

# ATOMIC STRUCTURE AND MOLECULAR ARCHITECTURE - OBJECTIVES

1. Discuss the various scientific experiments that lead to the quantum model of the atom.
2. Give detailed descriptions of the currently accepted model of the atom and know how to write electron configurations.
3. Discuss periodicity in the elements and trends in the periodic table.
4. Give detailed descriptions of ionic, covalent, polar covalent, metallic and coordinate covalent bonding.
5. Use VSEPR theory to predict shapes of molecules up to octahedral.
6. Determine the polarity of bonds and molecules.
7. Contrast intra-molecular and inter-molecular bonding.
8. Describe: Van der Waals forces, dipole-dipole interactions and hydrogen bonding.
9. Describe ionic, metallic, molecular and network solids in terms of their inter- and intra-molecular bonding and properties.
10. Identify the major inter-molecular forces present in a substance given the name or formula of the substance.

# Evolution of the Theory of the Atom

How did the evolution of the theory occur?

400 BC - Democritus –

1808 – Lavoisier, Proust, Dalton –

1903 - Thomson –

1910 - Rutherford-

1913 - Bohr –

Approx 1920+ .... Quantum and Waves

Definitely get to know these guys

There are lots of people to know from the past

## The Early Theories of the Atom

**Read pages 162-168 + Internet!**

- Scientist, approx. year, key experiments (empirical data) and theories added to the understanding of the atom
- Make a note of the technology being used

| Scientist or theory                | Experiments and/or technologies | Theories |
|------------------------------------|---------------------------------|----------|
| Democritus                         |                                 |          |
| Dalton                             |                                 |          |
| Lavoisier                          |                                 |          |
| Proust                             |                                 |          |
| Arrhenius                          |                                 |          |
| Farady                             |                                 |          |
| Crookes                            |                                 |          |
| Thompson                           |                                 |          |
| Millikan                           |                                 |          |
| Rutherford                         |                                 |          |
| Rutherford Thompson and associates |                                 |          |
| Aston                              |                                 |          |
| Chadwick                           |                                 |          |
| Soddy                              |                                 |          |
| Brookes                            |                                 |          |

## Homework

- Read 3.1 and 3.2
- Complete Questions 6

| Scientist or theory | Experiments and/or technologies | Theories |
|---------------------|---------------------------------|----------|
| Democritus          |                                 |          |
| Dalton              |                                 |          |
| Lavoisier           |                                 |          |
| Proust              |                                 |          |

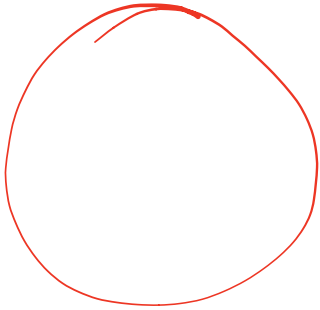
|           |  |  |
|-----------|--|--|
| Arrhenius |  |  |
| Farady    |  |  |
| Crookes   |  |  |
| Thompson  |  |  |

|   |  |  |
|---|--|--|
| Millikan                                    |  |  |
| Rutherford                                  |  |  |
| Rutherford<br>Thompson<br>and<br>associates |  |  |
| Aston                                       |  |  |

|          |  |  |
|----------|--|--|
| Chadwick |  |  |
| Soddy    |  |  |
| Brookes  |  |  |

