Copper is easily smelted

Process of reducing a material to its natural form

Most often find CuCO3-malachite

Add heat CuCO3 = CuO + CO2

Carbon 2C + O2 -> 2CO

CO is a great reducer

CuO + CO -> Cu + CO2

140 lbs of wood > 20 lbs of charcoal > 1lb of Cu > 2 axe heads

Yield strength for copper is really low

Increase strength of copper – work hardening

-plastically deform it

-dislocations-inperfections

Theoretically yield str is 500,000 lb/sqin – actual is 1000 lb/sqin

Work hardening makes it not ductile- makes it brittle

Amneal- Heating it up again will remove dislocations

Tempering-Making it hard and heating it up

Bronze

Harder

Alloy- mixture

2nd hardening mechanism

alloy hardening-use impurities to slow down dislocations

first used arsenic- arsenic was volatile and hazardous

arsenic is soluble in copper up to 8%

phase diagram temperature and composition

added tin instead of arsenic

tin was far away, started trade

1000 bc lots of bronze statues