Chemistry: Unit 2, Worksheet Name:

1. Which statements in Dalton's atomic theory are now considered to be incorrect? Describe how the modern atomic theory differs from these statements.

1. atom is smallest -- there are subatomic particles + now fundamental particles

2. all atoms of an element are identical - isotopes of an element differ by the number of neutrons

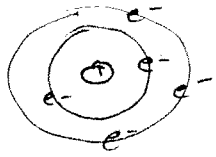
2. Which subatomic particles are charged?

protons (+) and electrons (-)

3. Describe the structure of a typical atom by identifying where each subatomic particle is located. Draw a picture of an atom represented by the Bohr model.

protons + neutrons are in the nucleus

electrons are outside the nucleus in energy levels



4. How does Thomson's plum pudding atomic model compare with Rutherford's nuclear atomic model.

Thomson had the positive charge distributed throughout and Rutherford centered in positive charge in the nucleus

5. What caused the deflection of the alpha particles in Rutherford's gold foil experiment? Why did they deflect?

the highly positive charge density of the nucleus - having a high density provides enough of a force to deflect them

6. Which statement is consistent with the results of Rutherford's gold foil experiment?

a. All atoms have a positive charge.
b. Atoms are mostly empty space.
c. The nucleus of an atom contains protons and electrons.
d. Mass is spread uniformly throughout an atom.

7. Which subatomic particle was discovered by researchers working with a cathode ray tube?

electrons

8. Which subatomic particle identifies an atom as that of a particular element? How is this particle related to the atom's atomic number?

proton - # of protons equals the atomic number

9. Which subatomic particles account for most of an atom's mass? Describe the relative masses of the subatomic particles.

protons + neutrons -- both have about 1 a.m.u.

the electron is much smaller - about 1/2000 the mass of a proton

10. Identify the number of subatomic particles in each of the following:

symbol	# of protons	# of electrons	# of neutrons	Atomic #	Mass #
$^{88}Sr^{+2}$	38	36	50	38	88
$^{110}Ag^{+1}$	47	46	63	47	110
$^{34}S^{-2}$	16	18	18	16	34

11. How are isotopes of the same element alike? How are they different?

isotopes share the same # of protons but have different # of neutrons

12. Explain how the existence of isotopes is related to atomic masses not being whole numbers.

The atomic mass is a weighted average of all existing isotopes

13. Nitrogen has two naturally occurring isotopes, N-14 and N-15. The atomic mass of nitrogen is 14.007 amu. Which isotope is more abundant in nature? Explain your answer.

N-14 is more abundant because the atomic mass is much closer to 14

14. An element has three naturally occurring isotopes. What other information do you need in order to calculate the element's atomic mass?

we need the abundances of each isotope

15. What is the average atomic mass of silicon if 92.21 % of its atoms have a mass of 27.977 amu, 4.07 % have a mass of 28.976 amu, and 3.09 % have a mass of 29.974 amu?

$A = (0.9221 \cdot 27.977) + (0.0407 \cdot 28.976) + (0.0309 \cdot 29.974) = 27.903$ a.m.u.

16. Calculate the average atomic mass of silver if 13 out of 25 atoms are silver-107 and 12 out of 25 atoms are silver-109.

$A = \left(\frac{13}{25} \cdot 107\right) + \left(\frac{12}{25} \cdot 109\right) = 107.96$

17. A certain wavelength of violet light has a wavelength of 413 nm. What is the frequency of this wave?

$\nu = \frac{c}{\lambda}$ $\quad \frac{2.998 \times 10^8 \text{ m}}{\text{s}} \Big| \frac{\text{s}}{413 \text{ nm}} \Big| \frac{1 \times 10^9 \text{ nm}}{1 \text{ m}} = 7.26 \times 10^{14} \text{ s}^{-1}$

18. A certain wave has a frequency of 2.34 x 10^8 Hz. Find the wavelength, energy of a photon and the type of e.m.r.

$\lambda = \frac{c}{\nu}$ $\quad \frac{2.998 \times 10^8 \text{ m}}{\text{s}} \Big| \frac{\text{s}}{2.34 \times 10^8} = 1.28 \text{ m}$ Radio wave

$E = h \cdot \nu$ $\quad \frac{6.626 \times 10^{-34} \text{ J} \cdot \text{s}}{} \Big| \frac{2.34 \times 10^8}{\text{s}} = 1.55 \times 10^{-25} \text{ J}$

19. Visible light is created when electrons fall to the second energy level in an atom. Explain how red light photons are produced as compared to blue light photons.

Red light has a longer wavelength, therefore it has lower frequency and lower energy. The electron that produces a red photon would fall a shorter distance as compared to an e^- that produces a blue photon.