




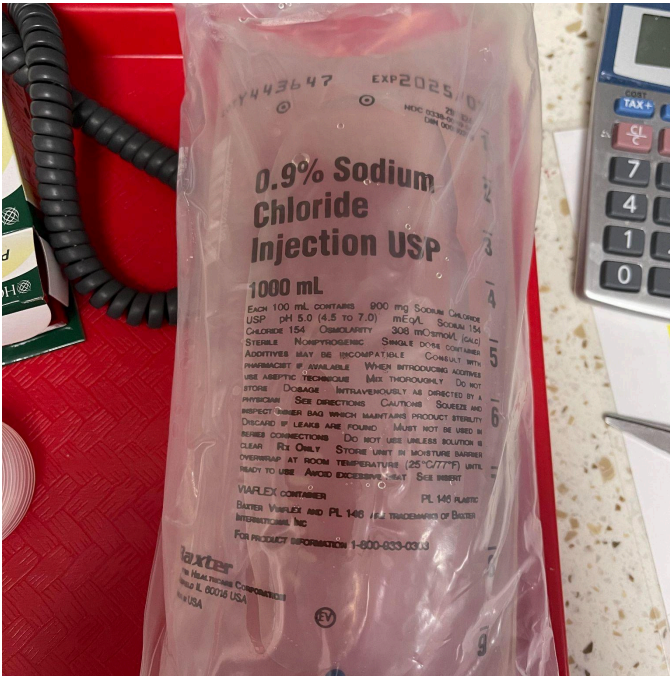


IV G-Force

OVERVIEW

The students will learn how gravity is used to administer medications to patients in hospitals.

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| <p>AUTHOR Kendra Hughes</p> | <p>GRADE LEVEL 5th Grade</p> | <p>CONTENT AREA Science</p> |
|  |  |  |
| <p>ESSENTIAL QUESTIONS</p> <p>How is gravity used to impact the motion of fluids from IV bags to the patient?</p> <p>What STEAM careers are available in an industry that sparks my interest?</p> | <p>TIME NEEDED</p> <p>2 Class Periods- 45 minutes each</p> | <p>STANDARDS</p> <p>5.P.1.1 Explain how factors such as gravity, friction, and change in mass affect the motion of objects.</p> <p>5.P.1.2 Infer the motion of objects in terms of how far they travel in a certain amount of time and the direction in which they travel.</p> |



Making Connections

Students have been taught about the needs of unicellular and multicellular organisms, human body systems, and basics of gravitational pull.

Students have been taught about the needs of all cells; both unicellular and multicellular. They have learned about the following human body systems: circulatory, nervous, respiratory, digestive, skeletal and muscular. Students should have an

understanding of how the human body systems work together and use transport systems to meet the needs of all cells in the body. They have been taught about friction and how it affects force and motion, as well as vocabulary related to forces and motion.

Materials

- IV bags/zip lock bags
- tubing
- rulers
- stopwatch or timer
- stuffed animals
- worksheet for data collection and analysis

The Activity

Part 1: Day 1

- 1) Begin the lesson by asking students to review what they know/have learned about gravity.
Discuss with students their understanding and guide misconceptions for understanding.
- 2) Introduce gravity using visual aids, such as videos or diagrams. Explain how gravity affects motion, using examples of objects falling to the ground. Here are some examples-
<https://www.generationgenius.com/videolessons/gravity-pulls-things-down-video-for-kids/>
<https://www.youtube.com/watch?v=H9YMgx5T9Sk>
- 3) Conduct an experiment demonstrating gravity's effect on motion. Drop different objects with different weights and observe their motion. Guide students to notice patterns and differences in how objects fall.

Part 2: Day 2

- Review gravity and motion from the previous lesson.
- Divide students into groups and distribute materials to each group.
- Follow these procedures:
 1. Assign jobs for each teammate
 - a. Holder- This student will hold the IV bag.
 - b. Timer- This student will time the liquid from the IV bag to the patient.
 - c. Releaser- This student will release the clamp to allow the water to flow through.
 - d. Measurer- This student will measure and tell the holder where the bag needs to be held.
 2. Set up your IV bag at the various heights shown in the [table below](#).
 3. Release the water to flow through the tube.
 4. Time the water from the release point to the patient.
 5. Calculate the speed (Speed = distance/time) and record in the table below at the appropriate height.
 6. Look for patterns and differences in your speed from your data.
 7. Consider how gravity affects the motion of the IV medication's speed at different heights.

