

Name: \_\_\_\_\_

*Atomic Theory, test#3*

1. Bohr's model of the atom is a good model and is still used extensively in science when the more sophisticated Quantum model is not needed. However, three sets of experimental observations were presented in class which indicate that Bohr's model of the atom is lacking. List these observations and explain why they indicate that Bohr's model of the atom is not correct.

(1)

(2)

(3)

2. Give the electronic configuration for each of the following:

a)  ${}_{26}\text{Fe}^{59}$ :

b)  ${}_{66}\text{Dy}^{162}$ :

3. What is meant by the term isoelectric (isoelectronic)? Give an example of isoelectric species?

4. An electron in the third energy level could have any one of eighteen different sets of quantum numbers, 10 sets where  $l=2$ . Give all sets of quantum numbers that have  $l=2$ . (As an example of what is wanted here all quantum numbers sets for  $l=0$  are given.)

<u>n</u>	<u>l</u>	<u>m</u>	<u>s</u>
3	0	0	+1/2
3	0	0	-1/2

1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

5. Which atom in each of the following sets is the largest?

a) Si, P, S;    b) Si, Ge, Sn    c) Sn, Ge, Si, P, S, Cl

6. To what energy level would the electron in the hydrogen ion have to move to so that the hydrogen atom would have a size of 1 mM.

7. Calculate the energy change that would result from an electron in a Li atom changing from  $n=5$  to  $n=2$ ? Would the wavelength of light associated with this change be visible? (Note: the visible spectrum ranges from about 380 nm to 760 nm.) Would energy be absorbed by this change or emitted? (You may assume that the equations developed by Bohr for hydrogen hold for lithium.)

Absorbed or Emitted (circle one)

## Energy Change Calculations:

## Wavelength Calculations

### One step beyond (Extra Credit)

How much energy would be needed to cause the hydrogen atom to assume the size referenced in question 8?

### Twilight Zone (Extra Credit)

An unknown element was analyzed to determine its identity. From the data below determine the identity of this element. If the data is inconclusive give the possibilities of the element.

1. The ion  $X^{2+}$  was found to have no unpaired electrons
2. The ion  $X^{3+}$  was found to have two unpaired electrons.
3. The element was representative, a weak conductor of electricity, and had a metallic luster.