

Lesson 4: Identifying Metals

**Identifying Ferrous Metals Using Spark Testing**

**Objective:** Students will identify different types of ferrous metals by the characteristics of their sparks.

**Directions:** Use a grinding wheel and known samples of different ferrous metals to explain how spark testing can be used to identify metals. Then test unidentified samples so that students can apply what they have just learned to identify the new samples.

**Materials and Equipment:**

Bench grinder

Grinding wheel

Four “known” ferrous metal samples of different types, labeled “A,” “B,” “C,” and “D”

Three different “unknown” ferrous metal samples, labeled “1,” “2,” and “3”

Safety glasses or goggles or a face shield\*

Leather apron or other protective clothing recommended by the instructor

\* Everyone participating in or observing the demonstration should wear appropriate protective eyewear.

**CAUTION:** This activity is designed as a demonstration. Students should only perform these or similar procedures themselves if they have successfully completed all competencies relevant to operating the grinder and have the instructor’s permission to perform the procedure.

**Procedure:**

1. Hand out AS 1 (Student).
2. Before beginning the procedure, review safety procedures for use of the grinder as needed.
3. If needed, begin by reviewing the theory behind spark testing, which is that different ferrous metals oxidize in different and predictable ways and produce characteristic spark patterns. By knowing what these sparks should look like, the welder can identify an unknown ferrous metal.
4. Inspect equipment, materials, and work area to ensure safe and correct operation.
5. Use the spark test on known samples of different ferrous metals.
  - a. Explain what each metal is before testing it.

- b. After testing the first example, have the students as a class identify characteristics of the sparks produced and fill in the information on AS 1 (Student).
  - c. Mention any significant characteristics they may not notice.
  - d. Continue performing spark tests on each sample and have students classify the characteristics.
  - e. To help students become familiar with the composition of different metals, it would probably be useful to present the samples in an ordered way (e.g., from less carbon content to more) and point out to students this ordering system and any corresponding changes in spark pattern.
  - f. Students should be able to examine the samples before and after testing, provided the samples are cool and it does not interfere with their observation of the procedure.
6. Now test the unknown samples one at a time.
    - a. Students should individually apply what they have learned and discussed as a group to fill out the information about samples 1, 2, and 3 on their own.
    - b. Students should be able to examine these samples as well, before and after testing, provided the metal is cool and it does not interfere with their observation of the procedure or completion of the questions.
    - c. The “unknown” samples should be of metals that the students have seen tested or have a composition that would allow the students to deduce the type of metal from information presented during the demonstration. If a completely new sample is presented, indicate to students that “new sample” is a valid answer, but that they must explain in what way the sample seemed unique.
  7. The instructor can repeat any or all of the samples as many times as he or she feels is appropriate.
  8. This is only an outline for a suggested activity. The instructor should adapt it to the particular needs of the class as he or she feels is appropriate.
  9. Observe safety and cleanup procedures.
  10. Collect AS 1 (Student) sheets.