

Chapter 8 Bonding Test Questions:

Answer 3 of the following 5 questions. Send them to me at jeff@szeryk.ca

1) Discuss briefly the relationship between the dipole moment of a molecule and the polar character of the bonds within it. With this as the basis, account for the difference between the dipole moments of CH_2F_2 and CF_4 .

2) The boiling points of the following compounds increase in the order in which they are listed below:



Discuss the theoretical considerations involved and use them to account for this order.

3) NF_3 and PF_5 are stable molecules. Write the electron-dot formulas for these molecules. On the basis of structural and bonding considerations, account for the fact that NF_3 and PF_5 are stable molecules but NF_5 does not exist.

4) The values of the first three ionization energies (I_1 , I_2 , I_3) for magnesium and argon are as follows:

	I_1	I_2	I_3
	(kJ/mol)		
Mg	735	1443	7730
Ar	1525	2665	3945

- (a) Give the electronic configurations of Mg and Ar.
- (b) In terms of these configurations, explain why the values of the first and second ionization energies of Mg are significantly lower than the values for Ar, whereas the third ionization energy of Mg is much larger than the third ionization energy of Ar.
- (c) If a sample of Ar in one container and a sample of Mg in another container are each heated and chlorine is passed into each container, what compounds, if any, will be formed? Explain in terms of the electronic configurations given in part (a).
- (d) Element Q has the following first three ionization energies:

	I_1	I_2	I_3
	(kJ/mol)		
Q	496	4568	6920

What is the formula for the most likely compound of element Q with chlorine? Explain the choice of formula on the basis of the ionization energies

5) Use appropriate chemical principles to account for each of the following observations. In each part, your response must include specific information about both substances.

- (a) At 25°C and 1 atm, F_2 is a gas whereas I_2 is a solid.
- (b) The melting point of NaF is 993°C , whereas the melting point of CsCl is 645° .
- (c) The shape of ICl_4^- ion is square planar, whereas the shape of BF_4^- ion is tetrahedral.
- (d) Ammonia, NH_3 , is very soluble in water, whereas phosphine, PH_3 , is only moderately soluble in water.