

0.0.unit of study: structure, bonding, and properties of metals

grade level: 10-12

1) teacher's objective(s) for the class

A) curricular concept(s): swbat relate properties of metals to their internal crystalline structure

B) stem applications: annealing, life of workable metals, how properties of metals can be altered to serve a given purpose

C) PS1A: structure and properties of matter

2) class activity:

A) short video on metal working <http://www.youtube.com/watch?v=rwQqtf86qOc>

B) introduce and carry out the learning activity

C) article on metal-working <http://www.pbs.org/wgbh/nova/samurai/swor-nf.html>
<http://www.pbs.org/wgbh/nova/tech/metal-fundamentals.html>

D) graph data and draw conclusions

3) materials

paperclips, bunsen burners, mallet & anvil (or metal block), minerals along the Moh's scale (of hardness)

7) completion of a data table, statement based on results (e.g., description of data table), draw a graph of the class results, draw conclusions based on their data and subsequent reading, and statement regarding how their could further their understanding of what was observed.

class activity:

1) gather materials

2) student begins to bend their paperclips to failure; count the number of bends required to induce failure (save each half of the, now broken paperclip); record data

3) using one half of the paperclip test the "worked-end" and an "unworked-end" for hardness (i.e., moh's scale scratch test); record observations

4) using the second half (of the paperclip) test the "worked-end" and an "unworked-end" for malleability or deformation; record observations

5) student begins to bend the paperclip, but stop at ____ (e.g., $\frac{1}{2}$, $\frac{1}{3}$, $\frac{2}{3}$ etc.) number of bends

6) place the worked area of the paperclip over a lit bunsen burner until it is red hot

7) let the paper clip cool, and repeat step #5 & 6 until failure; record the total number of bends require to induce failure

8) complete steps #3 & 4 for this “new” broken paperclip