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# MSE 2001- PRINCIPLES AND APPLICATIONS OF ENGINEERING MATERIALS

Exam NO. 1

Spring 2014

**Instructions:**

1. Please write your name and student ID number on top portion of this page.
2. Please insert your answers in the table below.
3. Please use clicker device to answer questions. Any violations will result in a 5 point penalty
4. Test time is 45 minutes. When prompted, you should stop writing and turn your first page over for collection.
5. Please submit only the first page. If you feel that the answer for any of the questions are different from what is provided, you can indicate that on this page and submit.
6. Good luck.

1	2	3	4	5	6	7	8	9	10	11
b	c	c	a	b	a	c	a	b	d	b
12	13	14	15	16	17	18	19	20	21	22
d	e	b	c	b	a	a	a	b	a	a
23	24	25	26	27	28	29	30	31	32	33
a	b	a	b	b	d	d	a	b	d	a
34										
c										

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Chapter-1:

1. Elastic Modulus is the:
  - a. Slope of the force deflection curve
  - b. Slope of the stress strain curve
  - c. Same as strength
  - d. Same as stiffness
2. Wood is classified as a
  - a. Metal
  - b. Ceramic
  - c. Polymer
3. Human skin is classified as a
  - a. Metal
  - b. Ceramic
  - c. Polymer
4. The ability of a material to conduct electricity is a
  - a. Property
  - b. Structure
  - c. Microstructure
  - d. None of the above
5. Strength is:
  - a. Is the ability of Materials to plastically deform
  - b. The Maximum stress that a materials can withstand before failure
  - c. Same as Elasticity

Questions from Chapter 2:

6. The Spatial distribution of the electrons in orbits can be influenced by external fields
  - a. Yes
  - b) No
  - c) Not enough information
7. The bond-energy curve can be used to gain information about three of the four following materials properties. Which type of information cannot be determined from the bond-energy curve?
  - a. Bond energy
  - b. Equilibrium separation distance
  - c. Primary bond type
  - d. Vaporization temperature
8. The energy of the shell is primarily dependent on n and l quantum numbers
  - a. Yes
  - b) No
9. What is the quantum number (l=?) associated with the p-orbital?
  - a. 0
  - b) 1
  - c) 2
  - d) 3
10. What is the maximum number of electrons  $2(2l+1)$  in the d sub-shell?
  - a. 4
  - b) 6
  - c) 8
  - d) 10

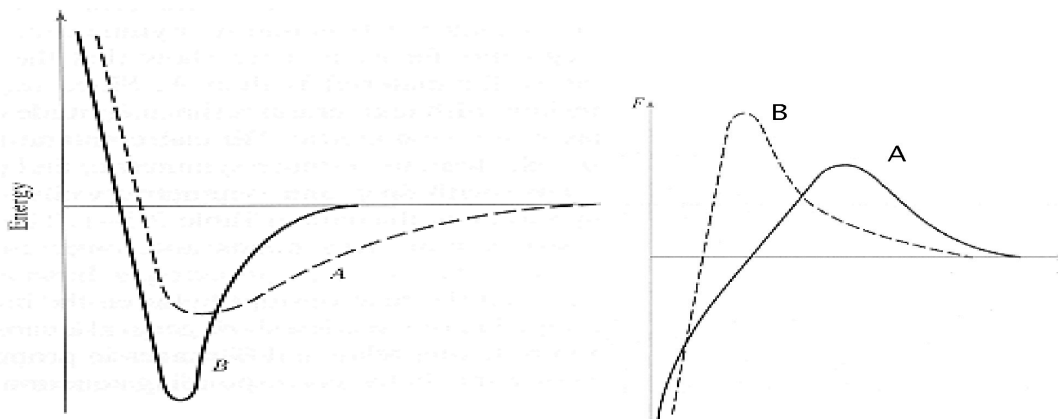
Determine the electron configuration for a Germanium atom ( $Z=32$ ). (Remember: a-Maximum number of electrons in a sub-shell is  $2(2l+1)$ , b)-the order of the sub-shell is:  $1s^a, 2s^b, 2p^c, 3s^d, 3p^e, 4s^f, 3d^g, 4p^h$ )

