Chemistry: Unit 2-Quantum Model Worksheet

Name: Answer Key

1. 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

2. A sample of chromium atoms was identified to have two isotopes; 52Cr and 56Cr. If one of the isotopes is stable and one is radioactive, predict which one is stable and which is radioactive. Explain your answer.

^{56}Cr would be radioactive. The atomic mass of chromium is 51.9961 amu., which is closer to ^{52}Cr than ^{56}Cr. This means more Chromium is ^{52}Cr than ^{56}Cr

3. Why are mass numbers whole numbers and atomic mass commonly not.

Mass numbers are sums of protons and neutrons, which makes them whole numbers. Atomic masses are weighted averages

4. 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 of nitrogen is closer to N-14 than N-15

5. 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?

$A = (0.9221 \cdot 27.977) + (0.0407 \cdot 28.976) + (0.0309 \cdot 29.974) = 27.903\ amu$

6. What is the electromagnetic spectrum?

The entire set of electromagnetic radiation emitted by the sun.

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

$c = \lambda \cdot \upsilon$

$\upsilon = \frac{c}{\lambda}$

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

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.

$\lambda = c/\upsilon$

$\frac{2.998 \times 10^8\ m}{s} \Big| \frac{s}{2.34 \times 10^8} = 1.28\ m$ radio wave

$E = h \cdot \upsilon$

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

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, lower frequency and lower energy as compared to blue light. That means the e^- producing red light would fall a shorter distance than an electron producing blue light