

Chapter 8 Review Worksheet

Key

1. Using only a periodic table, can you predict whether the ionic radius of Cl^- is greater than that of Ca^{2+} ? Explain your reasoning.

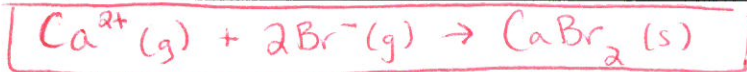
	Ca^{2+}	Cl^-
P	20	17
e	18	18

 Ca^{2+} has a higher Z_{eff} so it should be smaller than Cl^- .
Isoelectronic

2. Calculate the lattice energy for CaBr_2 , using the following information:

$\Delta H_{\text{formation}}$ for CaBr_2	-682.8 kJ/mol
$\Delta H_{\text{sublimation}}$ for Ca	178.2 kJ/mol
$\Delta H_{\text{vaporization}}$ for Br_2	30.9 kJ/mol
IE_1 for Ca	590 kJ/mol
IE_2 for Ca	1145 kJ/mol
EA for Br	-325 kJ/mol
Bond Dissociation Energy for Br_2	193 kJ/mol

See answers



IE_2 $\text{Ca}^{2+}(\text{g}) + e^- \rightarrow \text{Ca}^+(\text{g})$
 IE_1 $\text{Ca}^+(\text{g}) + e^- \rightarrow \text{Ca}(\text{g})$
 ΔH_{sub} $\text{Ca}(\text{g}) \rightarrow \text{Ca}(\text{s})$
 -2EA $2\text{Br}^-(\text{g}) \rightarrow 2\text{Br}(\text{g}) + 2e^-$
 -2BDE $2\text{Br}(\text{g}) \rightarrow \text{Br}_2(\text{g})$
 $-\Delta H_{\text{vap}}$ $\text{Br}_2(\text{g}) \rightarrow \text{Br}_2(\text{l})$

$\Delta H_f: \text{Ca}(\text{s}) + \text{Br}_2(\text{l}) \rightarrow \text{CaBr}_2(\text{s})$
 -590
 -1145
 -178.2
 2(-325)
 -193
 -30.9
 -682.8
 -2169.9 kJ
 -2170 kJ

3. Determine the bond characteristics of the following:

a. NaBr b. F_2 c. HCl
 $2.8 - 0.9 = 1.9$ $4.0 - 4.0 = 0$ $3.0 - 2.1 = 0.9$

Ionic Nonpolar Polar

Electronegativities	
Na	0.9
Br	2.8
F	4.0
H	2.1
Cl	3.0

$0 - 4 = -1.7$
 \uparrow
 $\text{O} \uparrow \text{I}$

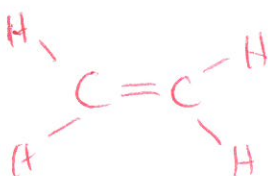
4. Using only a periodic table, arrange the following in order of increasing electronegativity: Cs, Li, Na

EN \uparrow across
 \downarrow down

$\text{Cs} < \text{Na} < \text{Li}$

5. Write plausible Lewis structures for the following molecules or ions. Evaluate each structure using formal charge.

a. C_2H_4



$4(\text{H}) \quad 1 - 1 - 0 = 0$
 $2(\text{C}) \quad 4 - 4 - 0 = 0$
 0

b. CO_3^{2-}

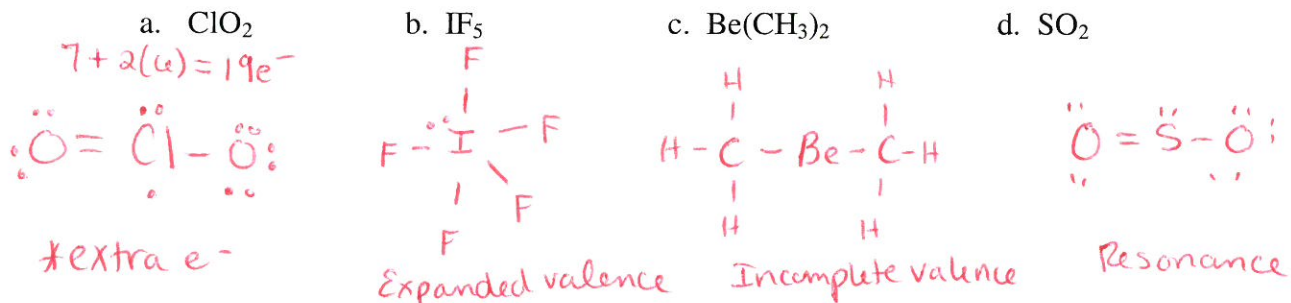
$\left[\begin{array}{c} \text{O} \\ \vdots \\ \text{O} - \text{C} - \text{O} \\ \vdots \quad \vdots \\ \text{O} \end{array} \right]^{2-}$