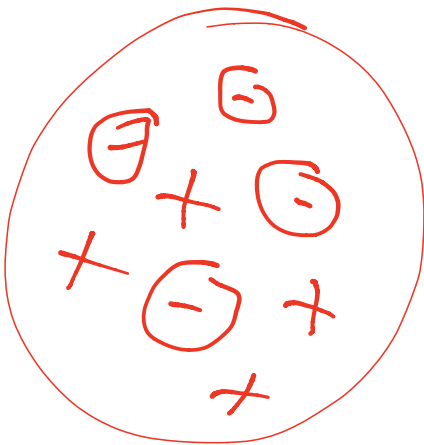
# ATOMIC THEORY

Dalton

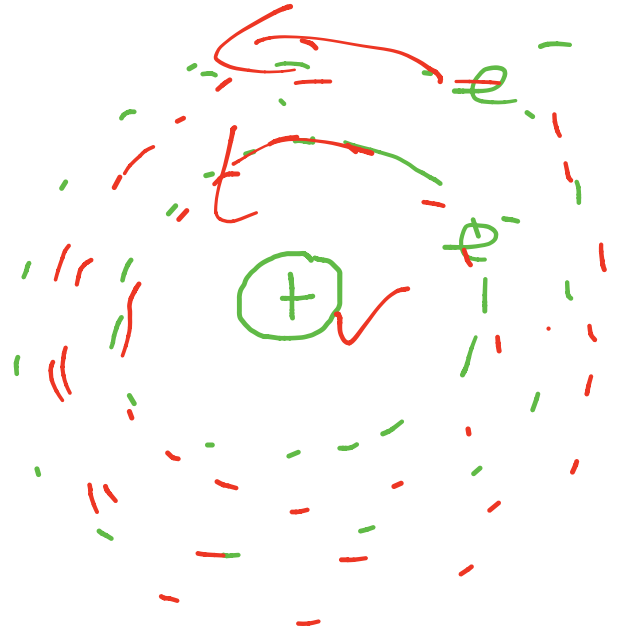
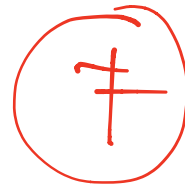
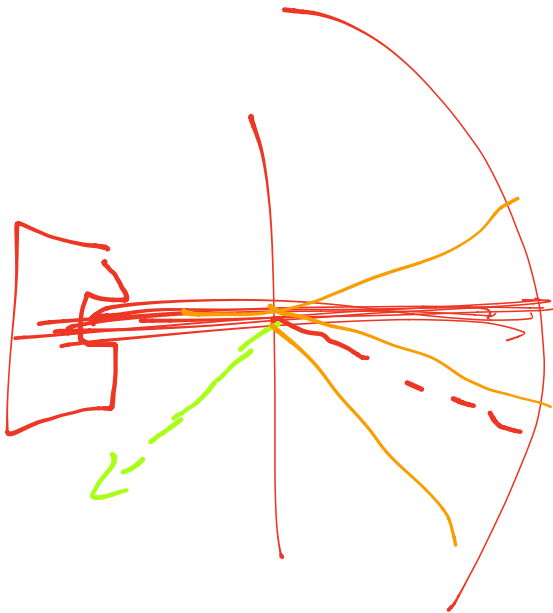


experiment

Thompson



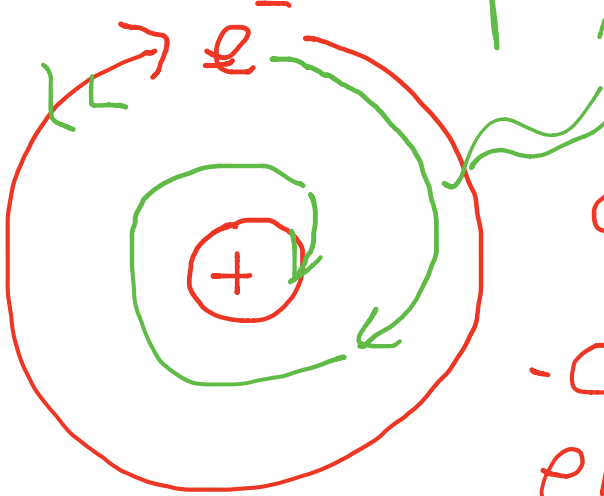
# Rutherford



## Rutherford's problem

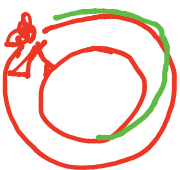
~~classical physics~~

$$a = \Delta \vec{v}$$



acceleration

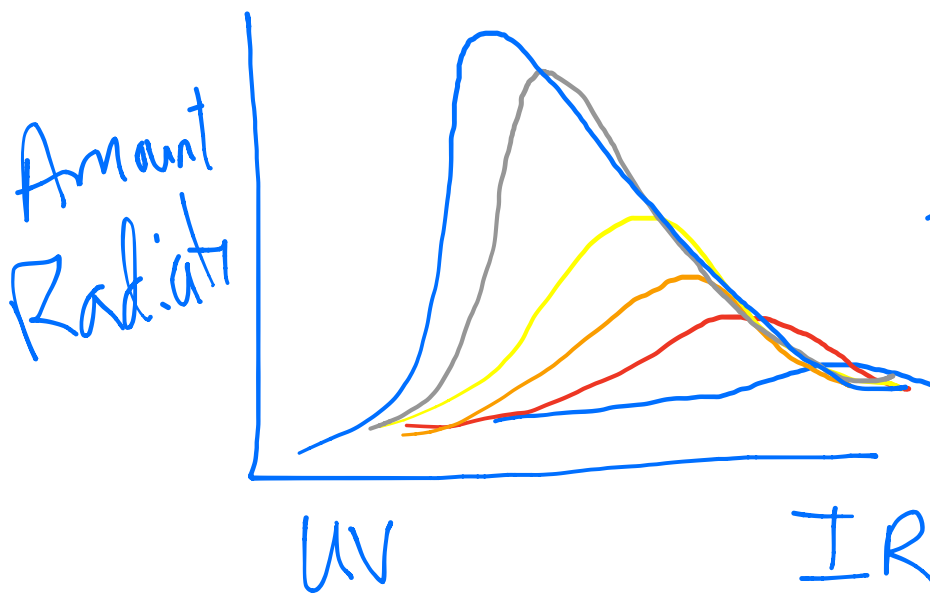
- charged particles  
emit radiation = energy





## Other Research at the time

### Blackbody Radiation



Max Planck  
- light exists  
as packages  
cool

### Photoelectric Effect