11. b is:
  - a. 1
  - b) 2
  - c) 4
  - d) 6
  - e)10
12. c is
  - a) 1
  - b)2
  - c) 4
  - d) 6
  - e)10
13. g is:
  - a) 1
  - b)2
  - c) 4
  - d) 6
  - e)10
14. h is:
  - a. 1
  - b)2
  - c) 4
  - d) 6
  - e)10

15. Ionic bond usually involve

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- a. electronegative atoms b) electropositive atoms, c) both types of atoms
16. The ionic bonding electrons  
a. shared b)transferred c) neither
17. The covalent bonding electrons are  
a. shared b)transferred c) neither d) both
18. Covalent bonding is:  
a. Directional b. Non-directional
19. The metallic bonding electrons are  
a. shared b)transferred c) neither
20. The metallic bonding electrons are  
a. localized b) delocalized c) neither
21. Water is an example of  
a. Hydrogen bond  
b. Van Der Waals  
c. Covalent bonding  
d. Ionic bonding
22. In the following equation, Z is the:  $F_a(x) = \frac{|Z_1 Z_2| q^2}{4\pi\epsilon_0 x^2}$   
a. Valence  
b. Atomic number  
c. Permittivity
23. The bond-energy curve can be used to gain information about Vaporization temperature?  
a. True b. false
24. The bond-energy curve can be used to gain information about Primary bond type?  
a. True b. false
25. Of the two materials (A or B) shown in the figure below which one has a higher coefficient of thermal coefficient of expansion a) A\_ or b) B
26. Of the two materials (A or B), which one can withstand a higher temperature  
a. A b) B
27. Which materials (A or B) exhibits a higher elastic modulus  
a. A b) B



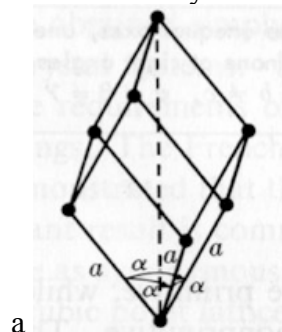
28. Which Statement is correct  
a. Van Der Waals bonding is stronger than Hydrogen bond

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- b. Van Der Waals Bonding is more permanent than Hydrogen bond
  - c. All of the above
  - d. None of the above
29. What are the constraints for calculating the coordination number :
- a. Cations (electropositive) touch anions (electronegative)
  - b. The number of anions surrounding a given cation will be as high as geometrically possible
  - c. Anions cannot overlap
  - d. All of the above
30. Thermosets are:
- a. 3D structures that do not form a melt (or liquid phase)
  - b. They are thermoplastics
  - c. They can stretch to hundreds of their length
  - d. All of the above

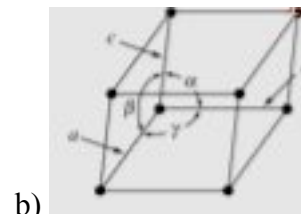
Questions from Chapter 3:

31. Amorphous solids show long Range Order:
- a. correct
  - b) Incorrect
32. Which of the following statement is correct
- a. the corner atoms in BCC touch one another
  - b. the corner atoms in FCC touch one another
  - c. both a and b are correct
  - d. None are correct
33. A Rhombohedral crystal structure is



$$a=b=c,$$

$$\alpha=\beta=\gamma \neq 90^\circ$$



$$a \neq b \neq c,$$

$$\alpha = \gamma = 90^\circ, \beta \neq 90^\circ$$

c)

34. What is the Miller Indices represented by B considering that  $a=1$ ,  $b=3$ ,  $c=6$
- a.  $[112]$
  - b) 221
  - c) (132)
  - d) (112)

