

## Heat Treating Steel Post Lab Questions

Name(s) \_\_\_\_\_  
Block # \_\_\_\_\_

Use these videos to answer the questions below:

<https://www.youtube.com/watch?v=VBzmGyWeNzo> – Types of Steel video (3:40 min)

<https://www.youtube.com/watch?v=JTU-Zz5jalC> – Types of Carbon Steel (2:57 min)

<https://www.youtube.com/watch?v=6jQ4yOLK1kY> – Heat Treating Steel (11:22 min)

1. What does the acronym C. A. S. T. stand for? **Carbon Steel, Alloy Steel, Stainless Steel, Tool Steel**
2. Steel is an alloy, a homogeneous mixture of metals. Explain how the numbering system 4140 is used to define the type of alloy steel is made of? **The code 4140 stands for 4 = Molybdenum, 1 = 1% Molybdenum, and 40 = .40% carbon**
3. What is the percent range of carbon in low carbon steel? **0.04% to 3% carbon**
4. Which element is added for drawing quality steel (more ductile)? **Aluminum**
5. Which element is added for structural quality steel (harder and more brittle)? **Manganese**
6. Which type of heat treating technique is used to make medium steels more useful? **Tempering**
7. What is the percent range of carbon in high carbon steel? **0.61% to 1.5% carbon**
8. Explain why high carbon steel is difficult to work with. **Once heat treated it becomes extremely hard and brittle.**
9. According to the heat treating video, what is the ideal material for a blade? **Normalized and hardened (tempered material)**
10. What crystalline structure does pure iron form? **Body centered cubic**
11. Why do small and more numerous crystal grains result in a stronger material? **Because the grains of one crystal are offset from the nearby grains of another crystal preventing the metal from splitting or tearing apart**
12. What crystalline structure does austenite form? **Face centered cubic**
13. What affects does tempering have on the steel? **It releases carbon atoms, ductile enough to absorb hammer blows without shattering, strong enough not to deform, and does not gather damage on cutting edge.**

Heat Treatment	Bobby Pin Properties (0.7% High Carbon Steel)	Paper Clip Properties (0.2% Low Carbon Steel)
<b>Control –</b> <i>Untreated metal for comparison purposes</i>	<b>“normal”</b>	<b>“normal”</b>
<b>Annealed –</b> <i>Heat red hot, slowly remove from flame and allow to air cool.</i>	<b>softer, easier to bend, lost the springiness</b>	<b>softer, easier to bend</b>
<b>Quenched –</b> <i>Heat red hot, quickly remove and dunk in ice water to cool.</i>	<b>Snaps in pieces, brittle</b>	<b>Doesn't break</b>
<b>Tempered –</b> <i>Heat red hot, quickly remove and dunk in ice water to cool. Now heat again until a blue color appears in metal. DO NOT let it get red hot!!! Dunk in water to cool.</i>	<b>Similar to control; sometimes harder</b>	<b>Similar to control</b>