

Engineering Materials (MSE-220)

Answers to Assignment #1

- is a physical property.
 - Gold
 - Sound
 - Corrosion
 - Hardness
 - Friction
 - Thermal conductivity
- is a mechanical property.
 - Color
 - Density
 - Ferromagnetism
 - Stereospecificity
 - Stiffness
 - Strength
- Which of the following is *not* an NDT technique?
 - radiography
 - acoustic emission
 - resonant frequency
 - holography
 - tomography
 - ulasonics
- The smallest defect that an x-ray could detect in a 10 mm-thick plate is
 - 4 mm
 - 1mm
 - 0.2 mm
 - 200 nm
 - 50 nm
 - 2 nm
- The thickness limit for ultrasonic inspection is
 - 10mm
 - 100mm
 - 1m
 - 10 m
 - no technical limit
 - all of the above
- What is the most sensitive technique to use to detect internal defects in an aluminum automobile connecting rod?
 - x-ray
 - particle emission
 - magnetic particle
 - dye penetrant
 - holography
 - microscopy
- What is an element?
 - a state of matter
 - types of metals
 - groups of molecules
 - a unique substance

8. What makes elements different from each other?
- number of protons
 - atomic forces
 - electron spin
 - charges
9. Electrons
- orbit the nucleus of an atom
 - vibrate in a described way
 - determine an element's reactivity
 - have distinct energies
 - all of the above
10. Valence electrons
- are the atomic size of an element
 - are in the outermost orbit
 - have a negative spin
 - rotate in a circle
11. A substance is
- a chemical
 - a solid
 - a solid, liquid, or gas
 - atoms of different elements
12. The periodic table is
- glossary of elements
 - a categorization of the elements by chemical characteristics
 - a listing of valences
 - a tabulation of atomic charges
13. The density of what is about two times that of aluminum?
- | | | |
|-------|-------|-------|
| a. Fe | c. Cu | e. Br |
| b. Li | d. Mg | f. H |
14. Which of the following is an inert gas?
- | | | |
|-------|-------|-------|
| a. Li | c. Cl | e. H |
| b. Ar | d. O | f. Ca |
15. An alloy is
- diatom
 - amphoteric
 - composed of two or more elements
 - molecules composed of elements

16. What is a metal?

Ans:

A material with its atoms held together by a sea of electrons.

17. What are dislocations and what is their role in materials?

Ans:

Dislocations are lines of atomic disarray (defects) in a crystalline material that can be produced by manufacturing processes or by deformation in service. They are nature's way of accommodating deformation.

18. How does quench hardening strengthen?

Ans:

Quench hardening of steels involves trapping carbon atoms in a structure that is being changed from FCC at elevated temperature to BCC at room temperature. The trapped carbon atoms produce a BCT structure which offers more resistance to deformation (higher hardness) than the same material not hardened.

19. How does cold work strengthen?

Ans:

Cold work produces dislocations which in turn impede the motion of new dislocations. These "barriers" to atomic slip strengthen a metal.

20. What is a ceramic?

Ans:

A ceramic is an inorganic material characterized by strong atomic bonds (covalent, ionic) which usually makes it hard and brittle. Many ceramics are compounds of a metal and nonmetal. The most common ceramics are oxides, carbides, and nitrides.

21. How are ceramics and metals strengthened?

Ans:

Metals can be strengthened by cold work, alloying, and thermal processing (quench, age hardened, etc.). Ceramics cannot be cold worked, or thermal processed to increase strength. Some can be strengthened by adding other elements, but the most common way of strengthening is to blend them with other ceramics, for example, alumina + 20% zirconia.

22. What is a plastic?

Ans:

A plastic is an organic material with repeating molecules that can be processed into a shape by viscous flow at an elevated temperature and a solid at warm temperature. (The Society of Plastic Engineers, and ASTM, in the USA have a more complicated definition – see Chapter 7.)

23. What is a composite?

Ans:

A composite is a material made from two or more other materials with properties that are superior to the properties of the starting materials.