The midterm is closed book and closed notes. Bring a calculator with plenty of "juice", pencil(s) and eraser(s).
I will give you all the equations, constants, and conversions you need except I **WILL NOT** give you the equations for:

- the area of a circle
- the area of a square
- stress
- elastic modulus
- the volume of a sphere
- the volume of a cube
- strain
- density
- lever rule

**Be able to define:**

- phase
- interstitial
- substitutional
- solubility limit
- mixture
- eutectic
- flux
- activation energy
- alloy
- freezing/melting range
- solid solution
- phase
- shear stress
- shear strain
- Poisson’s Ratio
- shear modulus
- concentration gradient

**Things to know:**

Be able to describe the different kinds of point defects, line defects, and area defects we discussed.
Be able to describe an edge dislocation and screw dislocation and locate the Burger's vector and dislocation line for each.
Be able to describe why dislocations are important.
Be able to describe how elastic and permanent deformation occur in crystalline materials.
Be able to describe why ceramic materials are, in general, brittle.
Be able to describe in what ways all strengthening processes are similar.
Be able to describe where dislocations are likely to form and to move (and how they move).
Be able to describe a slip system and know where they are likely to occur in BCC and FCC systems.
Be able to describe the effect of defects on physical properties such as strength and ductility and explain why the changes occur.
Be able to do calculations involving atomic and weight percents.
Be able to discuss how diffusion occurs, vacancy and interstitial, including which is 'easiest' and why.
Be able to describe and do calculations regarding the temperature dependence of the diffusion coefficient.
Be able to explain and do calculations using Fick's first law of diffusion.
Be able to read and use a binary phase diagram including determining what phases are present, their chemical composition, and the phase amount.
Be able to write the eutectic reaction (including phase names and compositions) from a phase diagram.
Be able to describe in words the difference between true stress and normal stress and true strain and normal strain.
Be able to describe what elastic strain and deformation and plastic strain and deformation are and what the difference is.
Be able to calculate the 0.2% offset yield strength
Be able to determine the breaking and tensile strengths from a stress-strain curve
Be able to determine the amount of plastic and elastic strain in a system using a stress-strain diagram.
Be able to do calculations with shear stress, strain and shear modulus.