Review Sheet KEY for Chem. 141 (Early Atomic Theory)

1. Complete the following table, indicating the correct atomic number, mass number, number of protons, electrons and neutrons and write the correct symbol

|  | **Atomic notation** | **Isotopic name** | **ATOMIC #** | **MASS #** | **PROTONS** | **ELECTRONS** | **NEUTRONS** | **ATOMIC MASS** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 5323V | Vandadium-53 | 23 | 53 | 23 | 23 | 30 | 50.94 |
| 2 | 20480Hg | Mercury-204 | 80 | 204 | 80 | 80 | 124 | 200.6 |
| 3 | 5323V3+ | Vanadium (III)-53 | 23 | 53 | 23 | 20 | 30 | 50.94 |
| 4 | 8235Br1- | Bromide-82 | 35 | 82 | 35 | 36 | 47 | 79.90 |
| 5 | 13254Xe | Xenon-132 | 54 | 132 | 54 | 54 | 78 | 131.8 |
| 6 | 199F1- | Fluoride-19 | 9 | 19 | 9 | 10 | 19 | 19.00 |
| 7 | 5726Fe2+ | Iron (II) -57 | 26 | 57 | 26 | 24 | 31 | 55.85 |
| 8 | 18153I1- | Iodide-181 | 53 | 181 | 53 | 54 | 128 |  |

1. Given the following information which atoms are isotopes of Chromium (you may select more than one answer)?
2. 25 protons, 25 electrons, 27 neutrons
3. 23 protons, 23 electrons, 29 neutrons
4. **24 protons, 24 electrons, 28 neutrons**
5. 52 protons, 52 electrons, 24 neutrons
6. **24 protons, 24 electrons, 29 neutrons**
7. Describe Rutherford's nuclear model of the atom. In particular describe where the positive and negative charge resides in the atom, where the vast majority of the mass resides, and the size of the nucleus compared to the size of the atom as a whole. How does this model of the atom explain the scattering of alpha-particles from gold foil in Rutherford's experiment?

**Rutherford postulated that the atom consists of a small, very massive nucleus where all the positive charge resides and about which the negatively charged electrons move. Almost all of the mass of the atom is contained in the nucleus, so most of the atom consists of "empty space" through which the electrons travel. The nucleus itself is quite small, almost 10,000 times smaller in diameter than the atom itself.**

**When bombarding a gold foil with alpha particles, Rutherford observed that most of the particles passed through the foil undeflected, but a significant fraction of the particles were deflected out of the path of the alpha particle. In fact, a small (but significant) number of alpha particles (about 1 in every 20,000) bounced straight back. If the atom consists mostly of "empty space" with a tiny, massive, positively charged nucleus, then we would expect most alpha particles to pass through the atom undeflected since they would just be passing through empty space. A small fraction of the alpha particles would pass close enough to the positively charge nucleus to be repelled by it and deflected from the path of the alpha particle beam. A very small number would collide directly with the nucleus and bounce straight back toward the source of the beam. Thus this model of the atom explains well the observed scattering of alpha particles from a gold foil.**

1. A compound of copper and sulfur is 65.43% copper by mass. How many grams of copper can be obtained by decomposing 249 g of this compound completely? How many grams of sulfur would remain?

mass of copper in sample = (65.43 %/100%) x 249 g = **163 g Cu**

The remaining mass must be sulfur (by the Law of Conservation of Mass).

mass of sulfur in sample = 249 g - 163 g = **86 g S**

1. Magnesium has three naturally occurring isotopes: magnesium 24, magnesium 25 and magnesium 26. The following table gives the mass of the individual isotope and the naturally occurring abundance of that isotope

|  |  |  |
| --- | --- | --- |
| Isotope | Isotopic Mass | Percent Abundance |
| 2412Mg | 23.98 u | 78.70 % |
| 2512Mg | 24.97 u | 10.18 % |
| 2612Mg | 25.96 u | * 1. % |

Calculate the average atomic mass for the isotopes of magnesium.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Isotope | Isotopic Mass |  | Percent Abundance as decimal |  | Weighted amount |
| 2412Mg | 23.98 u | x | 0.7870 | = | 18.87 |
| 2512Mg | 24.97 u | x | 0.1018 | = | 2.54 |
| 2612Mg | 25.96 u | x | 0.1112 | = | 2.89 |
|  |  |  | Sum | = | 24.30 |