1. S – 6 valence electrons, 3O – 18 valence electrons, 2 electrons for charge. 26 total valence electrons. 26/8 – 3BP, R2/2 – 1LP. 4 total valence electron pairs. – **C**

2. 4 total valence electron pairs – tetrahedral – **E**

3. 4 total valence electron pairs – 4 orbitals – sp^3 hybridization – **C**

4. 3BP and 1LP – trigonal pyramidal – **E**

5. 3BP/3 terminal atoms = 1 – **A**

6. The only molecule with a disruption in symmetry is SO_3^{2-}, due to the lone pair. **G**.

7. The intermolecular axis is the z-axis. A sigma (σ) bond will occur along the intermolecular axis. A pi (π) bond will form along either of the other two axis (x-axis or y-axis.) – **E**

8. Reasonance is a way to reconcile Lewis electron dot structures with the actual or real structures. – **B**. *(Directly out of the notes – Lecture 21)*

9. Two elements with low but not necessarily equal electronegativities is most likely to form a metallic bond. – **B**

10. Using the ideal gas law, understanding that the composition of the gas does not change and the amount of the gas does not change, rearrange to $P_1V_1 = P_2V_2$, substituting (1)(1) = 3(x), solving x = 1/3 – **E**

11. Using the ideal gas law, understanding that the composition of the gas does not change and the amount of the gas does not change, rearrange to $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$, eliminating P since it is constant, substituting $\frac{1}{300} = \frac{x}{200}$. X = 2/3 – **D**.

12. Using the ideal gas law, understanding that the composition of the gas does not change and the amount of the gas does not change, rearrange to $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$, substituting $\frac{1 \cdot 3}{298} = \frac{x \cdot 6}{596}$. Canceling common factors gives 1. **C**.

13. Gas Law/Limiting Reagent Problem:

18. All gases at the same temperature have the same average kinetic energy. **B** *(Directly out of the notes – Lecture 27)* – **B**

19. Solid water – ice – **D -** Hydrogen bonding

20. KCl – **C** - interionic electrostatic interaction.

21. Diamond – **A** – covalent bonding

22. Paraffin wax – **G** - London dispersion forces.

23. *Solution* of sodium sulfate – **E** ion-dipole interaction

24. 8(1/8) + 1 = 2 Ti atoms, 4 (1/2) + 2 = 4 O atoms. Ti_2O_4 reduces to TiO_2. **B**

25. ΔG is (-) because evaporation of water from a sidewalk is spontaneous. ΔH is (+) because it takes energy to go from a liquid to a gas. ΔS is (+) because a phase change from liquid to solid has an increase in disorder associated with it. **C**

26. Calculator problem #2:

$$\Delta S = \frac{\Delta H}{T} \Rightarrow 39.7 JK^{-1}mol^{-1} = \frac{11.5 kJmol^{-1}}{T} \Rightarrow T = \frac{11500}{39.7} \Rightarrow 289K = 16.5C$$ **C**

27. Temperature increases, vapor pressure increases. Intermolecular forces increase, vapor pressure decreases, surface area increases, vapor pressure does not change. **D** – *(SNG got this one wrong)*

28. The reaction vessel got colder; the reaction was endothermic; (the reaction) was driven by the increase in entropy. **C**