

Material Science Quiz **Answers**

Answer the following questions without the assistance of a neighbor, friend or teacher.

1. For each material, indicate its material class.

quartz	<u>3</u>
steel	<u>2</u>
Teflon [®]	<u>1</u>
aluminum	<u>2</u>
plywood	<u>4</u>
fiber glass	<u>4</u>
diamond	<u>3</u>
Zip Lock [®] bag material	<u>1</u>
paper clip	<u>2</u>
polyvinyl chloride (PVC)	<u>1</u>
concrete	<u>4</u>
paper	<u>4</u>

Material Classes:

1. polymer
2. metal
3. ceramic
4. composite

2. Connect each material to the corresponding material class.

ductility	<u>8</u>	1. Hard, covalently bonded material
brittle	<u>9</u>	2. Describes displacement of particles in a deforming body
lattice	<u>7</u>	3. Measured stress at onset of plastic deformation
ceramic	<u>1</u>	4. The brand of science that deals with metal properties
stress	<u>10</u>	5. Irreversible alteration of a solid body under stress
plastic deformation	<u>5</u>	6. Reversible alteration of a solid body under stress I
yield strength	<u>3</u>	7. 3D geometric arrangement of atoms composing a crystal
elastic deformation	<u>6</u>	8. Ability of material to undergo permanent deformation without fracture
strain	<u>2</u>	9. Ability of material to break, or crack easily when subjected to a force
metallurgy	<u>4</u>	10. Force exerted on an object over a defined cross-sectional area

3. What type of bonding makes up ceramic materials?

- a. **covalent bonds**
- b. London dispersion forces
- c. metallic bonds
- d. ionic bonds

4. How many lattice structures exist?

- a. 2
- b. 14
- c. **7**
- d. 5

5. How many Bravais lattice structures exist?

- a. 2
- b. 14
- c. 7
- d. 5

6. The maximum attainable stress for a metal is called:

- a. yield stress
- b. fracture stress
- c. maximum stress
- d. ultimate tensile stress

7. All are attributes of ceramics, except:

- a. covalent bonded
- b. low melting point
- c. high stiffness
- d. High hardness

8. All are not attributes of metals, except:

- a. electrical insulators
- b. thermal insulators
- c. high melting points
- d. ductile

9. Below are examples of plastic deformation, except:

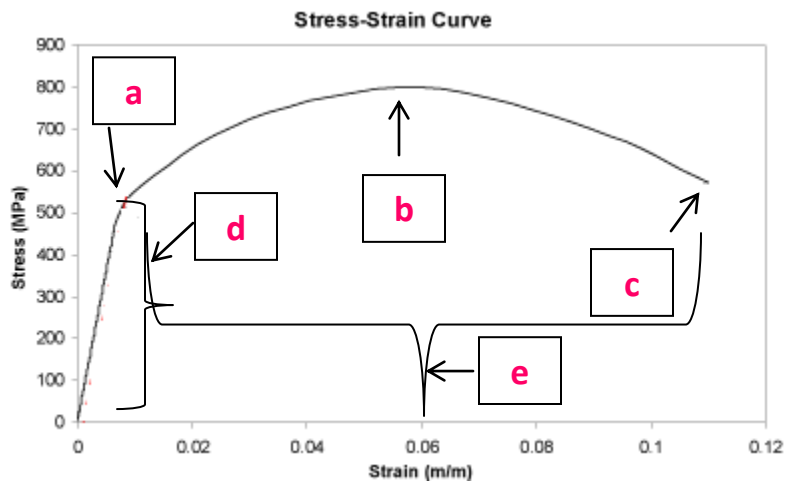
- a. a wire coiled 10 times around a magnetic core
- b. broken glass
- c. bent nail in wood
- d. molded clay

10. What class of material might be useful at temperatures 1100°C (2150°F)?

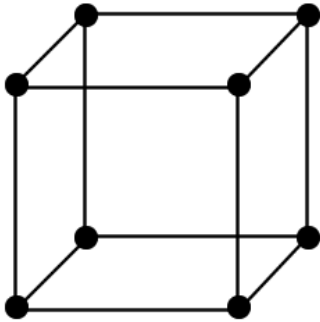
- a. pure metals
- b. polymer-polymer composites
- c. ceramics-ceramic composites
- d. lead-tin metal alloy

11. Label the stress strain plot below:

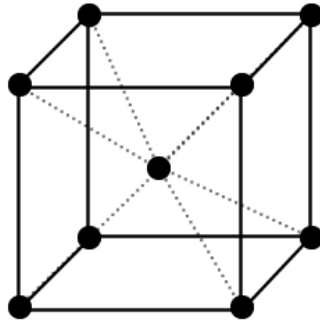
- a. yield stress
- b. ultimate tensile stress
- c. fracture stress
- d. elastic deformation region
- e. plastic deformation region



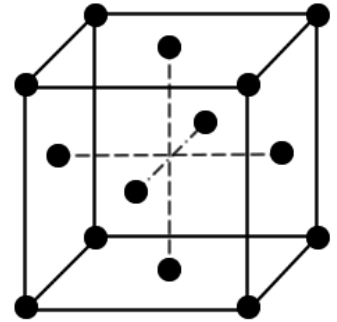
12. Label the lattice and packing below.



cubic; primitive



cubic; body centered (BC)



cubic; face centered (FC)

13. True or False? Aluminum alloy has an FCC structure.
14. True or False? Brittle materials typically fail fast and with excessive plastic deformation.
15. True or False? Strain is the measure of force per unit cross-sectional area.
16. True or False? Type of bonding dictates whether a material is electrically conductive or not.
17. True or False? Metallurgy is the study of metals and their behavior.
18. True or False? I like materials science and engineering.