Bonding and IMFS Free Response Study Guide

1. Draw the dang Lewis dot structure!
2. Reference the chart below depending on the question type.

Question Type	Example Question(s)	What to consider/talk about:
Expanded octet exceptions	• Which atoms can be stable with more than 8 bonded valence electrons and why?	• Must have access to <u>empty d sublevel</u> • Only available to elements in rows 3-7
Comparing bond length and/or strength	• Which bond is shorter, X_2 or Y_2? • Which bond is stronger, X_2 or Y_2?	More shared electron pairs means: o Stronger/shorter bond o Greater attractive force between e^- and nuclei o Nuclei pulled closer together/ harder to separate
Comparing bond angles	• Which bond angle is larger/smaller, H – X – H or H – Y – H?	• Count number of lone pairs vs bonding pairs on central atom • <u>Lone pairs are more repulsive than bonding pairs</u> • More lone pairs = smaller bond angle
Comparing VSEPR geometry	• Why does XH_2 have bent geometry, but YH_2 is linear? • Why does XH_3 have trigonal planar geometry, but YH_3 is trigonal pyramidal?	• Count number of lone pairs vs bonding pairs on central atom • Lone pairs distort the symmetry, pushing bonded atoms away
Comparing polar vs non-polar <u>bonds</u>	• Which bond is more polar, HX or HY? • The X_2 bond is non-polar. Explain.	• Greater electronegativity difference between bonded atoms = <u>more uneven distribution of e^- density</u> = more polar • Non-polar = equally distributed e^- density
Comparing polar vs non-polar <u>molecules</u>	• Why is XH_3 a polar molecule, but YH_3 is non-polar?	• Lone pair on central atom distorts symmetry = <u>uneven distribution of e^- density</u> = polar • No lone pair on central atom = symmetrical e^- density = non-polar
Comparing vapor pressures, boiling points, or melting points	• Why does XH_2 have a lower vapor pressure than YH_2? • Which has a higher melting point, XH_3 or YH_3? Explain.	• Identify IMFS o Non-polar = LDFs o Polar = dipole to dipole o H – FON = hydrogen bonding • Connect IMF strength to vocab o ↑ IMFs = ↓ VP, because molecules are more attracted to each other, less in gaseous state o ↑ IMFs = ↑ BP/MP, because molecules are more attracted to each other and require more energy to separate

But WAIT! **How can I tell if I molecule is polar?**

<table>
<tr><td rowspan="3">Lone pairs on the central atom?</td><td>Yes</td><td colspan="2">Polar molecule</td></tr>
<tr><td rowspan="2">No</td><td colspan="2">Look at terminal (non-central atoms)</td></tr>
<tr><td>Same?</td><td>Different?</td></tr>
<tr><td>Non-polar molecule</td><td>Polar molecule</td></tr>
</table>