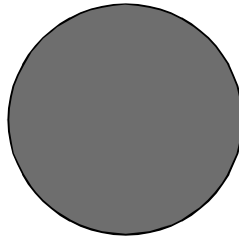


## Models of the Atom (Historical Evolution)

Gradual evolution to present day model (one of the greatest achievements in science).

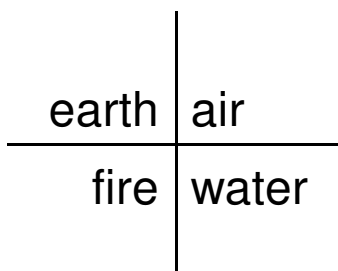
### 1. Democritus:

- Greek philosopher, c 400 B.C.E.
- used reason to deduce the existence of atoms
- all matter is composed of small indestructible fundamental particles called atoms



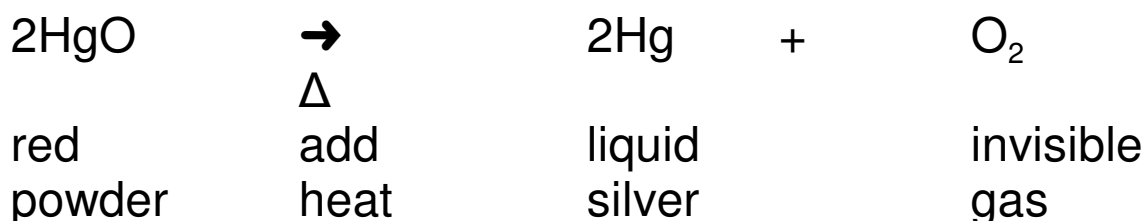
### 2. Empedocles:

- Greek philosopher, c 450 B.C.E.
- proposed the four humour model of matter
  - earth
  - air
  - fire
  - water
- all matter is made up of different ratios of these four fundamental types of matter
- his idea was endorsed by Aristotle, c 340 B.C.E.



### 3. Alchemists:

- the original of chemists (more like wizards)
- B.C.E. or middle ages
- believed that alteration of the ratio of earth/air/fire/water could convert matter from one form to another
- thought lead could be turned into gold
- experimented with mercury(II) oxide, a mysterious red powder



- suffered from mercury poisoning
  - awkward walk and twitchy behaviour
  - sudden bouts of irrational rage
  - mad as a hatter



- also performed many other experiments
- recorded detailed information (including mass)
- met at the “annual alchemy convention”
- compared results
- verified experiments
- became scientific in approach
- identified numerous different elements (substances that could not be broken down)
- identified two laws

A: Law of Constant Composition: when elements combine to form a compound, they do so in fixed proportion by mass. (i.e. water has a mass ratio of hydrogen:oxygen of 1:8, no matter how much water you make)

B: Law of Conservation of Mass: in a normal chemical reaction matter is neither created nor destroyed, mass is conserved.

4. Dalton:

- summarized the work of previous alchemists/chemists (1802)
- five point summary of the atom called Dalton’s Atomic Model

- i) Elements are made of tiny particles called atoms (Democritus)
- ii) All atoms of a given element are identical
- iii) Different elements are different particular in terms of mass
- iv) Atoms of one element can combine with atoms of other elements to form chemical compounds and do so in specific element ratios (i.e.  $H_2O$ )
- v) Atoms cannot be created, divided into smaller particles, nor destroyed in the chemical process; a chemical reaction simply changes the way atoms are grouped together

- Dalton set the stage for modern chemistry
- Dalton could explain both the Law of Constant Composition and the Law of Conservation of Mass from this model
- made possible the idea of a chemical formula (i.e.  $C_6H_{12}O_6$ )