$\left[\begin{array}{c} \text{O} \\ \vdots \\ \text{O} - \text{C} - \text{O} \\ \vdots \quad \vdots \\ \text{O} \\ \parallel \\ \text{O} \end{array} \right]^{2-}$

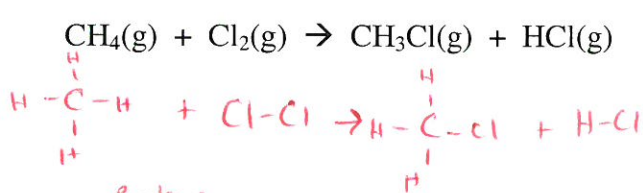
$[3(\text{O})] \quad 6 - 1 - 6 = (-1)3$
 $[\text{C}] \quad 4 - 3 - 0 = +1$
 -2

$2(\text{O}_1) \quad 6 - 1 - 6 = (-1)2$
 $(\text{O}_2) \quad 6 - 2 - 4 = 0$
 $\text{C} \quad 4 - 4 - 0 = 0$
 -2

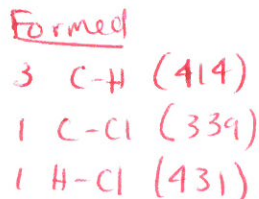
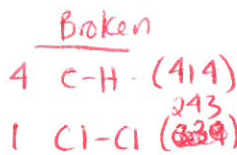
6. Write Lewis structures for the following. Comment on any unusual features of the structures.



7. Use bond energies to estimate the enthalpy change for the following reaction:



Bond Energies (kJ/mol)	
H - C	414
H - Cl	431
C - Cl	339
Cl - Cl	243

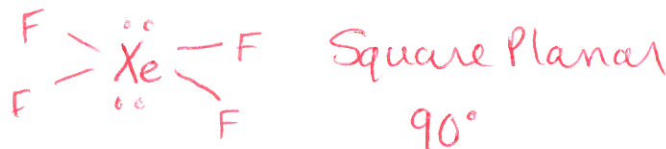


$$\Delta H = [4(414) + (243)] - [3(414) + (339) + (431)]$$

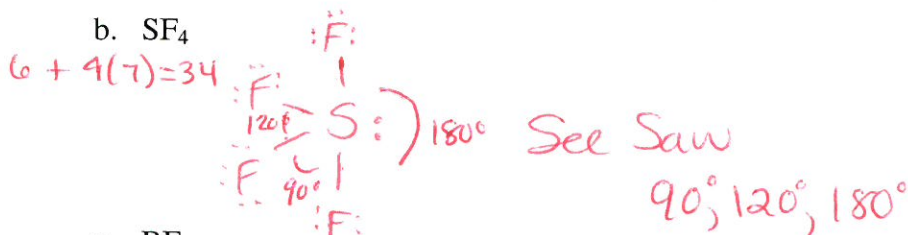
$$\Delta H = -113 \text{ kJ}$$

8. Draw Lewis structures, name the shape, and label the bond angles for each of the following. (Note, if resonance occurs, draw more than one shape.)

a. XeF_4



b. SF_4

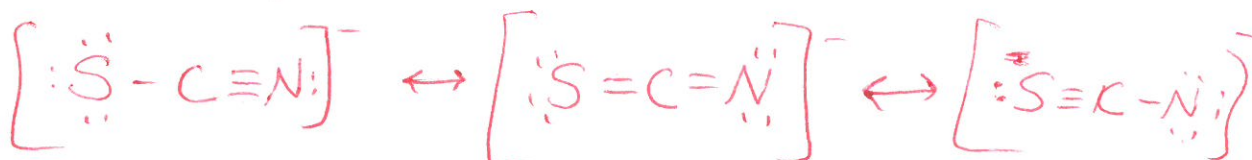


c. BF_3



d. SCN^-

$$6 + 4 + 5 + 1 = 16$$



Linear 180°