Helium Balloon Investigation

YEAR 7
PHYSICAL SCIENCES

QGC | FUTUREMAKERS | QUEENSLAND MUSEUM NETWORK | Queensland Government

Future Makers

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This partnership aims to engage and inspire people with the wonder of science, and increase the participation and performance of students in STEM-related subjects and careers — creating a highly capable workforce for the future.

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EVALUATE

Helium Balloon Investigation

Teacher Resource

Students investigate how much mass a helium balloon can lift, and then use this data to determine how many helium balloons it would take to lift them off the ground. Students use various weights to complete this task, record their observations and draw force-arrow diagrams to represent the forces acting on a helium balloon at various stages of the investigation. Students also consider the reasons for variations in collected data, and suggest changes that could be made to the investigation to increase the consistency of results.

Alternatively, to practice precise measurement, students could use a scale to identify material/s with the required mass. These materials can then be attached to the balloon rather than using the weights.

Curriculum Links

Science

YEAR 7

Science Understanding

Change to an object's motion is caused by unbalanced forces, including Earth's gravitational attraction, acting on the object (ACSSU117)

Science Inquiry Skills

Identify questions and problems that can be investigated scientifically and make predictions based on scientific knowledge (ACSIS124)

Collaboratively and individually plan and conduct a range of investigation types, including fieldwork and experiments, ensuring safety and ethical guidelines are followed (ACSIS125)

Measure and control variables, select equipment appropriate to the task and collect data with accuracy (ACSIS126)

Construct and use a range of representations, including graphs, keys and models to represent and analyse patterns or relationships in data using digital technologies as appropriate (ACSIS129)

Summarise data, from students' own investigations and secondary sources, and use scientific understanding to identify relationships and draw conclusions based on evidence (ACSIS130)

Reflect on scientific investigations including evaluating the quality of the data collected, and identifying improvements (ACSIS131)

Communicate ideas, findings and evidence based solutions to problems using scientific language, and representations, using digital technologies as appropriate (ACSIS133)

Helium Balloon Investigation

Student Activity

Have you ever wondered how many helium balloons it would take to lift you off the ground? Now is your chance to find out! Working in small groups of three or four, you will attach helium balloons, one at a time, to a weight until neutral buoyancy is achieved. Neutral buoyancy is achieved when an object neither sinks (negative buoyancy) nor rises (positive buoyancy). Instead the object will stay in place, hovering in mid-air until acted on by another force.

Aim

To identify how much mass a helium balloon can lift.

Materials

- Helium tank, operated by your teacher only
- Helium balloons, 30 cm diameter
- String or ribbon, one per helium balloon, 60 cm long
- 2 gram weight
- 5 gram weight
- 10 gram weight
- 20 gram weight

OR

- Various materials of different masses
- Scales, kitchen and bathroom

Method

1. Your teacher will inflate a helium balloon for your group. After the helium balloon is inflated, tie a knot in the balloon. Then tie a 60 cm length of string or ribbon to the balloon.

2. Attach a 2 gram weight to the string or ribbon. What happened? Record any observations. (Alternatively, you could use a scale to identify material/s with a total mass of 2 grams, and then attach material/s to the string or ribbon.)

3. Predict how many balloons it will take for the 2 gram weight to achieve neutral buoyancy. Record your prediction.

4. Continue to attach helium balloons to the 2 gram weight until neutral buoyancy is achieved. Record how many balloons were required to achieve neutral buoyancy.

5. Attach a 5 gram weight to the string or ribbon. What happened? Record any observations.

6. Predict how many balloons it will take to achieve neutral buoyancy. Record your prediction.

7. Continue to attach helium balloons to the 5 gram weight until neutral buoyancy is achieved. Record how many balloons were required to achieve neutral buoyancy.

8. Attach a 10 gram weight to the string or ribbon. What happened? Record any observations.

9. Predict how many balloons it will take to achieve neutral buoyancy. Record your prediction.

10. Continue to attach helium balloons to the 10 gram weight until neutral buoyancy is achieved. Record how many balloons were required to achieve neutral buoyancy.

11. Attach a 20 gram weight to the string or ribbon. What happened? Record any observations.

12. Predict how many balloons it will take to achieve neutral buoyancy. Record your prediction.

13. Continue to attach helium balloons to the 20 gram weight until neutral buoyancy is achieved. Record how many balloons were required to achieve neutral buoyancy.

Results

1. Record your observations and results.

Mass	Number of Balloons	Observations
2 grams		
5 grams Prediction:		
10 grams Prediction:		
10 grams Prediction:		

2. Draw a force-arrow diagram to represent the forces acting on a helium balloon in each of the following situations.

Neutral buoyancy	**Negative buoyancy**
Positive buoyancy	**A gust of wind**

3. In the movie ‘Up’, an old man uses helium balloons to lift himself and his house. Use the data you have collected to calculate how many helium balloons this would take. Record your working out in the space below.

4. Share your results with your class. Explore any variations in data. Why might these variations exist? How could the investigation be altered to gather more consistent data?

5. How many helium balloons would it take to lift you off the ground?