HARDNESS OF METALS

STUDENT BOOK	Chapter 12, page 371
TOOLBOX	Pages 62–67

GOAL

Compare the hardness of various metals.

OBSERVATION CRITERIA

1. Describe a mechanical property.

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_____

2. Give six examples of mechanical properties.

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3. What mechanical property is referred to when speaking of a material's ability to resist penetration?

_____

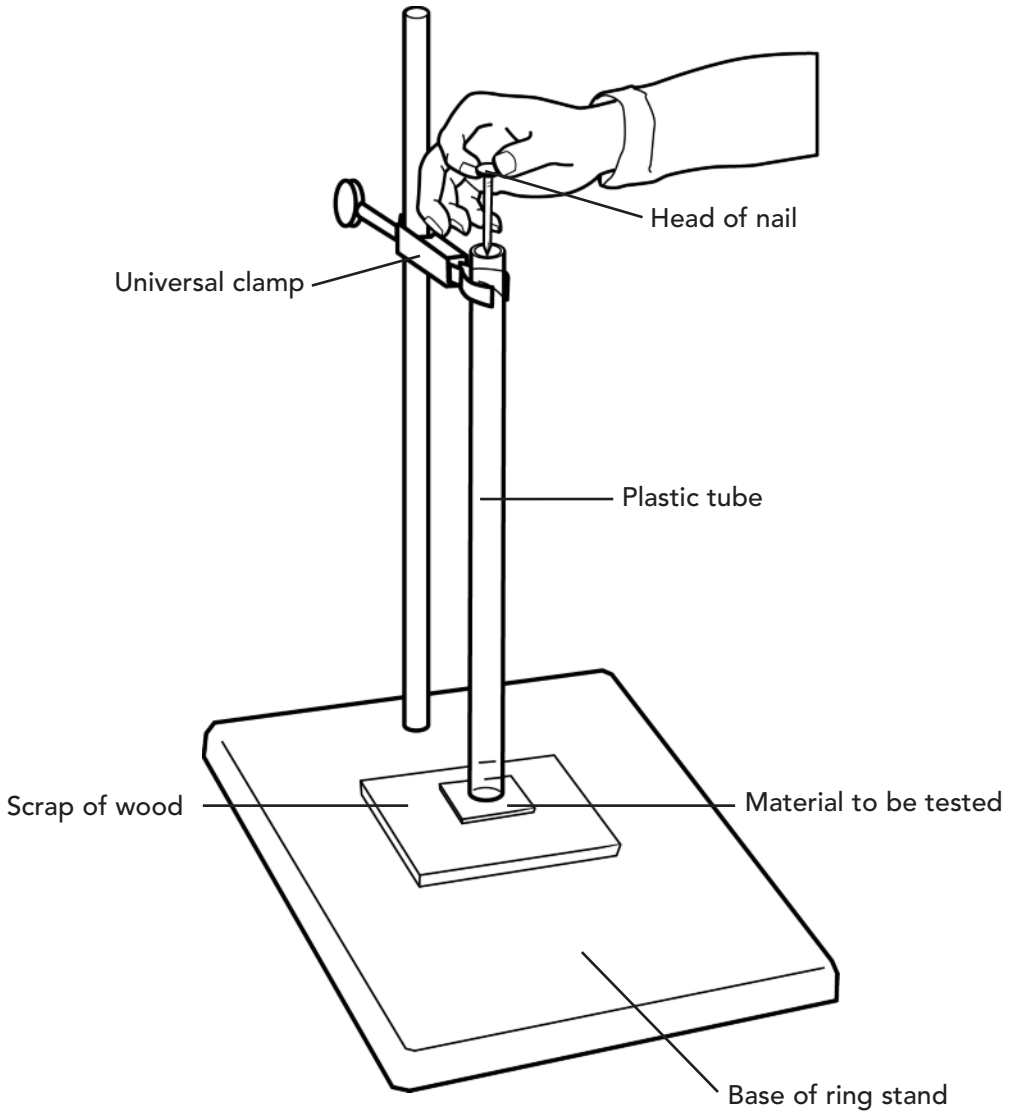
MATERIALS

- ring stand
- universal clamp
- 10-cm iron nail
- 1-m plastic tube
- 4 pieces of metal of equal size (about 20 mm × 20 mm):
  - iron
  - copper
  - nickel
  - zinc
- scrap of wood

PROCEDURE

1. Set the ring stand on the floor.
2. Set the scrap of wood on the base of the ring stand.
3. Place the plastic tube vertically over the scrap wood, allowing about 10 cm of space between the tube's lower end and the wood.
4. Keeping the plastic tube in place, attach it to the ring stand with the universal clamp.
5. Set the piece of iron under the plastic tube.
6. Insert the nail into the tube while pinching its head between your thumb and index finger.
7. Lower your hand until the fingers holding the nail come into contact with the tube opening. (See the setup shown on the next page.)

8. Open your fingers and let the nail drop into the tube.
9. Set the piece of iron aside.
10. Repeat Steps 5–10 in turn with the pieces of copper, zinc and nickel.
11. Categorize these materials according to the depth of each hole the nail makes after it falls (see "Observations").



OBSERVATIONS

Categorize the materials tested according to the depth of the hole made by the nail after it falls (1 as material with the shallowest hole and 4 as material with the deepest hole).

1- _____ 3- _____

2- _____ 4- _____

Name: _____ Group: _____ Date: _____

REFLECTING ON YOUR OBSERVATIONS

1. Based on your observations, which material tested is hardest and which is softest? Explain your answer.

2. Which of the materials tested would be the easiest to pierce? Explain your answer.

3. Hardness is a much sought-after property of steel. Which of the materials tested is used in manufacturing this alloy? Explain how your observations provide support for this use.