

## **Atomic Theory**

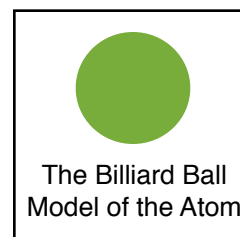
*How the model of the atom came to be*

### **Democritus**

- Greek philosopher (460 - 370 BCE).
- Believed in the philosophy of materialism.
- With Leucippus, they thought that matter \_\_\_\_\_.
- Proposed the existence of indestructible, \_\_\_\_\_ particles called \_\_\_\_\_.

### **John Dalton**

- British chemist, physicist, meteorologist.
- Proposed the first “modern” atomic theory in 1803.
- Dalton’s atomic model: \_\_\_\_\_

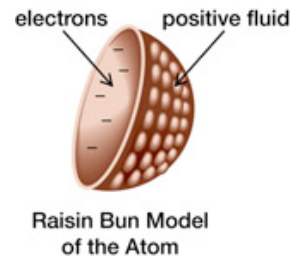


### **5 Points of Dalton’s Atomic Theory:**

- All matter is made of \_\_\_\_\_  
\_\_\_\_\_.
- Atoms cannot be \_\_\_\_\_ or \_\_\_\_\_.
- All atoms of a particular element are \_\_\_\_\_.
- \_\_\_\_\_ are formed through the \_\_\_\_\_ of  
elements.
- Chemical \_\_\_\_\_ involve atoms recombining to form  
\_\_\_\_\_.

## J.J. Thomson

- Studied behaviour of strange beams in evacuated glass cathode ray tubes (CRT) in 1897.
- He concluded that cathode rays consist of tiny “\_\_\_\_\_”
- These charged particles were much smaller than the tiniest \_\_\_\_\_ and came from within the atoms of the metal electrode.
- These “subatomic” particles were called \_\_\_\_\_ and led to the \_\_\_\_\_.



## Rutherford and the Nuclear Atom

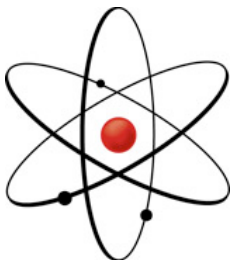
- Rutherford proposed that a beam of alpha particles ( $\text{He}^{2+}$  ions) should have enough energy to pass through a thin gold foil and be detected on a ZnS screeed behind the foil.
- The experiment initially seemed work, confirming Thomson’s Plum Pudding Model of the atom with a diffuse positive sphere.
- Most alpha particles behaved as expected but 1 in 8000 \_\_\_\_\_ (anomalies).

### *Rutherford’s Conclusions*

- The positive charge is not distributed \_\_\_\_\_ but is in a very dense positive \_\_\_\_\_.

•Most of the atom is simply \_\_\_\_\_ occupied by tiny \_\_\_\_\_.

•Rutherford proposed a new model called the \_\_\_\_\_ due to its resemblance to our solar system.



Planetary Model  
of the Atom

- Later, Rutherford proved that other atoms contain hydrogen nuclei.
- He concluded this is the simplest positively charged particle and named it the \_\_\_\_\_.

### **James Chadwick**

- Protons seemed to account for most of the mass of the atom, but evidence showed that atoms had only \_\_\_\_\_ the positive charge that was expected if the nucleus was composed only of protons.
- In 1932, Chadwick experimented with a new type of radiation emitted from beryllium
- The particle had no charge but almost the same mass as the proton; he called these particles \_\_\_\_\_.

### **Overview so far . . .**

<b>Democritus</b>	
<b>Dalton</b>	
<b>Thompson</b>	
<b>Rutherford</b>	
<b>Chadwick</b>	

## Problems with Rutherford

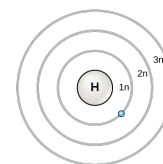
- Two pieces of evidence could not be explained:
  - \_\_\_\_\_: A charged electron orbiting a charged nucleus should lose energy as it orbits.
  - \_\_\_\_\_: All elements create a unique signature colour when excited.

## Bohr's Shell Model

1. Electrons can only occupy certain discrete \_\_\_\_\_ or energy levels.
2. Electrons can exist in an energy level without \_\_\_\_\_ energy.
3. Electrons \_\_\_\_\_ or release \_\_\_\_\_ only when they change their energy levels.

### *The Bohr Model and Electron Arrangement*

- Bohr's orbits (energy levels) can only hold a \_\_\_\_\_ number of electrons (2, 8, 8...).
- When an inner orbit is filled, electrons occupy orbits \_\_\_\_\_ from the nucleus.
- Bohr's shell model finally explained the structure of the Periodic Table, which had been published in 1869!



## Modern Atomic Theory: Schrodinger

- Used Schrodinger wave equation to describe atoms in terms of energy.
- Showed electrons don't orbit in \_\_\_\_\_ orbits but rather in \_\_\_\_\_.
- Exact location of electron is \_\_\_\_\_.
- Theory is known as \_\_\_\_\_.