**Atoms Notes**

Explaining Matter

1. Democritus – first person to propose the existence of \_\_\_\_\_\_\_\_\_\_\_\_
* Matter is composed of \_\_\_\_\_\_\_\_\_\_\_\_, which move through \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Atoms are \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Different atoms have different \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Size, shape, and movement of atoms determines the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of matter
1. Aristotle – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Democritus and the idea of \_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Empty space \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Matter is made of \_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_
1. John Dalton – based his ideas on many \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dalton’s Atomic Theory:

* All matter is made of \_\_\_\_\_\_\_\_\_\_\_, which are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* All atoms of a given element are identical in \_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are formed by combining two or more different kinds of atoms.
* A chemical reaction is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of atoms.

Conservation of Mass – When atoms of two or more elements \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to form a compound, the number of \_\_\_\_\_\_\_\_\_\_\_ of each element is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Thus the \_\_\_\_\_\_\_\_\_\_ is conserved as well.

 + =

Corrections to Dalton’s Ideas:

* Atom can be divided into \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Atoms of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can have slightly different \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**ATOMS**

Atom – the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of an element that retains the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the element

 Size:

* Copper atom diameter = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* If an atom were the size of an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a real\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ would be the size of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Too small to be seen with \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Use a \_\_\_\_\_\_\_\_\_ to form a picture of them

Subatomic particles: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| 1. Nucleus – \_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_ region in the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the atom; made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	* Makes up \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the atom’s mass
2. Electron cloud – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ region of the atom where electrons orbit \_\_\_\_\_\_\_\_\_\_\_\_\_\_ the nucleus
 |  http://www.bbc.co.uk/schools/gcsebitesize/science/images/19_1_atoms__isotopes.gif |
| * + Makes up most of the atom’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
	+ Held in place because of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to positively charged \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
 |

The atom is made of mostly \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Particle** | **Symbol** | **Location** | **Charge** | **Relative Mass** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**How Atoms Differ**

Atomic Number – the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_ in an atom

All atoms are neutral so the number of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ must be the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Element | Atomic # | Protons | Electrons |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Isotopes – atoms with the same # of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ but different #s of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* We identify isotopes by their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Mass # = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Writing Isotopes:

 Isotope name –

 Isotope symbol –

 

Finding Neutrons – the total # of neutrons in an isotope can be calculated by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ its \_\_\_\_\_\_\_\_\_\_\_ number from its \_\_\_\_\_\_\_\_\_\_ number

Example: Uranium-238 has an atomic # 92

 # of neutrons \_\_\_\_\_\_\_\_ # of protons \_\_\_\_\_\_\_\_ # of electrons \_\_\_\_\_\_\_\_

When you change the number of \_\_\_\_\_\_\_\_\_\_\_\_ of an atom, you produce a different \_\_\_\_\_\_\_\_\_

Ion – an atom with a \_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_ charge

* Atoms interact \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. They can add or loose \_\_\_\_\_\_\_\_\_\_\_\_\_\_ to give them a positive or negative \_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MASS OF ATOMS**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ have almost the same mass

It takes 1840 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to equal the same mass as 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Atomic mass unit (\_\_\_\_\_\_\_) - \_\_\_\_\_\_\_\_ the mass of a carbon-12 atom

* 1 amu is nearly the same as 1 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Atomic Mass – \_\_\_\_\_\_\_\_\_\_\_\_\_\_ mass of all \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ based on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

To find atomic mass:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ each isotope mass by % abundance
* \_\_\_\_\_\_\_\_\_\_ those amounts together

|  |  |  |
| --- | --- | --- |
|  | Chlorine-35 | Chlorine-37 |
| Mass | 34.969 amu | 36.966 amu |
| % abundance | 75.78% | 24.22% |
| Amount : |  |  |
| Total Atomic Mass: |  |

Isotope abundance

* The element’s \_\_\_\_\_\_ can often indicate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ for that element

Atomic Spectra

When all frequencies (\_\_\_\_\_\_\_\_\_\_\_\_) of visible light reach our eye at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, we see \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Spectroscope – an instrument used to see the \_\_\_\_\_\_\_\_\_ components of any \_\_\_\_\_\_\_\_\_\_\_ source

Making Atoms Glow

* When \_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is added to an element, the atoms \_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ and become \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* To go back to a \_\_\_\_\_\_\_\_\_\_\_\_\_ state, the atom \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to release the energy
* The atoms of each element emit only \_\_\_\_\_\_\_\_\_\_\_\_\_\_ frequencies of light, giving each element a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ glow when energized

Atomic Spectrum – pattern of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ frequencies formed by an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hydrogen - Atomic spectrum is more \_\_\_\_\_\_\_\_\_\_\_\_\_\_ – creates a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Niels Bohr

* Atoms give off energy in \_\_\_\_\_\_\_\_\_\_\_\_\_
* Energy can’t exist \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ those levels

Bohr’s Planetary Model

* Showed electrons \_\_\_\_\_\_\_\_\_\_\_\_\_\_ the nucleus much like the \_\_\_\_\_\_\_\_\_\_\_\_ orbit the sun
* Each level was assigned a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number (\_\_\_\_\_\_)
* \_\_\_\_\_\_\_\_\_\_\_\_ is the lowest or closest level to the nucleus

Excited Electrons

* When electrons are \_\_\_\_\_\_\_\_\_\_\_\_, they jump to \_\_\_\_\_\_\_\_\_\_\_ energy levels
* As they drop back to \_\_\_\_\_\_\_\_\_\_\_\_ energy levels, they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ certain light frequencies

 Electron Waves

Louis de Broglie – electrons behave like \_\_\_\_\_\_\_\_\_\_\_\_\_

* Travel about \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ meters per second
* The \_\_\_\_\_\_\_\_\_\_\_\_\_ an object moves, the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it becomes

Electrons as waves

* Only waves that an electron exhibits while \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to an atom are those that are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Self-reinforcing waves are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ perfectly
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the closest orbital can be is \_\_\_\_\_\_\_ wavelength

Probability Clouds

* If we could plot the positions of electrons over time with \_\_\_\_\_\_\_\_\_\_\_, it would resemble a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the region of the cloud, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of finding the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in that region

Atomic Orbitals

* Also specifies a volume of \_\_\_\_\_\_\_\_\_\_\_\_ where an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is most likely to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Specifies a \_\_\_\_\_\_\_\_\_\_\_\_\_, saying that \_\_\_\_\_\_\_ of the time they are found \_\_\_\_\_\_\_\_\_\_\_\_ that border

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ interact in chemical changes

Shell Model - explains how electrons are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ around the \_\_\_\_\_\_\_\_\_\_\_\_\_\_

3 Basic Points:

1. The Atomic # (# of \_\_\_\_\_\_\_\_\_\_\_\_\_) = # of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in an atom
2. The maximium number of electrons in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_\_
3. The maximum number of electrons in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is \_\_\_\_\_\_\_\_\_\_\_ where n = the shell number

Chlorine:

Valence electrons - electrons in the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ shell that participate in \_\_\_\_\_\_\_\_\_\_\_\_ bonding

Electron Dot Structure - includes the element \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_ representing the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons

 S P C O Ca