Thermodynamics background quiz

1. An ergodic state of a system is:

    a. An excited state of a molecule that lies above the ground state of a molecule

    b. A supercooled condition that is unstable with respect to the crystalline state

    c. An equilibrium state that the system has had sufficient time to explore and represents a global minimum in energy

    d. A non-equilibrium state that the system has had insufficient time to explore and does not represent a global minimum in energy

2. The natural variables of a thermodynamic function describe:

    a. Those variables that are derived from the thermodynamic definition of the function

    b. Those variables that describe the first derivatives of the thermodynamic function when it is written out as a total derivative

    c. Are S and P for the Enthalpy function

    d. Are S and V for the total energy function

3. The Second Law of thermodynamics:

    a. Provides a function to determine the direction of process change towards equilibrium in an isolated system

    b. States that the entropy of a disordered material is larger than the entropy of a crystalline material

    c. Allows that the entropy can be calculated from only the heat flows and temperatures in a process when that process is chosen such that it conveys the system from one state to another state along a reversible path

    d. States that “entropy is time’s arrow”

4. The Gibb’s Free-Energy is the appropriate thermodynamic function to determine the equilibrium state of system for changes occurring at constant temperature and pressure because:

    a. T and P are the natural variables of the Gibb’s Free Energy function

    b. T and V are the natural variables of the Gibb’s Free Energy function

c. The Gibb's Free Energy function reaches a minimum value for a process occurring at constant temperature and pressure

d. The Gibb's Free Energy functions describes the so-called "free energy" available to a system undergoing a process to change its state

5. The entropy of a supercooled liquid:

   a. Typically decreases with decreases temperature, and at all temperatures above the Kauzmann temperatue is less than that of the corresponding crystalline state.

   b. Typically increases with decreasing temperature, but at all temperatures above the Kauzmann temperatue is more than that of the corresponding crystalline state.

   c. Typically decreases with decreasing temperature, but at all temperatures above the Kauzmann temperatue is more than that of the corresponding crystalline state.

   d. Typically increases with decreasing temperature, but at all temperatures above the Kauzmann temperatue is less than that of the corresponding crystalline state.

6. The enthalpy of a supercooled liquid:

   a. Typically decreases with decreases temperature, and at all temperatures above the glass transition temperatue is less than that of the corresponding crystalline state.

   b. Typically increases with decreasing temperature, but at all temperatures above the glass transition temperatue is more than that of the corresponding crystalline state.

   c. Typically decreases with decreasing temperature, but at all temperatures above the glass transistion temperatue is more than that of the corresponding crystalline state.

   d. Typically increases with decreasing temperature, but at all temperatures above the glass transition temperatue is less than that of the corresponding crystalline state

7. The Gibb's Free Energy of a supercooled liquid:

   a. Typically decreases with decreases temperature, and at all temperatures below the glass transition temperature is less than that of the corresponding crystalline state.

   b. Typically increases with decreasing temperature, but at all temperatures below the glass transition temperature is more than that of the corresponding crystalline state.

   c. Typically decreases with decreasing temperature, but at all temperatures below the glass transistion temperature is more than that of the corresponding crystalline state.

   d. Typically increases with decreasing temperature, but at all temperatures below the glass transition temperature is less than that of the corresponding crystalline state

8. The Kauzmann temperature for a supercooled liquid:

    a. Can be a higher temperature than the glass transition temperature

    b. Can be a higher temperature than the melting (or liquidus) temperature

    c. Is always lower than the glass transition temperature

    d. Is always lower than the melting (or liquidus) temperature