Models of the Atom HW Answers Q#2,3,5-13 pg 173

2. a) In a chemical reaction, the mass of products equals the mass of reactants. According to Dalton's theory atoms are indestructible (atoms are not destroyed or created in chemical reactions—instead they are rearranged). Therefore the mass doesn't change.
   b) Dalton couldn't explain why the atoms combined in fixed proportions (certain ratios)
3. The neutrons → added mass but no charge
5. In order for the foil to be penetrated by alpha particles, it had to be extremely thin. Gold can be hammered into a very thin sheet.
6. Thomson and Rutherford: atoms contain positive and negative charges, contains electrons; Thomson: uniform charge distribution; Rutherford: positive charge in the nucleus; electrons orbit the nucleus.
7. Rutherford's electrons are free to orbit anywhere in the volume of space around the nucleus; Bohr's have only specific allowable energy levels. This change provides a model that can explain emission and absorption spectra.
8. These are the only transitions that produce photons with wavelengths in the visible region of the spectrum.
9. a) microwave, visible, gamma ray Gamma rays have the highest energy and frequency and the shortest wavelength; microwaves have the lowest energy and frequency and the longest wavelength.
   b) infrared, visible, X ray X rays have the highest energy and frequency and the shortest wavelength; infrared light has the lowest energy and frequency and the longest wavelength.
   c) radio wave, ultraviolet, X ray X rays have the highest energy and frequency and the shortest wavelength; radio-frequency waves have the lowest energy and frequency and the longest wavelength.
10. Continuous spectrum of radiation but we see experimentally a line spectrum.
11. a) $n = 2$ b) $n = 5$ (after absorbing, n=2 after emitting)
12. In Dalton's symbols for water and methane, he had the proportions wrong. Water has two hydrogen atoms with one oxygen atom and methane has four hydrogen atoms with one carbon atom.

13. The amount of energy that electrons could have was quantized or has an exact value. Electrons in Bohr's model could exist only in allowed energy levels, emitting or absorbing only energy in specific quantities when moving from one energy level to another.