LBS 172
Exam 1 Review Questions

1. If under certain condition, pressure is equal to 2.7 atm, convert the pressure into units of
   mm Hg, torr, kilopascals (kPa), and Pascals (Pa). 2100 mm Hg, 2100 torr, 270 kPa, 2.5 × 10^5 Pa
2. If V_1 = 700 mL, P_2 = 1.0 atm, V_2 = 1750 mL, what is P_1 equal to? 2.5 atm
3. Name and state the law relating temperature and volume. Charles’ Law: \( \frac{V_1}{T_1} = \frac{V_2}{T_2} \)
4. Avogadro’s Law, \( \frac{V_1}{n_1} = \frac{V_2}{n_2} \), relates number of moles and volume. For this law to
   hold true, what conditions must be constant? Pressure and temperature
5. What is the volume to 2.0 moles of gas assuming that both temperature and pressure are
   standard? 44.828 L
6. What is the density of H_2O (g) at 380°C and 720 torr? 0.589 g/L
7. 0.850 g Cl_2 (g) and 0.163 g H_2 (g) are in a 5.0 L vessel at 350°C. The reaction produces
   only HCl. What is the final pressure in Pascals? In torr? 2.47 × 10^4 Pa, 186 torr
8. Find the root mean squared (weighted average speed) of a Br_2 molecule under standard
   conditions. \( \bar{u} = \sqrt{\left(\frac{3RT}{M}\right)} \), thus \( \bar{u} = 215.7 \) m/s
9. Explain the differences between gas diffusion and effusion. Diffusion is the gradual
   mixing of molecules of one gas with molecules of another while effusion is a process in
   which gases escape out of a small opening in a container. Although different in meaning,
   both relate speed with molar mass and show that at constant temperature and pressure,
   the speed of the gases is proportional to the inverse of the square root of the molar mass.
10. To solve for a variable in PV = nRT, all but the unknown variable must be known. It is
    also well-known that PV = nRT only refers to ideal gases. Why can this equation not be
    applied to non-ideal gases? PV = nRT assumes no interactions between collisions and
    that molecules have no volume.
11. T or F
    a. Water is a bent molecule that is formed by bonded molecules. F
    b. Intermolecular forces are stronger than covalent bonds. F
    c. Dipole-induced dipole forces are temporary forces that are weaker than dipole-dipole
       forces. T
    d. London dispersion forces are only present in induced dipole-induced dipole forces. F
12. Explain why oil and water do not mix. H_2O w/ H_2O is lower E than w/ oil and oil w/ oil is
    lower E than w/ H_2O.
13. Why is H_2S more polarizable than H_2O? H_2S because the e⁻ cloud is bigger because S is
    bigger than O. Bigger atoms are more polarizable.
14. In general as IMFs increases, boiling point ___________ (increases/decreases). increases
15. Why are oxygen, nitrogen, and fluorine the only elements that a hydrogen atom can bond
    to and bond to another O, N, or F on another molecule to cause hydrogen bonding?
    O, N, and F have the three highest EN values (\( \chi \)). When they bond with H, highly polar
    bonds with H are created. O, N, and F are the smallest highest \( \chi \)ed atoms.
16. Rank all IMFs present in NH₃ from strongest to weakest. Hydrogen bonding, dipole-dipole, London dispersion forces

17. T or F
   a. Hydrogen bonding is not actually bonding. T
   b. Hydrogen bonding can only occur with like-molecules, meaning NH₃ can only have hydrogen bonds with other NH₃ molecules. F
   c. Cohesive forces will cause H₂O to climb up a capillary tube due to attraction to the walls. T
   d. When going from a liquid to gas, it is referred to as sublimation. F
   e. When using phase diagrams, if at a given temperature and pressure, a line is present, this means that both phases are present. T
   f. The triple point is the only set of condition in which each phase is present in equilibrium. T

18. Name the four kinds of solids. Molecular, ionic, metallic, covalent

19. T or F
   a. Covalent solids are weaker than molecular solids F
   b. Ionic solids are made of ions and are held together by electrostatic attraction. T
   c. Molecular solids have relatively high melting points. F
   d. Both ionic and molecule solids are non-conducting. T
   e. Covalent solids are usually used as insulators or semi-conductors. T