

BIG CHEM: Unit 3 - Atomic Structure

Problem Set #3

Due: Wednesday, October 24
Mr. Darlington

Make sure you are following the problem set formatting guidelines as outlined in the course information sheet.

- 1 Describe the origins of the word 'atom'. Include who first proposed it and when.
- 2 **John Dalton - Great Britain**
 - a Describe the significance of Dalton's law of multiple proportions and law of definite proportions?
- 3 **J.J. Thompson - Great Britain**
 - a Describe Thompson's contribution to Chemistry.
 - b Draw the model that was the result of Thompson's work. What is it called?
- 4 **Albert Einstein - Germany**

Describe the significance of Einstein's Photoelectric effect to chemistry?
- 5 **Ernest Rutherford - New Zealand**
 - a Describe and sketch a picture Rutherford's famous experiment. What did he conclude about atoms and their structure?
 - b Draw a picture of the Rutherford model of the atom.
- 6 **Neils Bohr - Denmark**
 - a Describe and draw a picture of the Bohr model.
- 7 **Erwin Schrödinger - Austria**
 - a Describe how the Schrödinger equation led to the current orbital model of the atom.
 - b Draw a picture of the orbital model of the atom.
- 8 **Describe the location, charge and mass of the three primary components of atoms:**
 - a proton
 - b neutron
 - c electron
- 9 **Describe the four fundamental forces in nature in order from weakest to strongest.**
- 10 **If the nucleus of an atom is the size of a bowling ball, 21.6 cm in diameter, how far must the electrons be to accurately represent their true scale consistent with an actual atom?**
- 11 **Determine the number of protons and neutrons in the following isotopes (show your work).**
 - a Polonium-210
 - b C-14
 - c Uranium-235
 - d Uranium-238
 - e Na-22
- 12 **Complete the Worksheet: 'Analyzing the Bohr Atom' and attach it after number 11 and before number 13 in your problem set.**
- 13 **Complete the Worksheet: 'Number of Neutrons' and attach it after number 12 and before number 14 in your problem set.**
- 14 **Find the atomic mass for each of the elements listed below**
 - a An element recently discovered in Spring Valley High School called "valleyum" occurs in the following proportions: 81.75% Vm-500 and 18.25% Vm-502
 - b A new element, "schooolium," found only in schools occurs in the following proportions: 9.750% Sl-750 and 90.25% Sl-752
 - c A new element "newium" has been discovered which occurs in the following proportions: 25.25% Nw-300; 15.25%; Nw-301; and 59.50% Nw-302
 - d A new element found in the science department office called "departmentium" is found in the following proportions: 11.78% Dt-800; 1.850% Dt-801; and 86.37% Dt-803
- 15 **Complete the Worksheet: 'Electron Dot Diagrams, etc' and attach it after number 14 and before number 16 in your problem set.**
- 16 **Complete the Worksheet: 'Location of Electrons' and attach it after number 15 and before number 17 in your problem set.**
- 17 **For each of the following elements, write the Bohr notation of the element with its valence electron in the excited state.**
 - a Lithium
 - b Calcium
 - c Y
 - d Zirconium
 - e Rb
- 18 **For each of the following elements, write the Orbital notation of the element with its valence electron in the excited state.**
 - a Carbon
 - b P
 - c Chlorine
 - d Rh
 - e Ir
- 19 **The electromagnetic spectrum.**
 - a Describe the EM spectrum.
 - b Sketch the EM spectrum identifying the 7 major components from low to high wavelength.
 - c For the wavelength of each of the 7 components, give an example of something that is 'About the size of . . .' You can do this right under your sketch from part b.
- 20 **Astronomers are able to determine what elements exist on other planets without ever going there. How is this done? What is this technique called?**
- 21 **Base your answers to the following questions on the diagram below, which shows bright-line spectra of selected elements. (quest. from the Aug 03 regents).**
 - a Identify the two elements in the unknown spectrum.
 - b Explain how a bright-line spectrum is produced, in terms of excited state, energy transitions, and ground state.

