sample exam 3

Chem 152 Example Problems

The idea of this "mini exam" is to provide some examples of the material covered in the last sections of chapter 12 and chapter 13 for use as you prepare for the final.

1. Multiple Choice:

a. Which of the following is true about the ionization energy of Mg^{+}?

A: It will be equal to the ionization energy of Li.
B: It will be equal to and opposite in sign to the electron affinity of Mg.
C: It will be equal to and opposite in sign to the electron affinity of Mg^{+}.
D: It will be equal to an opposite in sign to the electron affinity of Mg^{+2}.

b. Which species has the greatest electron affinity:

A: Na B: N C: Li D: F

c. Sodium losing an electron is a _____ process, and fluorine losing an electron is a _____ process.

A: endothermic, exothermic
B: endothermic, endothermic
C: exothermic, endothermic
D: exothermic, exothermic

d. Which of the following molecules is non-polar?

A: H_2O B: CO_2 C: SCl_2 D: NH_3

e. Choose the molecule with the strongest bond:

A: CH_4 B: H_2O C: NH_3 D: HF

2 Lewis Dot Structures. Write the Lewis dot structures for the following compounds. Include all structural isomers, resonance structures, and formal charges for each structure. Underline the one you believe is the most-reasonable structure. Finally, using VESPR describe the 3D geometry of your most-reasonable structure. An example is provided below:

a) BrO_2^-

geometry _____.

b) SF_4

geometry _____.

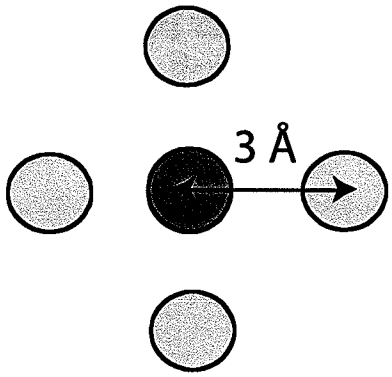
c) ONF

geometry _____.

d) SO_2

geometry _____.

3. Imagine a two-dimensional collection of positive (light grey) and negative (dark grey) ions schematically represented as follows:



Assuming the positive ions carry a charge of +e and the negative ions a charge of –e, calculate the stabilization energy associated with this configuration.

Useful Information

Constants: $h = 6.626 \times 10^{-34}$ J.s
$c = 3 \times 10^{8}$ m/s
F = 96,495 C/mol e-
e- charge = 1.6×10^{-19} C
e- mass = 9.1×10^{-31} kg
R = 8.314 J/mol.K = 0.0821 l.atm/mol.K
1 nm = 10^{-9} m

$$E = -2.178x10^{-18} J\left(\frac{Z^2}{n^2}\right) \qquad E = \frac{n^2 h^2}{8mL^2} \qquad E = h\nu = \frac{hc}{\lambda}$$

$$\Delta G° = -nFE^{o}_{cell} = -RT\ln K \qquad E_{cell} = E^{o}_{cell} - \frac{0.0591V}{n}\log(Q)$$

$$\Delta G = \Delta G° + RT\ln(Q)$$

$$aA + bB \rightleftarrows cC + dD \qquad K = \frac{[C]^c[D]^d}{[A]^a[B]^b}$$

$$V(r) = \frac{-(Ze)(e)}{r} = 2.3x10^{-19} J.nm\left(\frac{Q_1 Q_2}{r}\right) \qquad \Delta x \bullet \Delta p = \frac{h}{4\pi}$$

For H-atom like wavefunctions:

n = 1, 2, …., l = (n-1), (n-2), …. 0, m_l = -l……0……l, $m_s = \pm 1/2$