Bend and Stretch

Apparatus

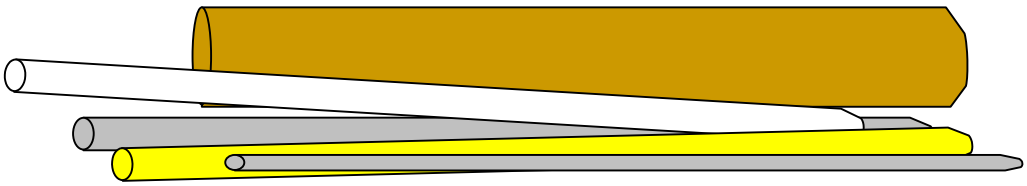
box of chalk, strips or rods of metal, length of rubber hose.

Action

The students attempt to bend and break the materials using bending, tension, compression, shear forces.

The Physics

Most materials are better able to withstand compressive and tension forces than shearing or torsional forces. Metal is more plastic than chalk, and hence will bend before it breaks. However the yield strength is much less than the ultimate strength, so the metal will permanently deform well before it breaks. The rubber has a high yield strength, and the ultimate strength is similar to the yield strength, so the rubber will "bounce back" as long as it isn't ruptured.



Accompanying sheet

Bend and Stretch

Bend, twist, compress and stretch the different materials.

Which ones break by bending? Which ones break by twisting?
What about stretching and compressing?
Which ones bend and which ones stretch?

What can you say about the yield strength, Young's modulus
and ultimate strengths of these materials?