**S9 Developing Atomic Theories (p. 111 - 113)**

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| **1. Ancient Greeks** ANd9GcQRvDgVJZpS57U2TasAfyqhM90R0VajkKaKd5lww4XFjaUL5kBQ | **Matter is composed of small particles** **that cannot be broken down** = called these particles ***atoms*** from the word “atomos” (meaning indivisible). |
| **2. John Dalton** (1808)ANd9GcRblyqojUs6eLvzpM9iNBafOY_IDbOkxQO5dahM8hds6knDbRmn**SOLID SPHERE, BILLIARD BALL MODEL**   | **• Atom is smallest particle of matter , indestructible,  indivisible** **• atoms are identical for one element, and different from  other elements** **• atoms of different elements have different** **mass** **• atoms of different elements combine to make compounds (CO2)** **LEARNING CHECK!****• how many different elements are in CO2 (carbon dioxide)? \_\_\_\_\_\_****• How many total atoms are in CO2 ? \_\_\_\_\_\_\_\_****• Build a CO2 molecule using a chem model set** |
| **3. J. J. Thomson**   (1894) ANd9GcSPLWPcDsOveuvcvdF7c21Yj6hxVuEEg7_VvjDURTY38Sm2ErTw&t=1**PLUM PUDDING MODEL** | **• the atom is NOT the smallest particle!** **• every atom has tiny negative particles he called electrons** **embedded in a (+) charged material.** **The experiment:**• sent a high voltage through a ***gas discharge tube*** (GDT = a  sealed tube of gas under low pressure), and a glowing line  appears – (neon signs are a modern version of this) - **glowing  line veered towards (+) plate** • the glowing line is a stream of **negatively charged** particles from  the energized gas atoms - he called them **electrons**• since **samples of matter normally have no charge**, there must  also be negative and positive charges in the atom! He devised the  “plum pudding” model – an atom is made of **electrons (negative  charges) embedded in a** **positively charged sphere.** |
| **3. Ernest Rutherford**(1909) ANd9GcT4dmkkFkJB043FQ9CGo7jdZpi62NkJUY9BldKJ4UloZQyXQI_WUg**nuclear or solar system model** | **•**  **An atom is** **mostly** **empty space** with tiny **electrons (- charge)  orbiting** around a dense nucleus. • The **nucleus is**  made of **protons** (+ charge) and **neutrons (no  charge) and has most of an atom’s mass.**. **• The experiment:** **Bombarded a thin gold foil with alpha particles** (large (+) charged particles emitted from radioactive elements) from a radioactive source. Most passed straight through the foil (so hit  nothing) – so an atom must have lots of empty space.But some of the particles deflected at large angles and even backwards, so he concluded that the (+) charge of the atom must be in a very small, dense volume. [**http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/ruther14.swf**](http://www.mhhe.com/physsci/chemistry/essentialchemistry/flash/ruther14.swf) |
| **Neils Bohr**ANd9GcRK4MO6G2hWFRlPhpavQ6VqYucuVGBgM2UL83v53icToSXKmqptcw **Bohr Model** | Because Rutherford’s model did not explain why each element emitted different colors (color = wavelengths of different energy), Bohr did experiments and showed that **electrons can only exist in specific energy levels** which emitted specific wavelengths of energy resulting in the color patterns seen in the spectroscope**. If electrons absorb energy they move into a shell further away from the nucleus. If electrons release energy they move into a shell closer to the nucleus.**  |
| **Louis de Broglie/Erwin Schrodinger****Electron cloud****model** | Electrons exist in definite energy levels (orbitals). Exact location of electrons is uncertain so is described in terms of the probability of being found in a certain region around the nucleus. density |