weight. Every cell, tissue, and organ in your body needs water to function correctly and stay healthy.

3. What are the symptoms of dehydration, and how can dehydration be prevented?

If you become dehydrated, you could experience any of the following symptoms: absence of sweating, dry mouth, muscle cramps, nausea and vomiting, or heart palpitations. Dehydration can be prevented by drinking plenty of water and ensuring protection from the heat.

4. After observing your own hydration levels for 12 hours, what time of the day did you find you were dehydrated the most?

Answer will vary based on students’ observations of their own hydration levels.

5. What actions did you take during the day to change your hydration levels?

Answers will vary.

6. Explain why hydration is important for athletes during physically demanding sports such as football, basketball, and marathons.

Whether a serious athlete or recreational exerciser, one must get the right amount of water before, during, and after exercising. Water regulates body temperature, lubricates joints, and helps transport nutrients for energy and health. If not properly hydrated, the body will be unable to perform at its highest level, and the individual may experience fatigue, muscle cramps, dizziness, or more serious symptoms of dehydration.

7. Must astronauts in space be concerned about their hydration levels? How do they ensure they stay hydrated while in space?

Yes, astronauts must stay well hydrated. Astronauts’ bodies cannot function properly without water. Therefore, when they first enter orbit, astronauts must drink a sufficient amount of water. They continue to drink water and eat properly while in orbit to stay hydrated and healthy for their return to Earth.

(Note to teacher: As astronauts reach orbit they experience a shift of fluids. The body senses the extra fluid and begins to get rid of what it thinks is excess. This sudden loss of fluids can result in dehydration. Dehydration is a lack of water that can be extremely dangerous.)

8. How many astronauts have run marathons while living on the International Space Station (ISS)? List the astronaut(s) and the participating marathon(s). Was hydration an important factor?

Two astronauts have run marathons in space on the ISS treadmill. The first was Colonel William “Bill” McArthur, who ran a half-marathon (21 km or 13.1 mi) simultaneously with the Houston Marathon, and Captain Sunita “Suni” Williams (U.S.N.), who completed a full marathon (42 km or 26.2 mi) with an official participant number from the Boston Marathon. Hydration for both astronauts

was an important factor. They kept themselves well-hydrated throughout their entire marathons to keep their bodies in good condition for completing the events.

[Note to teacher: McArthur's half-marathon was performed while circling the globe at an altitude of 354 km (220 mi) above the Earth's atmosphere. He ran it in support of friends and colleagues who were running on the ground in the Houston Marathon. Williams completed her full marathon with a finish time of 4 hours, 23 minutes and 46 seconds. Running on the ground in Boston in support of Williams were NASA Astronaut Karen Nyberg and Williams' sister, Dina Pandy.]