

IMF and Phase Change - Mixed Practice**Name:**

1. _____ Which process is exothermic?
(A) condensation (B) fusion (C) sublimation (D) vaporization
2. _____ A low molar heat of fusion is expected for a solid that is
(A) ionic (B) metallic (C) molecular
3. _____ What are the strongest intermolecular forces between neighboring carbon tetrachloride, CCl_4 , molecules?
(A) dipole-dipole forces (B) covalent bonds (C) hydrogen bonds (D) dispersion forces
4. _____ What is responsible for capillary action, a property of liquids?
(A) dispersion forces (B) cohesive forces (C) adhesive forces (D) mechanical forces
5. _____ Which of the following substances would you expect to have the lowest boiling point?
(A) methane, CH_4 (B) diamond (C) copper (D) glycerine, $\text{C}_3\text{H}_5(\text{OH})_3$
6. Assume 12,500 J of energy is added to 2.0 moles (36 grams) of H_2O as an ice sample at 0°C . The molar heat of fusion is 6.02 kJ/mol. The specific heat of liquid water is $4.18 \text{ J/g } ^\circ\text{C}$. The molar heat of vaporization is 40.6 kJ/mol. The resulting sample contains which states of water?

7. The boiling points, surface tension and viscosities of water and several alcohols are listed below to the right:

	Boiling Point ($^\circ\text{C}$)	Surface Tension (J/m^2)	Viscosity ($\text{kg/m}\cdot\text{s}$)
Water, H_2O	100	7.3×10^{-2}	0.9×10^{-3}
Ethanol, $\text{CH}_3\text{CH}_2\text{OH}$	78	2.3×10^{-2}	1.1×10^{-3}
Propanol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	97	2.4×10^{-2}	2.2×10^{-3}
<i>n</i> -Butanol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$	117	2.6×10^{-2}	2.6×10^{-3}
Ethylene glycol, $\text{HOCH}_2\text{CH}_2\text{OH}$	197	4.8×10^{-2}	26×10^{-3}

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- a. For ethanol, propanol, and *n*-butanol, the boiling points, surface tensions, and viscosities all increase. What is the reason for this increase?

- b. How do you explain the fact that propanol and ethylene glycol have similar molecular weights (60 vs 62 amu), yet the viscosity of the ethylene glycol is more than ten times larger than propanol?

- c. How do you explain the fact that water has the highest surface tension but the lower viscosity?