HOW FORCES AFFECT THE DEFORMATION OF FOUR METALS

STUDENT BOOK	Chapter 12, page 369
TOOLBOX	Pages 14 and 75

GOAL

Observe the effect of various forces on the deformation of four metals.

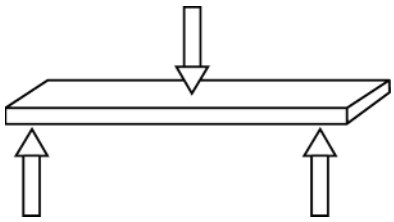
OBSERVATION CRITERIA

1. What is a mechanical constraint?

_____

_____

2. What constraint is shown in the illustration at right? Explain your answer.



_____

_____

_____

3. In the table below, state the possible consequences of mechanical constraints on materials, explaining each one.

Possible consequence	Explanation

Name: _____ Group: _____ Date: _____

4. What measurement unit generally serves to quantify a force? Provide its symbol. _____

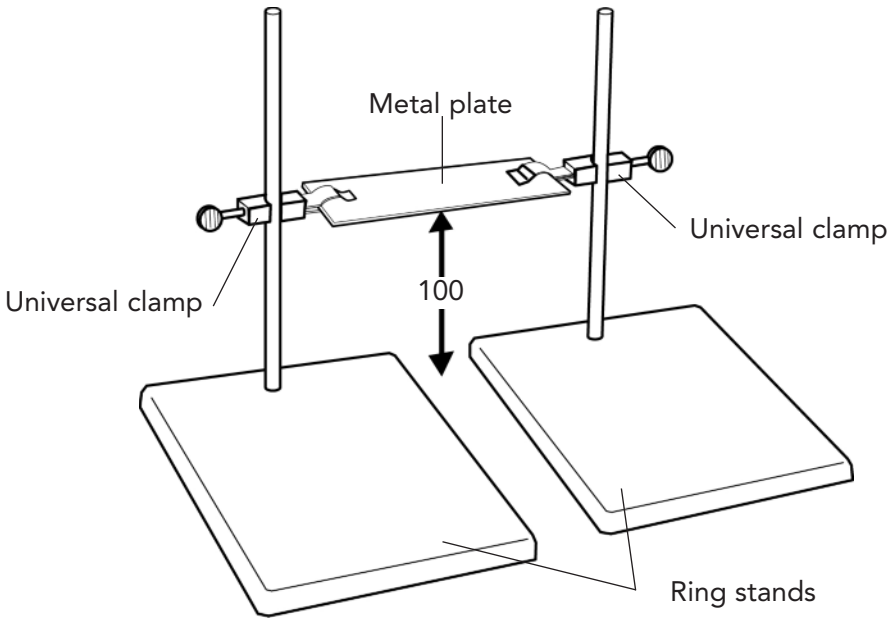
5. What is the equivalence of the mass of an object and the force it exerts on Earth? _____

MATERIALS

- 2 ring stands
- 2 universal clamps
- 500-g weight
- 1000-g weight
- ruler
- 4 metal plates about 126 mm × 20 mm (electrodes)
  - copper
  - iron
  - nickel
  - zinc

PROCEDURE

1. Attach a universal clamp securely to each end of the copper plate.
2. Attach the free end of each universal clamp securely to both ring stands.
3. Adjust the height of the copper plate so it is 10 cm above the worktable. The copper plate must be parallel to the worktable. (See the setup below.)



4. Set the 500-g weight on the centre of the copper plate.
5. Measure the height between the lowest point on the plate and the table.
6. Remove the weight.
7. Observe the plate to see whether or not it has regained its original shape.
8. Repeat Steps 4–7 with the 1000-g weight.
9. Repeat Steps 1–8 in turn with the iron, nickel and zinc plates.

Name: _____ Group: _____ Date: _____

OBSERVATIONS

Record your observations in the table below. Give the table a title and provide the appropriate measurement units within the parentheses provided.

Title: _____

	500-g weight		1000-g weight	
Metal	Height between metal plate and table (____)	Initial shape regained?	Height between metal plate and table (____)	Initial shape regained?
Copper				
Iron				
Nickel				
Zinc				

REFLECTING ON YOUR OBSERVATIONS

1. Indicate the force that was applied on the metal plates by each of the weights.

Weight used (g)	Force applied (N)
500	
1000	

2. What effect did an increase in force have on bending of the metal plates?

_____

_____

_____

3. Do metal plates bend differently depending on the type of metal? Explain your answer based on your observations.

_____

_____

_____

_____

4. What type(s) of deformation did you observe by the metal plates in this lab?

_____

_____

Name: _____ Group: _____ Date: _____

5. How could you have obtained a fracture in the metal plates with the same setup?

_____

6. When rainwater gutters are installed on buildings, it is preferable that they bend easily during installation. Of the types of metal you tested, which one would you choose for manufacturing rainwater gutters? Explain your answer.

_____

_____

_____

_____

7. For a nail to hold properly, it is preferable that it be made of a metal that does not bend easily. Of the types of metal you tested, which one would you choose for manufacturing nails? Explain your answer.

_____

_____

_____

_____