Properties of Metals

Lesson Concept Metals have common chemical properties, i.e., metals can bond with non-metals to make salts, and physical properties, i.e., luster, malleability, thermal and electric conductivity.

Link When students looked at the periodic table, they noticed that there were three types of elements: metals, semi-metals (or metalloids), and non-metals. There are many metals, but how do we decide if an element is a metal? All metals have similar chemical properties.

Time One class period

Materials

Per Group (groups of 4)

Two decks of cards:

Yellow Deck (alloy cards)

Blue deck (element cards)

Individual

Science Notebook

Advance Preparation

1. Copy the alloy cards on yellow cardstock and the element cards on blue cardstock. (The yellow deck consists of 8 “alloy” cards. These cards list an alloy and its two main elemental constituents. The blue deck consists of 16 element cards, i.e., each of the two elements from the 12 alloys listed in the blue deck.)

Procedure:

Engage ***(10 minutes) The periodic table represents three types of elements: metals, semi-metals (or metalloids), and non-metals. There are many metals, but how do we decide if an element is a metal? All metals have similar chemical properties.***

1. Ask the class to list some metals they use every day.
2. Touch on the fact that all matter is made of only just a little over 100 elements. Relate this concept to how all words are made from just 26 letters.
3. Explain how the periodic table (like the alphabet) lists and organizes these elements.
4. Explain the two (technically three) basic categories of the periodic table (I.e., metals and non-metals). Relate this fact to how the alphabet is split into consonants and vowels.

5. Explain to students that today's activity will help us understand properties of metals, and that some metals are made from a combination of other metals. These mixtures are called alloys.

Explore/Explain ***(25 minutes) Many metals we use in every day life are actually made of a combination of metals. These mixtures of metals are called alloys. Alloys are often used to get new properties that are desirable but not found in the pure metals themselves.***

6. Distribute the yellow and blue decks of cards to groups of four students.
7. Explain how to play the cards. All 16 cards in the blue deck are placed face down while 3 yellow cards are placed face up. In groups of 4, each student takes a turn flipping over two blue cards. The goal is to try to get two blue cards that match the elements listed on any of the 3 alloy cards. When there is a match, that student gets a point, takes the 3 cards (2 blue and 1 yellow,) and a new yellow card replaces the one that was won.

Extend ***(10 minutes plus homework and computer lab time) Many metals we use in every day life are actually made of a combination of metals***

8. Replicate the diagram from the graphic organizer on the whiteboard or large white butcher paper. This serves as a mental model for students to differentiate between metals, non-metals, and metalloids, and to classify alloys as combinations of metals. Have students replicate the diagram in their science notebook.
9. Ask students to bring in pictorial or actual representations of the different types of elements, especially focused on metals and alloys. Since brass and steel are frequently assessed on the released CST questions, emphasize those alloys and bring in actual examples of them. Add these examples to the graphic organizer.

Evaluate ***(10 minutes) Metals have common chemical (can bond with non-metals to make salt) and physical properties (luster, malleability, thermal and electric conductivity.)***

10. In their science notebooks, ask students to write their definitions of metals, semi-metals, non-metals, and alloys. Encourage students to use characteristics and placement on the periodic table as part of their definition.