

1. Which one of the following substances is **INCORRECTLY** matched with the kind of solid it forms?
- | <u>Substance</u> | <u>Kind of Solid</u> |
|--------------------|----------------------|
| a) graphite | covalent |
| b) calcium bromide | ionic |
| c) methane | molecular |
| d) lithium | ionic |
| e) sulfur dioxide | molecular |
2. The substance sulfur dioxide has the following properties: normal melting point 200K, normal boiling point 263K, triple point (0.0017 atm; 198K), critical point (78 atm; 430K). A sample of sulfur dioxide is initially at a pressure of 76.4 atm and a temperature of 269K. The pressure on the sample is reduced to 0.0010 atm at a constant temperature of 269K. Which of the following is **false**?
- a) One or more phase changes will occur.
b) the final state of the substance is a gas.
c) Additionally lowering the temperature from that point could cause liquification.
d) the sample is initially a liquid.
3. Which of the following boils at the **highest** temperature?
a) C_4H_{10} b) C_3H_8 c) C_6H_{14} d) C_2H_6 e) C_5H_{12}
4. Which liquid would have the **highest** viscosity at room temperature?
a) C_7H_{14} b) C_5H_{12} c) $C_8H_{17}NH_2$ d) C_9H_{18}
5. Calculate the amount of heat (in joules) required to convert 92.5 g of water at 25.0°C to steam at 108.0°C. (Sp. heat of $H_2O(l)$ = 4.18 J/g•°C, Sp. heat of $H_2O(g)$ = 2.03 J/g•°C, heat of vap. of $H_2O(l)$ = 2.260 kJ/g)
a) 2.20×10^4 J b) 3.05×10^4 J c) 6.43×10^5 J d) 2.26×10^5 J e) 2.40×10^5 J
6. Which of the following interactions are the strongest?
a) covalent bonding force d) dispersion force
b) London force e) hydrogen bonding force
c) permanent dipole force
7. Which statement is **FALSE**?
a) Most molecular solids melt at lower temperatures than metallic solids.
b) Metallic solids exhibit a wide range of melting points.
c) Molecular solids generally have lower melting points than covalent solids.
d) The interactions among the molecules in molecular solids are generally stronger than those among the particles that define either covalent or ionic lattices.
e) The lattice of a metallic solid is defined by the positions of the metal nuclei, and the valence electrons are distributed over the lattice as a whole.
8. The boiling points of the halogens increase in the order $F_2 < Cl_2 < Br_2 < I_2$ due to the resulting increasing _____ interactions.
a) permanent dipole-dipole c) London dispersion e) ion-dipole
b) hydrogen-bonding d) ion-ion
9. Which liquid would evaporate most quickly at room temperature?
a) Gasoline, C_8H_{18} , 114 g/mol c) H_2O , 18 g/mol
b) Vegetable oil, 895 g/mol d) Mineral oil, $C_{12}H_{26}$, 170 g/mol
10. In a face-centered cubic lattice, an atom laying in a face of a unit cell is shared equally by how many unit cells?
a) eight b) two c) four d) one e) sixteen
11. Which of the following solid compounds has the **highest** melting point?
a) AlF_3 b) CaF_2 c) NaF d) MgF_2 e) Al_2O_3
12. A particular compound of elements A and B forms a crystal in which atoms of A occupy corner sites and atoms of B occupy facial sites of a face-centered unit cell. What is the empirical formula of this compound?
a) AB_4 b) AB c) AB_6 d) A_3B_4 e) AB_3

13. In a body-centered cubic structure of a metallic solids, how many nearest neighbors does a metal ion have? (i.e., what is its coordination number)
 a) 4 b) 6 c) 12 d) 8 e) 3
14. In a body-centered cubic lattice, how many atoms are contained in a unit cell?
 a) three b) two c) four d) five e) one
15. **The density of palladium is 12.0 g/cm^3 . The unit cell of Pd is a face-centered cube. Calculate the atomic radius of Pd.
 a) 1.56\AA b) 1.44\AA c) 1.26\AA d) 1.64\AA e) 1.37\AA
16. What is the mole fraction of CH_3OH in a 3.50 m aqueous solution of CH_3OH ?
 a) 0.350 b) 0.650 c) 0.0630 d) 0.0592 e) 0.0679
17. Which of the following substances will have the strongest intermolecular forces?
 a) H_2S b) CH_3NH_2 c) Cl_2 d) Rn e) NO
18. If the concentration of CO_2 is 2.90 g of CO_2 per 1.00 L of soft drink when bottled under 2.0 atm of CO_2 pressure, what will be the concentration of the CO_2 in the drink after it has been opened and left to come to equilibrium with the atmosphere which has a CO_2 partial pressure of $3.0 \times 10^{-4} \text{ atm}$?
 a) $2.0 \times 10^{-4} \text{ g CO}_2/\text{L}$ d) $2.2 \times 10^{-3} \text{ g CO}_2/\text{L}$
 b) $1.0 \times 10^{-4} \text{ g CO}_2/\text{L}$ e) $4.6 \times 10^{-2} \text{ g CO}_2/\text{L}$
 c) $4.4 \times 10^{-4} \text{ g CO}_2/\text{L}$
19. The boiling point of pure water in Winter Park, CO (elev. 9000 ft) is 94°C . What is the boiling point of a solution containing 11.3 g of glucose (180 g/mol) in 55 mL of water in Winter Park? K_b for water = $0.512^\circ\text{C}/m$.
 a) 98.6°C b) 94.6°C c) 100°C d) 95.1°C e) 93.4°C
20. Which aqueous solution would have the **lowest** vapor pressure at 25°C ?
 a) 1 M NaCl c) $1 \text{ M Na}_3\text{PO}_4$
 b) $1 \text{ M sucrose, C}_{12}\text{H}_{10}\text{O}_{11}$ d) 1 M MgCl_2
21. Calculate the molality of a 10.0% H_3PO_4 solution in water.
 a) 1.51 m b) 0.760 m c) 1.89 m d) 1.13 m e) 0.380 m
22. Which of the following pairs would not form a solution?
 a) Pentane, C_5H_{12} , in CCl_4
 b) NaCl in water
 c) Vegetable oil in mineral oil
 d) Methyl alcohol, CH_3OH , in water
 e) NaCl in CCl_4 (carbon tetrachloride, a nonpolar solvent)
23. Calculate the freezing point of a solution that contains 30.0 g of urea, $\text{CH}_4\text{N}_2\text{O}$, in $200. \text{ g}$ of water. Urea is a nonvolatile nonelectrolyte. K_f for $\text{H}_2\text{O} = 1.86^\circ\text{C}/m$.
 a) -1.86°C b) -4.23°C c) -4.65°C d) -3.72°C e) -2.79°C
24. When 20.0 grams of an unknown compound are dissolved in $500. \text{ grams}$ of benzene, the freezing point of the resulting solution is 3.77°C . The freezing point of pure benzene is 5.48°C , and the K_f for benzene is $5.12^\circ\text{C}/m$. What is the molecular weight of the unknown compound?
 a) 100 g/mol b) 80.0 g/mol c) 120 g/mol d) 140 g/mol e) 160 g/mol
25. Which version of this quiz do you have?
 a) **Version A** b) Version B

KEY:

1)d 2)c 3)c 4)c 5)e 6)a 7)d 8)c 9)a 10)b 11)e 12)e 13)d 14)b 15)e 16)d 17)b 18)c 19)b 20)c 21)d 22)e 23)c 24)c 25)a