

Atomic Models Celebration **ANSWERS**

| name | symbol | atomic mass | atomic number | electron configuration | #p ⁺ | #n ⁰ | #e ⁻ |
|----------|--------|-------------|---------------|------------------------|-----------------|-----------------|-----------------|
| calcium | Ca | 40 | 20 | 2-8-8-2 | 20 | 20 | 20 |
| titanium | Ti | 48 | 22 | 2-8-10-2 | 22 | 26 | 22 |
| bromine | Br | 80 | 35 | 2-8-18-7 | 35 | 45 | 35 |
| nitrogen | N | 14 | 7 | 2-5 | 7 | 7 | 7 |
| carbon | C | 12 | 6 | 2-4 | 6 | 6 | 6 |
| aluminum | Al | 27 | 13 | 2-8-3 | 13 | 14 | 13 |

1. Explain in complete sentences how the atomic mass for mercury is 200.59 amu while at the same time every single atom of mercury in the universe has a whole number of protons and neutrons. **Each atom of mercury has a whole number of neutrons and protons, giving it a whole number atomic mass. But the isotopes of mercury (and all atoms) come in varied percentages, and when the weighted average atomic mass is made mathematically, taking into consideration the different whole number amu masses, and the percentages of atoms of the particular isotopes, an average atomic mass has a "non-whole number" mass.**

2. Element Pl (for plum pudding) has three isotopes, who have masses of 120, 121 and 124 amu. The most common is Pl-121 making up 85% of all this element. P-120 makes up 12% of all this element. What is the average atomic mass for Pl?
 $(.85)(121 \text{ amu}) = 102.85 \text{ amu} + (.12)(120 \text{ amu}) = 14.40 \text{ amu} + (.03)(124 \text{ amu}) = 3.72 \text{ amu} = \text{grand total: } 120.97 \text{ amu}$

3. Antimony has an electron configuration of 2-8-18-18-5. How many orbitals of electrons does it have? How many electrons are in its highest energy level? How many in its lowest energy level? **Antimony has five orbitals (it's in the fifth period on the periodic table). Sb has 51 electrons (its atomic number). Highest level orbital has 5 electrons while the lowest energy orbital contains 2 electrons.**

4. Rutherford's gold foil experiment proved that atoms were made mostly of **EMPTY SPACE** . It also proved that the nucleus had a **POSITIVE** charge. He shot **ALPHA** particles at the gold foil. These are easily described as **HELIUM** nuclei, or as **HELIUM** atoms without the electrons. They are produced by the **DECAY** of **RADIO-ACTIVE** material found inside the lead box.
5. When all the electrons of an atom are "where they belong" or in their lowest energy levels, the atom is said to be in the **GROUND STATE**. When energy is absorbed and electrons jump up to higher energy orbitals, the atom is said to be in an **EXCITED STATE**.
6. When these electrons jump "down" to the normal orbitals, they release energy that can be seen sometimes as **LIGHT**. This is also known as **SPECTRA**.
7. What are the differences between atomic mass and atomic numbers? **Atomic mass is the average, or weighted mass for all isotopes of an atom. In all atoms (in high school) only protons and neutrons have mass. Atomic numbers refer to the number of protons and equal numbers of electrons that an atom contains. The Periodic Table of Elements is arranged by Atomic Number.**
8. Atoms that are chemically identical but have different masses are called **ISOTOPES**.
9. Platinum-195 is a type of atom. The number is this atom's **ATOMIC MASS**.
10. K-39 has a nucleus. What is the charge of its nucleus? **The nucleus of all atoms has protons and neutrons (except hydrogen which is really just one proton and NO neutrons). Protons have a positive charge and neutrons are of course neutral. Therefore, all nuclei are POSITIVELY CHARGED. Atoms are neutral because of the equal numbers of protons and electrons.**
11. Barium has more than 40 different isotopes. What is the atomic number for barium? Does the atomic number change with different isotopes? What stays the same for every isotope of barium? **Barium's atomic number is 56. That never changes and it remains the number of protons and electrons for all barium isotopes. All barium isotopes are chemically identical, but have different masses.**
12. What are the three basic sub atomic particles of all known atoms? **protons, neutrons and electrons**