

*Key*

0. Little review from Ch. 8 :

Which of the following elements has the highest fourth ionization energy? (predict without going to reference tables!)

- \*a. Al      b. Ga      c. Se      d. As      e. S

[Write out electron configuration for each ion in the process  $M^{3+} \rightarrow M^{4+} + e^-$ ]

**Chapter 9 material:**

Discuss definition of ionic bond and covalent bond. Which one has the higher percentage of sharing between two bonded atoms? How do you determine stable ions charge for a given element?

1. A. A binary compound formed between aluminum and selenium would be expected to have the formula: \*c.  $Al_2Se_3$

(is it ionic or covalent? \_\_\_\_\_ it's chemical name is \_\_\_\_\_ aluminum selenide  
~~aluminum selenide~~)

- B. The empirical formula of a salt consisting of  $Ca^{2+}$  and  $P^{3-}$  ions is \*b.  $Ca_3P_2$ .

(is it ionic or covalent? ionic it's chemical name is calcium phosphide)

Electronic configurations of ions:

2. A. Electronic configuration of a stable sulfide ion is :  $1s^2 2s^2 2p^6 3s^2 3p^6$

(Write out neutral S atom e-configuration first, add electrons to complete octet)

- B. How many electrons (all together!!) does a stable phosphide ion have? \*d. 18

(Show the students that you don't have to write out the whole configuration every time. Figure this one out first by determining the charge of phosphide ion to complete electron octet on P atom, then taking this charge and adding it to phosphorus atomic number)

- C. From last midterm : The correct formula of boron oxide is:

[Discuss determination of stable boron ion charge!]

\*d.  $B_2O_3$

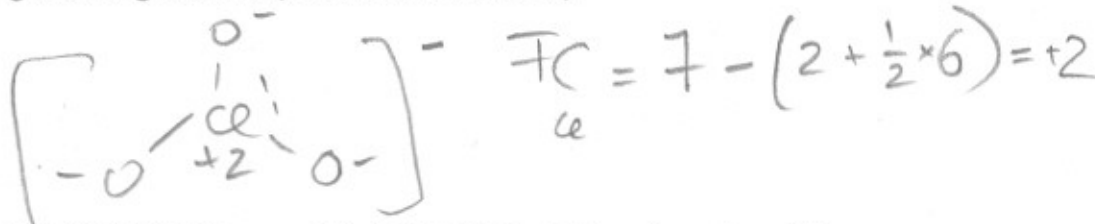
3. Which of the following species has a Lewis structure similar to  $H_3O^+$ ?

(Do ALL Lewis structures first!)

- \*a.  $NH_3$       b.  $HCO_3^-$       c.  $CO_3^{2-}$       d.  $ClF_3$       e.  $NF_3$

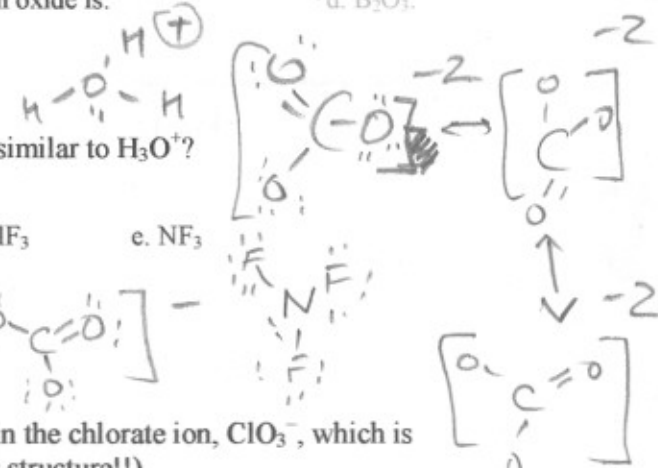
4. What is the formal charge on the chlorine atom in the chlorate ion,  $ClO_3^-$ , which is drawn showing three single bonds? (Draw Lewis structure!!)

answer: +2



5. When the cations  $Na^+$ ,  $K^+$ ,  $Rb^+$ ,  $Cs^+$  are combined chloride ion to form ion pairs, which pair formation releases the greatest amount of energy (called lattice energy)?

\*a.  $NaCl$  (according to Coulombs law the smallest "r" (sodium is smallest) will give



highest LE)

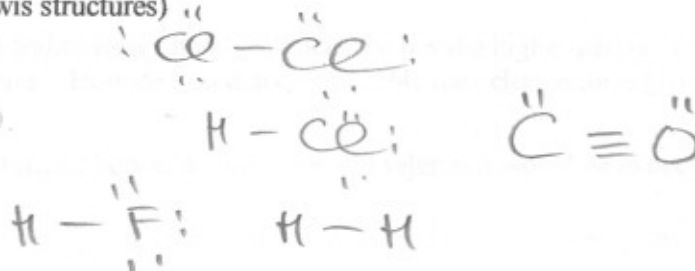
- b. KCl
- c. RbCl
- d. CsCl
- e. none of the above

LE  $\sim \frac{q_1 q_2}{r_2}$  ← same  
biggest in case of Na  
smallest in case of Na

6. Which of the following diatomic molecules has the greatest bond strength?

(Hint you will need to draw Lewis structures)

- a. Cl<sub>2</sub>
- b. HCl
- \*c. CO (only triples bond)
- d. H<sub>2</sub>
- e. HF



EXTRA.

Explain based on the data from table 9.3 p.340. (this is EXTRA material, we have not covered in in lecture)

Construct a Born-Haber cycle similar to the one on fig. 9.3 p. 333 and indicate which term is/are affected by changing identity of the metal.

## The Born-Haber Cycle

The Lattice energy can be calculated with the following steps:

