Name: _____ Group: _____ Date: _____

LAB 17
EXPERIMENT

# MECHANICAL ENERGY OF AN OBJECT IN FREE FALL

STUDENT BOOK | Chapter 2, page 39

## Part I

### Goal

Determine the degree of distortion to a surface caused by the mechanical energy of an object falling from different heights.

**1.** What is the independent variable in this lab?

_____

**2.** What is the dependent variable in this lab?

_____

_____

### Hypothesis

I think that _____

because _____

_____

## Part II

### Goal

Determine the degree of distortion to a surface caused by the mechanical energy of falling objects of different mass.

**1.** What is the independent variable in this lab?

_____

**2.** What is the dependent variable in this lab?

_____

### Hypothesis

I think that _____

because _____

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## Parts I and II

## Materials

- plasticine (about 400 mL)
- large plastic container
- 1-m ruler
- 3 marbles (different sizes)
- balance (optional)

## Procedure

**Part I**

***1.*** Divide the plasticine into three even portions.

***2.*** Shape each plasticine portion into a slightly flattened ball.

***3.*** Place each plasticine ball on the bottom of the plastic container.

***4.*** Position the ruler vertically at the top of one plasticine ball.

***5.*** Hold the largest marble above the plasticine ball at a height of 25 cm.

***6.*** Release the marble and let it fall.

***7.*** Measure the diameter of the impression made in the plasticine ball. Record the result.

***8.*** Repeat steps 4 to 7 with the second plasticine ball, dropping the same marble from a height of 50 cm.

***9.*** Repeat steps 4 to 7 with the third plasticine ball, dropping the same marble from a height of 100 cm.

**Part II**

***1.*** Reshape the plasticine balls.

***2.*** Place each plasticine ball on the bottom of the plastic container.

***3.*** Position the ruler vertically at the top of one plasticine ball.

***4.*** Hold one marble above the plasticine ball at a height of 100 cm.

***5.*** Release the marble and let it fall.

***6.*** Measure the diameter of the impression made in the plasticine ball. Record the result.

***7.*** Repeat steps 3 to 6 with the second plasticine ball, dropping the second marble from the same height.

***8.*** Repeat steps 3 to 6 with the third plasticine ball, dropping the third marble from the same height.

***9.*** Clean up and put away materials.

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## Results

Record your results in the tables below. Give each table a title.

## Part I

**Title:**

| Height of free fall (cm) | Diameter of impression (mm) |
|---|---|
| 25 | |
| 50 | |
| 100 | |

## Part II

**Title:**

| Mass of marble (g) | Diameter of impression (mm) |
|---|---|
| | |
| | |
| | |

## Analysis of the results

**1.** Which situation resulted in an impression of the greatest diameter?

_____

**2.** How does diameter of impression vary according to height of free fall?

_____

**3.** How does diameter of impression vary according to mass of object in free fall?

_____

_____

**4.** The mechanical energy of an object can cause it to deform another object. During this experiment, in which situation did the object in free fall have the greatest mechanical energy?

_____

_____

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**5.** What are the possible sources of error in this lab?

_____

_____

**6.** How could you improve the protocol for this lab?

_____

_____

## Conclusion

**1.** Complete the following sentences:

a) In this experiment, the _____ the _____ energy of an object, the greater the diameter of the impression formed.

b) The _____ and the mass of an object in free fall affects its _____ energy.

c) Mechanical energy increases as the _____ of an object in free fall increases.

d) The greater the mass of an object, the _____ its mechanical energy.

**2.** Was your hypothesis confirmed or not? Explain your answer.

_____

## Application

How can the mechanical energy of a hammer be varied when driving a nail into a floor?

_____

_____

_____

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