

ATOMIC THEORY

Review

Classification of Matter

Matter: Anything that has mass and volume.

Properties: The characteristics of a substance.

e.g., colour, density, state at room temperature, etc.

Element: Substance that cannot be chemically separated into simpler substances.

Atom: The smallest unit of matter that retains the properties of a given element.

- Different types of matter are made up of different types or combinations of atoms.

e.g., Carbon dioxide is made by combining 1 Carbon atom with 2 Oxygen atoms. (CO₂)

Atomic Theory

- Atoms are made up of smaller, subatomic particles

	Symbol	Charge	Location	Relative Mass	Atomic Mass Units
Proton	p	+1	nucleus	1836	1
Neutron	n	0	nucleus	1837	1
Electron	e	-1	orbits nucleus	1	0*

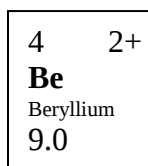
* Because the mass of electrons is so small compared to the mass of protons and neutrons, they are considered to have a mass of zero; therefore, only the nucleus of an atom is considered to have mass.

Lesson 1

Note: Some tables will show the most common charge or charges of an element after they react, but atoms do not have charge before they react so the number of protons = the number of electrons **for all atoms**.

- **Atomic Number = number of protons**
- **Atomic Mass = # protons + # neutrons**
- **Nuclear Charge = # protons (since neutrons have no charge)**

- Example: Beryllium



Atomic Number = 4

protons = 4

Atomic Mass = 9

electrons = 4

Nuclear Charge = 4

neutrons = 5

*Provide the practice page (Protons, neutrons and electrons)and do several examples together.

Ion – an atom that has acquired a positive or negative charge in a chemical reaction due to a transfer of electrons. Metals tend to **lose** electrons in a chemical reaction and become positive ions called **cations**. Non-metals tend to **gain** electrons and become negative ions called **anions**.

Charge = **number of protons** – **number of electrons**.

*Provide practice page (Ions and subatomic particles)

Lesson 1

Periodic Table

- All of the known elements are arranged on the Periodic Table of Elements based on their **atomic number** in rows (**periods**).
- Elements within a column (**group** or **family**) have common characteristics. For example, all of the elements in family 1 react with **water**.
- Group #1: **Alkali metals**. Very reactive metals that form **+1** ion.
- Group #2: **Alkaline Earth metals**. Reactive metals that form **+2** ion.
- Group #17: **Halogens**. Very reactive non-metals that form **-1** ion.
- Group #18: **Noble gases**. Non-reactive non-metal gases.

The Periodic Table of the Elements

1 H Hydrogen 1.00794																	2 He Helium 4.003				
3 Li Lithium 6.941	4 Be Beryllium 9.012182															5 B Boron 10.811	6 C Carbon 12.0107	7 N Nitrogen 14.0064	8 O Oxygen 15.9994	9 F Fluorine 18.9984032	10 Ne Neon 20.1797
11 Na Sodium 22.989770	12 Mg Magnesium 24.3050															13 Al Aluminum 26.981538	14 Si Silicon 28.0855	15 P Phosphorus 30.973761	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.845	27 Co Cobalt 58.933200	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.92160	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80				
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.818	50 Sn Tin 118.710	51 Sb Antimony 121.760	52 Te Tellurium 127.60	53 I Iodine 126.90447	54 Xe Xenon 131.29				
55 Cs Cesium 132.90545	56 Ba Barium 137.327	57 La Lanthanum 138.9055	58 Ce Cerium 140.116	59 Pr Praseodymium 140.90765	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.92534	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93032	68 Er Erbium 167.26	69 Tm Thulium 168.93421	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967	72 Hf Hafnium 178.49				
87 Fr Francium (223)	88 Ra Radium (226)	89 Ac Actinium (227)	90 Th Thorium 232.0381	91 Pa Protactinium 231.03588	92 U Uranium 238.0289	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (262)					

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Columns
Groups
Families

Rows

Periods

- Go over the Periodic Table highlighting:
- Metalloids
- Liquid elements at room temperature
- Gaseous elements at room temperature
- Diatomic elements (We will come back to this later in the course)

Activity

Periodic Table Scavenger Hunter (BC Science10 BLM Chapter 4:2-8)

Lesson 1

Assignment: worksheets on atom and ions.