Unit 3A Quiz #1: Atomic Structure

Name: _____

Block: _____ Date: _____

I. Matching: Each scientist may be used <u>once</u> or <u>more than once.</u>

A. John Dalton
B. Democritus
C. Robert Millikan

D. Louis de Broglie
E. Werner Heisenburg
F. Neil Bohr

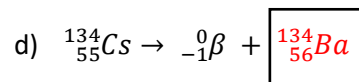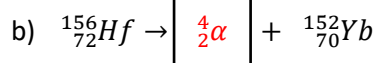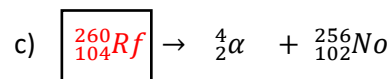G. James Chadwick
H. J. J. Thompson
İ. Ernest Rutherford

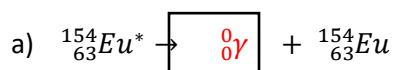__**H**__ 1. Proposed the Plum Pudding Model

__**E**__ 2. Position and the velocity of an object cannot both be measured exactly

__**B**__ 3. Believed all matter was made of atoms.

__**A**__ 4. Claimed that atoms are indestructible.

__**F**__ 5. Proposed that energy is transferred only in certain well defined quantities.

__**C**__ 6. Performed the Oil Drop Experiment

__**H**__7. Proved that cathode rays were negatively charged particles

__**I**__ 8. Performed the Gold Foil Experiment

__**F**__ 9. Proposed the Planetary Model

__**G**__10. Bombarded beryllium atoms with alpha particles and noticed neutral particles were produced.

__**D**__11. Predicted wave functions of electron orbitals

__**I**__ 12. Experiment proved atoms are mostly empty space

__**A**__ 13. Developed First Atomic Theory

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

1. In order for an atom to be neutral, <u>the number of protons must equal the number of electrons</u>.

2. Explain what isotopes are and draw examples in the space below. <u>Isotopes are atoms that have equal number protons but a different number of neutrons.</u> $^{12}_{6}C$ $^{13}_{6}C$ $^{14}_{6}C$

3.   An isotope with an atomic number of 30 and a mass number of 64 would belong to which element? <u>Zinc</u>

4. Write the complete isotopic notation for a potassium atom with 59 subatomic particles. $^{40}_{19}K$

5. The atomic number of an atom is equal to the number of <u>protons in the nucleus</u>.

6. Which subatomic particle is located outside the nucleus? <u>electrons</u>

7. How many neutrons are present in an isotope of ^{52}Cr? 28

8. What is the isotopic notation for an atom containing 15 protons, 16 neutrons, and 18 electrons? $^{31}_{15}P^{-3}$

9. Balance the following nuclear equations:

a) $^{154}_{63}Eu^* \rightarrow \boxed{^{0}_{0}\gamma} + ^{154}_{63}Eu$

c) $\boxed{^{260}_{104}Rf} \rightarrow ^{4}_{2}\alpha + ^{256}_{102}No$

b) $^{156}_{72}Hf \rightarrow \boxed{^{4}_{2}\alpha} + ^{152}_{70}Yb$

d) $^{134}_{55}Cs \rightarrow ^{0}_{-1}\beta + \boxed{^{134}_{56}Ba}$

III. Calculations - Must show work to earn credit.

1. An element has one stable isotope with a relative mass of 84.9118 amu at 72.17% abundance and another stable isotope with a relative mass of 86.9092 amu at 27.83% abundance. Calculate its average atomic mass and identify the element using the periodic table.

$$AAM = (84.9118 \times 0.7217) + (86.9092 \times 0.2783) = 85.47\ amu$$

Rubidium is 85.4678 amu

2. Bromine exists as two stable isotopes and has an atomic mass of 79.904. Bromine 79 makes up 50.69% of all naturally occurring bromine atoms. What is the mass of the other isotope? Show work for your calculation.

$$100\ \% - 50.69\ \% = 49.31\%$$

$$79.904 = (79 \times 0.5069) + (Mass \times 0.4931)$$

$$\frac{79.904 - (79 \times 0.5069)}{0.4931} = Mass = 80.8 \approx 81\ amu$$

3. Indium (In) has two stable isotopes, ^{113}In and ^{115}In, and about 80 known radioisotopes. Indium-111, having a half-life of 2.8047 days, decays by means of electron capture. If a 25 gram sample of ^{111}In was tested after 19.6329 days, how many half-lives have passed?

19.6329 days ÷ 2.8047 days = 7 half-lives have passed

4. Bromine-78, a radioactive isotope with a half-life of 6.45 minutes, is known to undergo electron capture. How much time has passed if a sample of bromine-78 has experienced five half-lives?

5 x 6.45 minutes = 32.25 minutes

5. How many half-lives will it take for 100 g of radioactive Americium-243 to decay to *less than 20 grams*?

100 → 50 → 25 → 12.5   3 half-lives