TEACHERS GUIDE

RING & BALL APPARATUS

ITEM # 3226-00

CHEMISTRY - PROPERTIES OF MATTER

See metal shrink and grow! Demonstrate thermal expansion. The Ring and Ball Apparatus is two brass rods with insulated handles, one with a ring, the other a ball at the end. The former passes through the latter if both are at room temperature. If the ball is heated, it expands and cannot pass through the ring.

- Are metallic objects limited to remain one size?
- Could Sauron's ring have resized if Lord of the Rings was a true story?

Materials

- Ring and Ball Apparatus
- Blank Shrinky Dinks
- Oven
- Movie clip of Fellowship of the Ring where the ring changes size

Goals & Objectives

Students will:

- discuss the elements causing a change in the metal size
- discuss how the physical laws causing the change in the metal could be useful in technology

Assessment

Students will write a statement explaining what has happened to the ball, and what that has caused. Students must be able to define what a physical and a chemical change is.

Activities

1. View the movie clip and discuss whether a metal could actually spontaneously change size.
2. Discuss what element might create such a reaction. Offer hints by asking them to consider what other things they've seen in life change size, and what caused that.
3. Pull out Shrinky Dink "paper" and tell students to create their own logo, design, or name with colored pencils and scissors. Place them on a cookie sheet and take a "field trip" to the school kitchen. Bake as directed, and let students watch the results. Make clear that heat was the element that created the result.
4. Pass around the wand of the apparatus that has the ball on it and ask students to feel the metal. Ask them to predict if something that hard could be affected like the Shrinky Dink material.
5. Demonstrate that the ball passes freely through the ring on the other half of the apparatus.
6. Hold the ball over a burner. Then attempt to pass the ball through the ring again. It will not fit this time. Students will write a statement explaining what has happened to the ball, and what that has caused.
7. Discuss how this physical law could be useful in technology. Where could an expanded piece of metal be used as a safety guard? (Answers might include an emergency shut-off valve; if a machine is overheating, the ball overheats, expands, gets too large, and will not fit through a part of the machine so it will not continue working.)

Note

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

8. Once the metal is cooled, demonstrate that the ball once again fits through the ring. Teach that this indicates that the change in size is a physical one, not a chemical one, which would have been permanent.
9. Use this lesson as an introduction to using natural reactions for work (found in the Compound Bar lesson).

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