**Unit 3A Quiz #1: Atomic Structure**

Name: _____ 35 total points _____

Block: _____ Date: _____

**I. Matching: Each scientist may be used once or more than once.**

| | | |
|---|---|---|
| A. James Chadwick | D. Louis de Broglie | G. John Dalton |
| B. Ernest Rutherford | E. Neil Bohr | H. Robert Millikan |
| C. Democritus | F. J. J. Thompson | İ. Werner Heisenburg |

__F__ 1. Proposed the Plum Pudding Model

__C__ 2. Argued that matter was composed of "atomos"

__G__ 3. Claimed "All atoms of a given element are identical in mass and properties."

__H__ 4. Performed the Oil Drop Experiment

__F__ 5. Proved that cathode rays were negatively charged particles

__B__ 6. Performed the Gold Foil Experiment

__A__ 7. Bombarded beryllium atoms with alpha particles and noticed neutral particles were produced.

__D__ 8. Predicted wave functions of electron orbitals

__B__ 9. Experiment proved atoms have dense positive nucleus

__I__ 10. Position and the velocity of an object cannot both be measured exactly

__E__11. Proposed the Planetary Model

__G__12. Developed First Atomic Theory

__E__13. Proposed that energy is transferred only in certain well defined quantities.

**II. Short Answer and Fill-in-the-Blank.**

1. The mass number of an atom is equal to the number of protons and neutrons in the nucleus.
2. Which two subatomic particles are relatively the same size? protons and neutrons
3. In order for an atom to be neutral, the number of protons must equal the number of electrons.
4. Explain what isotopes are and draw examples in the space below. Isotopes are atoms that have equal number protons but a different number of neutrons. ${}^{12}_{6}C$ ${}^{13}_{6}C$ ${}^{14}_{6}C$
5. An isotope with an atomic number of 10 and a mass number of 22 would belong to which element? Neon
6. How many neutrons are present in an isotope of ${}^{30}Si$? 16
7. What is the isotopic notation for an atom containing 19 protons, 20 neutrons, and 18 electrons? ${}^{39}_{19}K^{+1}$

8. Write the complete isotopic notation for a sulfur atom with 50 subatomic particles. $^{34}_{16}S$

9. Balance the following nuclear equations:

a) $^{207}_{82}Pb \rightarrow {}^{4}_{2}\alpha + \boxed{^{203}_{80}Hg}$

b) $^{42}_{19}K \rightarrow \boxed{^{0}_{-1}\beta} + {}^{42}_{20}Ca$

c) $\boxed{^{206}_{89}Ac} \rightarrow {}^{4}_{2}\alpha + {}^{202}_{87}Fr$

d) $^{102}_{44}Ru^{*} \rightarrow \boxed{^{0}_{0}\gamma} + {}^{102}_{44}Ru$

## III. Calculations - Must show work to earn credit.

1. An element has one stable isotope with a relative mass of 68.9257 amu at 60.4% abundance and another stable isotope with a relative mass of 70.9249 amu at 39.6% abundance. Calculate its average atomic mass to two decimal places, and identify the element using the periodic table.

$$\boldsymbol{AAM = (68.9257 \times 0.604) + (70.9249 \times 0.396) = 69.7}$$

**Gallium is 69.72 amu**

2. Silver exists as two stable isotopes and has an atomic mass of 107.868. Silver-107 makes up 51.839% of all naturally occurring silver atoms. What is the mass of the other isotope to three significant figures?

$$\mathbf{100\ \% - 51.839\ \% = 48.161\%}$$

$$\mathbf{107.868 = (107 \times 0.51839) + (\mathit{Mass} \times 0.48161)}$$

$$\frac{\mathbf{107.868 - (107 \times 0.51839)}}{\mathbf{0.48161}} = \boldsymbol{Mass = 108.8\ amu \approx 109\ amu}$$

3. Carbon-14, a radioactive isotope with a half-life of 5730 years, is used to date ancient artifacts. How old is an artifact, if three half-lives have occurred?

5730 x 3 = 17,190 years old

4. How many half-lives will it take for 150 g of radioactive Californium-252 to decay to *less than 15 grams*?

150 → 75 → 37.5 → 18.75 → 9.375 4 half-lives

5. Bromine (Br) has two stable isotopes, $^{79}$Br and $^{81}$Br, and 30 known radioisotopes, the most stable of which is 77Br, with a half-life of 57.036 hours. If a 120 gram sample of $^{77}$Br was tested after 285.18 hours, how many half-lives have passed?

285.18 hr ÷ 57.036 hr = 5 half-lives have passed