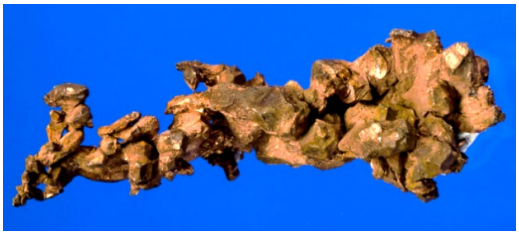
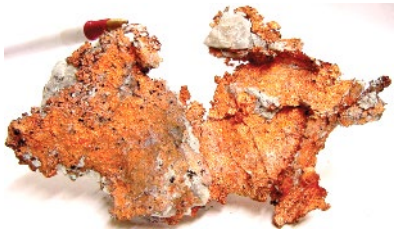
2. Copper (Cu)





Copper is an important economic metal because it is a good conductor of electricity, so it is used in the power lines that bring electricity to your home, the wiring in your walls to the light switches and outlets, and the cords we plug in to the outlets. Copper is used in many industries besides for conducting electricity. Currently, copper is of interest because of its biocidal properties, which means that it can be used for disinfection purposes. Copper is used for the US penny coin—before 1982, it formed 95% of the penny, but to save money, the US Mint now manufactures pennies that contain only 2.6% copper as a coating on a zinc alloy coin. Copper is often alloyed with other metals to produce harder composites such as brass and bronze. Copper can be mined even in low concentrations that would not be economic with conventional mining methods by using solution mining, which uses water or dilute acid to leach the copper from the ore body.

Activities:

K: Find a penny coin and make a rubbing of it by putting the coin under this paper and rubbing the side of your pencil point over it:

K-3: Copper is useful because it is a good conductor of heat and electricity. Look at the cooking pots in your kitchen or at a store or online retailer. Do any of the pots have copper on the bottom of the pot? Circle your answer: Yes No

Why do you think that copper is on the bottom of cooking pots? _____

_____.

2-5: One of the ways that elemental copper is identified is by a property called malleability. All true metals are malleable. That means that when they are pounded with a hammer, they bend instead of break. The opposite of malleability is brittleness. Most nonmetallic minerals are brittle, which means they easily break or form a powder where scratched. First, to demonstrate brittle fracture, put on safety glasses, place a dried macaroni noodle on a concrete or asphalt sidewalk or driveway, and lightly tap it with a hammer. Then, make a small ball of aluminum foil and tap it the same way with a hammer. Label which one broke and which one flattened out without breaking? Circle the answer for each one:

2. Copper continued

Dried noodle: Brittle or malleable?

Aluminum foil ball: Brittle or malleable?

5+: When the atoms of copper join with oxygen in the air, they form the molecule copper oxide (CO). This formation on the surface of pennies makes them look dirty. Assemble the following materials:

- 10 dirty pennies
- 4 tablespoons lemon juice
- 8 tablespoons vinegar
- 1 teaspoon salt
- Small bowl (not made of metal)
- Spoon (not made of metal)
- Paper towels

1. Mix the lemon juice, vinegar, and salt in the bowl with the spoon until dissolved.
2. Dip a penny hallway into the mixture for 20 seconds. Take it out and describe what happened: _____.
3. Put the other nine pennies into the mixture. Watch carefully and describe what happens: _____ _____
4. After 5 minutes, remove four of the pennies from the mixture and lay them on a paper towel to dry. Take the remaining pennies out and rinse them thoroughly under running water. Lay them to dry on a paper towel. What is different between the pennies that weren't rinsed and those that were?

   _____

   The acidic mixture of lemon juice, vinegar, and salt dissolved the copper oxide on the surface of the pennies, but when that coating was removed from the pennies it was easier for the copper atoms to bond with oxygen and chlorine in the salt, forming a new mineral compound called malachite on the pennies that weren't rinsed.

6-8: Copper has antimicrobial properties, which means that it kills bacteria. You may have seen this mentioned in the news or on TV or online advertising of copper-infused products? Why do you think companies would want to put copper into products? _____

_____.

9+: An alloy is a metal made by combining two or more metallic elements, typically to give greater strength or resistance to corrosion. The two most common alloys using copper (there are more than 400!) are brass and bronze. Research what is the primary metal combined with copper for each and list some properties of these alloys.

Brass: Copper combined with _____. Properties: _____.

Bronze: Copper combined with _____. Properties: _____.