

## **Learning Objectives – Metals BE-410, Spring '06, Dr. C. S. Tritt**

### **General**

Be able to list any 4 typical features (advantages or disadvantages) of metals relative to ceramics and polymers.

Be able to list three ways in which metallic bonding influences the properties of metals.

Be able to name and describe in good detail any 3 common metal processing techniques.

Be able to explain how protective oxide layers can protect metals from corrosion.

Be able to describe two ways in which protective oxide layers on metals can be damaged.

Be able to explain what passivation is and on what types of alloys it is typically used.

Be able to explain what *anodization* is and on what metal it is typically used.

### **Specific**

Be able to describe specific advantages and disadvantages of gold and platinum relative to other metallic implant materials.

Be able to describe the typical composition, properties and medical uses of martensitic stainless steels.

Be able to describe the typical composition, properties and medical uses of austenitic stainless steels.

Know what type of stainless steel (its full alphanumeric designation) is usable for implants and why.

Be able to describe two common problems with stainless steels that can be traced to processing errors.

Be able to explain the difference between two common types of cobalt based alloys used for implants.

Be able to describe a specific attribute of cobalt based alloys relative to other metallic implant materials.

Be able to describe a specific advantage of titanium based alloys relative to other metallic implant materials.

Be able to describe a specific disadvantage of titanium based alloys relative to other metallic implant materials.

Be able to describe 2 uses of nickel based “super” alloys.

Be able to explain why aluminum is not a suitable implant material.

Be able to describe how Al-Cu alloys can age harden.

## **Corrosion**

Be able to list 4 of the 5 features that make body fluids such a corrosive environment.

Be able to identify the anode and cathode in an electrochemical cell.

Be able to write an electrochemical reaction typically involved in the corrosion of metals (the anode reaction).

Be able to use the electrochemical series to determine which of a pair of metals would “protect” the other.

Be able to explain why it is unwise to use two different metals or alloys close together in the body.

Be able to describe out protective oxide films can be damage and what typically results when this occurs.

Be able to describe the process of stress corrosion cracking.