- Instruct each group to set up the experiment using IV bags or Ziplock bags and tubing. They should suspend the bags from a fixed height and observe how gravity affects their motion.
- Students measure and record the time and distance from IV bag to patient. Students will then calculate speed and record.
- Students will repeat the experiment at different heights (using the sheet attached to see heights) and measure the speed of the medication (water) from the IV bag to the patient.

WRAP UP AND ACTION

Discuss how gravity was used to provide medication for the patient. Remind the students of the experiment's purpose and the concepts of gravity and motion. Guide students through analyzing the data they collected from their experiments using the graphs they produced. Guide and help students to identify patterns and draw conclusions about the effects of gravity on the motion of the medicine coming from the IV bags. Discuss the findings as a class while encouraging students to relate their observations to real-life scenarios where understanding gravity and motion are crucial. Some of these areas are sports, transportation, and engineering. The students will complete a brief writing to summarize the experiment, their findings, and what they have learned about gravity and motion.

Extensions

- Graph the data on a line graph to illustrate the relationship between Gravity and Speed
- Conduct the same experiment using different sizes of IV bags to see if there is a difference when the size/weight is different
- Field trip to Baxter-North Cove to learn about production of IV bags
- Visiting other industries
- Design and conduct other experiments to explore other aspects of gravity, friction, and motion.
- Compare and contrast the amount of technology offered in the industries
- Discuss the jobs offered at Baxter-North Cove in the STEAM fields with a focus on science and technology
- Other Forces and Motion Lessons based on other industries products or process

Resources

Used to gain knowledge about how IVs work in a hospital setting:

- Administration of Medication: Gravity Infusion-
https://www.coramhc.com/sites/default/files/2020-12/RELEASE_75-52983C_Gravity_Infusion_Guide_DIGITAL_0.pdf
- Medicines Learning Portal- <https://www.medicineslearningportal.org/2020/12/using-gravity.html>
- Infusing IV Fluids by Gravity-
<https://pressbooks.bccampus.ca/clinicalproceduresforsaferpatientcaretrubscn/chapter/8-6-infusing-iv-fluids-by-gravity-or-an-electronic-infusion-device-pump/>

About the Author

Kendra Hughes is a 5th grade teacher with 18 years of experience in elementary education. She holds a Bachelor of Arts in elementary education from Lees McRae College and a Masters of Education in elementary education from Greensboro College, and especially believes in the importance of hands-on learning/learning through doing. Her Kenan Fellowship (2023-24) was sponsored by Dogwood Health Trust and involved working with mentors at Baxter- North Cove to learn about the production of IV bags and the importance of high quality medical care.

About the Fellowship

Kendra Hughes completed her internship at Baxter- North Cove. Baxter's mission is to save and sustain lives. Baxter- North Cove provides IV bags to 70% of the nation's healthcare facilities and 60% of the world's healthcare facilities. They produce approximately 1.3 million IV bags daily at the plant in North Cove, North Carolina. This lesson plan was inspired by Kendra's internship with them and she followed up the experiment by taking her students on a field trip to learn about Baxter and their importance in our community.

Student Pages

IV G-Force Data Collection Sheet

Experiment setup/procedure:

- 1) Assign jobs for each teammate
 - i) Holder- This student will hold the IV bag.
 - ii) Timer- This student will time the liquid from the IV bag to the patient.
 - iii) Releaser- This student will release the clamp to allow the water to flow through.
 - iv) Measurer- This student will measure and tell the holder where the bag needs to be held.
- 2) Set up your IV bag at the various heights shown in the table below.
- 3) Release the water to flow through the tube.
- 4) Time the water from the release point to the patient.
- 5) Calculate the speed (Speed= distance/time) and record in the table below at the appropriate height.
- 6) Look for patterns and differences in your speed from your data.
- 7) Consider how gravity affects the motion of the IV medication's speed at different heights.

| Height | 0 ft. | 0.5 ft. | 1 ft. | 2 ft. | 3 ft. | 5 ft. |
|-----------------|-------|---------|-------|-------|-------|-------|
| Speed (seconds) | | | | | | |

1. How does the height of the IV bag influence the speed of medication flow?

2. Based on your observations and data analysis, what can you conclude about how gravity affects the motion of objects?

Appendix

- Students should find that the higher the IV bag, the faster the medication will flow.
- Teachers can make connections between treating patients using gravity and other everyday activities such as roller coasters, airplanes, watering plants, sledding, etc. to have students make further connections to height and gravity.
- Experiments with different types of friction combined with gravity will allow students to understand how they affect motion when combined.