SI Worksheet

4/24/22

Agenda:

Worksheet

**Chapter 7: Thermochemistry**

1. Calculate the change in the internal energy of a system if 300J of heat energy is absorbed by the system and if 400J of work is done on the system. **(700J)**



1. A sample of unknown metal with a mass of 192 g heated to a temperature of 100 °C was immersed into a brass calorimeter with a mass of 0.128 kg containing 240 g of water at a temperature of 8.4 °C. Provided that the water temperature stabilized at 21.5 °C, calculate the specific heat capacity of the metal and based on this value of capacity identify the metal.

Assume that the specific heat capacity of brass is 0.402 J/g\*C, and water is 4.184 J/g\*C



|  |  |
| --- | --- |
| **Substance** | **Specific Heat (J/g\*C)** |
| Helium | 5.193 |
| Aluminum | 0.897 |
| Lead | 0.130 |



1. How much heat will be released when 11.8 g of iron reacts with excess O2 according to the following equation?

**Fe + O2 🡪 Fe3O4 Hrxn=-1120.48 kJ**



1. Given the following equations

(1) H3BO3(aq )→ HBO2(aq) + H2O(l) ΔH = - 0.02 kJ



(2) H2B4O7(aq) + H 2O(l )→ 4HBO2(aq) ΔH = - 11.3 kJ

(3) H2B4O7(aq) → 2B2O3(s) + H2O(l) ΔH = 17.5 kJ

Find the ΔH for this overall reaction: **2H3BO3(aq) → B2O3(s) + 3H2O(l)**

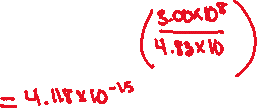


**Chapter 8: Quatum Mechanical Model of an Atom**

1. The wavelength of an X-ray is 0.483 Å. What is its frequency (in Hz)? The speed of light is 3.00 x 108 m/s. 1 Å=10-10m. (**6.21 x 1018** Hz)



1. What is the energy (in J) of an X-ray photon with a wavelength of 4.83 x 10-2 nm? The speed of light is 3.00 x 108 m/s.



1. Identify the subshell in which electron with the following quantum numbers are found:
   1. n = 3, l = 2

3d

* 1. n = 1, l = 0

1s

* 1. n = 4, l = 3

4f

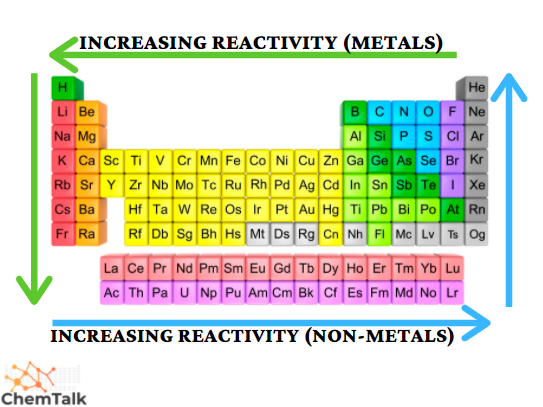
**Chapter 9: Periodic Properties of Elements**



1. Draw the box diagram and electron configuration for each of the following elements.

|  |  |  |
| --- | --- | --- |
| Element | Box Diagram | Electron Configuration |
| Boron |  |  |
| Lithium |  |  |
| Oxygen |  |  |
| Phosphorus |  |  |
| Chlorine |  |  |
| Potassium |  |  |
| Aluminum |  |  |

1. Reactivity of halogens \_\_\_\_\_\_\_\_\_\_ down the group? (decrease)



1. What is the approximate “net” charge felt by the valence electron of…
   1. Lithium

1s22s1

Therefore there is 2 core electrons, the nucleus has a charge of +3

+3-2= +1

* 1. Magnesium

1s22s22p63s2

10 core electrons

Nucleus charge: 12

+12 – 10= +2

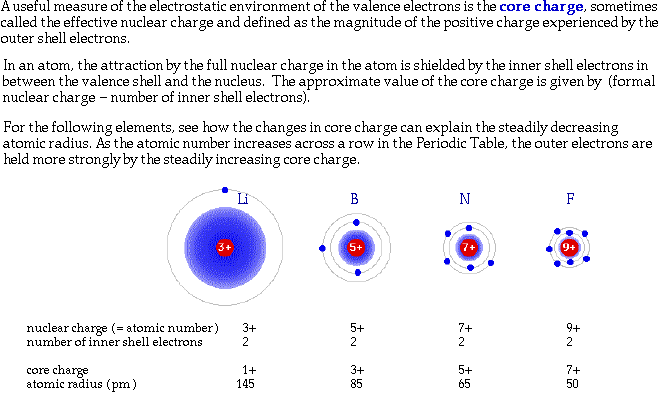
* 1. Oxygen

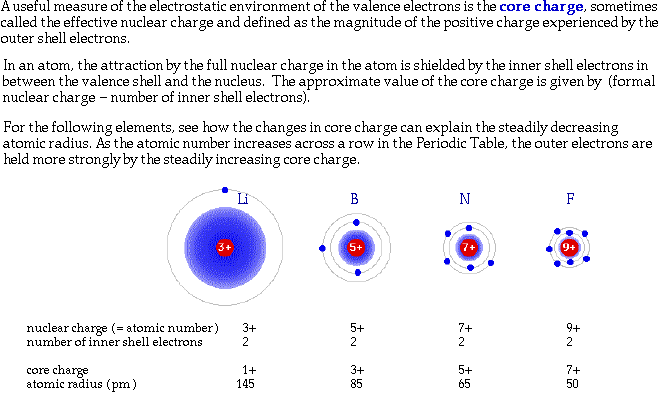
1s22s22p4

2 core electrons

Nucleus charge: 8

+8 – 2= +6

1. The valence electron in which if the following atoms experience a larger attractive force from the core charge/effective nuclear charge? (right)



* 1. Which one is smaller? (right)

1. List the following ions in order of increasing radius: As3–, Br–, K+, Mg2+.

