

ASSESSMENT

Student Assessment Questions/Answer Key

- 1** **1. Vocabulary**
Define the following terms:
- Gravity** - the amount of pull objects experience when falling toward the center of the earth.
- Vacuum** - an enclosed space void of matter, esp. air, so that what little remains in the space is ineffective.
- Air resistance** - the opposition of the atmosphere against objects' progress
- Velocity** - speed
- 2** **Answer the following questions:**
- 2. Which box hit the ground first?**
- The full one
- 3. Why do you think this happened?**
(Consider your vocabulary words.)
- Air would have had less resistance against the heavier item, which can push through more air than the lighter one can. (Like a heavier item in water can push more water out of the way, or displace more water.)
- 4. What item hit first in the tube, heaviest or lightest?**
- They hit at the same time.
- 5. Explain the response in number 4. What was present in the outdoors that was not in the vacuum tube?**
- In the tube, the vacuum removes air resistance, so gravity is the only factor. The earth's pull is the same regardless of the item it is affecting.
- 6. Write paragraph 1 here:**
- Answers will vary.
- 7. Write paragraph 2 here:**
- Answers will vary.



TEACHERS

GUIDE



**COIN AND FEATHER
DEMO**
ITEM # 3550-00

MECHANICS - DEMONSTRATION

- How does a parachute stop my fall?
- How do I see air resistance? Air is invisible.

Demonstrate the power of air resistance and gravity by showing what happens in the absence of air resistance, or a vacuum. Students will see that a heavy object and a light object fall at an equal rate in this vacuum tube. Made of transparent tube, 100cm d x 37cm h. Has rubber end caps, one with a nozzle and stopcock for connecting to a vacuum pump (not included). Simulated coin and feather included.

Materials

- Coin and Feather Apparatus
- 1 empty box
- 1 full box of the same size
- 2 stopwatches
- toy parachute with action figure
- same size action figure without parachute
- lab worksheet

Goals & Objectives

Students will:

- describe the effects of forces on motion of objects.
- explain how to apply this to everyday needs.
- increase vocabulary with the following terms: gravity, vacuum, air resistance, velocity.
- predict which item would hit the ground first, a full or empty box.

ASSESSMENT

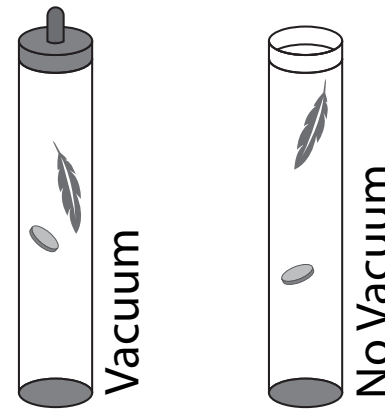
Participation, Vocabulary and Student Handout

ACTIVITIES

- 1 Have students make predictions about which item will hit the ground first (full or empty box).
- 2 As a class, go to a second story window or parking garage, while two students remain at ground level with stopwatches.
- 3 Drop the items while each student with a stopwatch times the fall of 1 specific item. Hypothesize in writing about the outcome; what conditions made this happen? Teacher grades responses. Verbally, teacher gives correct response.
- 4 Back in class, watch the coin and the feather fall inside the vacuum tube. Note: this is easiest to see if several tubes are used in small groups within the class.
- 5 Note the result and hypothesize about what caused the difference in writing. For example, what was present in the outdoors that was not in the vacuum tube? Teacher grades responses. Verbally, teacher gives correct response.
- 6 From a second story, drop a single action figure and one with a parachute at the same time, noting the length of the fall.

Note

It is always best to DO an experiment ahead of time to be able to best present it to the class.



- 7 Write a paragraph (paragraph 1) explaining the effect of gravity and air resistance to falling objects, and how the tube supports this explanation. (What variables did it allow them to separate?)
- 8 Write a second paragraph (paragraph 2) about how this information is useful in everyday events. (Some areas to consider are: driving, aerodynamics, skydiving, ...)

STUDENT HANDOUT

Student Name: _____

Lab Worksheet

- 1** **Vocabulary**
Define the following terms:

Gravity

- 4** What item hit first in the tube, heaviest or lightest?

Vacuum

- 5** Explain the response in number 4. What was present in the outdoors that was not in the vacuum tube?

Air resistance

Teacher Initial: _____

- 6** Write paragraph 1 here:

Velocity

Answer the following questions:

- 2** Which box hit the ground first?

- 7** Write paragraph 2 here:

- 3** Why do you think this happened?
(Consider your vocabulary words.)

Teacher Initial: _____

