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

|  |  |
| --- | --- |
| **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 |