



Review on Grade 10 Chemistry

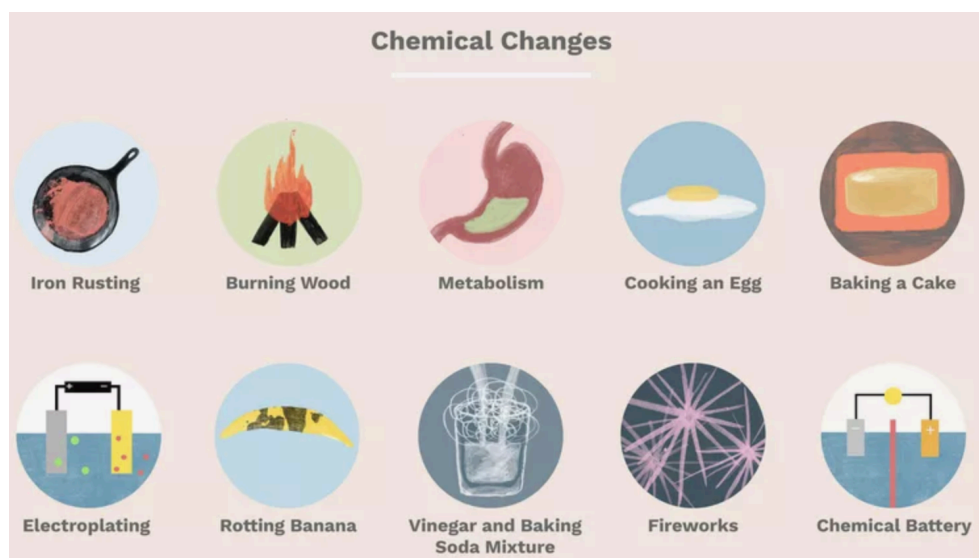
Part I: Classifying physical and chemical changes

1. Physical changes are those changes that affect the physical appearance of matter, but not its composition.



2. Chemical changes are changes that alter the composition of matter. For example:

- Iron rusting
- Wood burning (Combustibility and Flammability)
- Bread baking
- Reaction with acids





Practice problems:

Classify each situation as either a physical change or a chemical change. Explain your reasoning.

- (a) A rose bush grows from a seed that you have planted and nourished.
- (b) A green coating forms on a copper statue when the statue is exposed to air.
- (c) Your sweat evaporates to help balance your body temperature.
- (d) Frost forms on the inside of a freezer.
- (e) Salt is added to clear chicken broth.
- (f) Your body breaks down the food you eat to provide energy for your body's cells.
- (g) Juice crystals dissolve in water.
- (h) An ice-cream cone melts on a hot day.

Part II: Classifying Matter

1. **Atom:** The basic building blocks of ordinary matter composed of element, or even further divided tiny particles called proton, neutrons, and electrons.

Subatomic particle	Charge	Symbol	Mass (in g)	Radius (in m)
electron	1-	e ⁻	9.02×10^{-28}	smaller than 10^{-18}
proton	1+	p ⁺	1.67×10^{-24}	10^{-15}
neutron	0	n ⁰	1.67×10^{-24}	10^{-15}

2. **Element:** A basic substance that cannot be simplified. (H, O, Ar, etc.)
3. **Molecule:** is a pure substance that results when either identical or different elements are chemically joined together.
In terms of different number of atoms, molecules can be further divided as following:
- a) **Monoatomic molecules:** The noble gases exist in the atomic form and are stable, such as Helium, Neon, Argon, Krypton, etc.
 - b) **Diatomic molecules:** A molecule containing two atoms, could be two identical atoms as oxygen gas O_2 ; or different atoms as carbon monoxide CO.
 - c) **Polyatomic molecules:** the molecules containing three or more atoms, such as Sulphur crystal S_8 ; or carbonate anion CO_3^{2-} .



4. **Compound**: is a pure substance that results when **two or more different** elements combine chemically to form a different substance.

For example: carbon dioxide; water molecules; glucose.

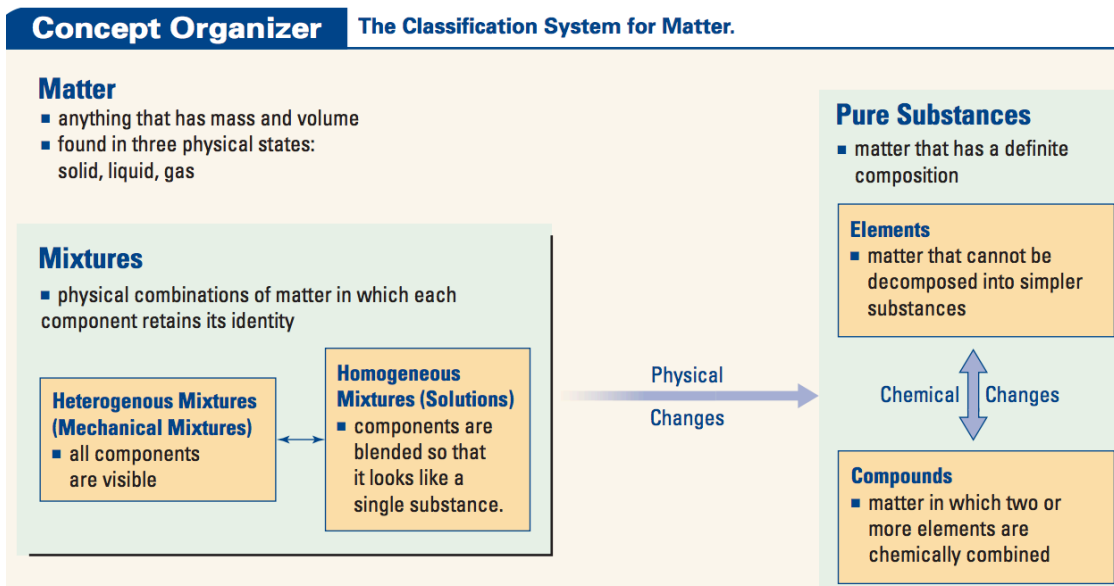
5. **Pure substance**: has only one composition, which stays the same in response to physical changes.

For example: a lump of copper, and water with nothing dissolved in it; diamond, carbon dioxide, gold, oxygen, and aluminum, etc.

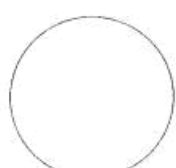
6. **Mixture**: is a physical combination of two or more kinds of substances.

For example: soil is a mixture of sand, clay, silt, and decomposed leaves and animal bodies. Each individual component retains its identity.

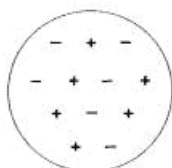
- a) **Heterogeneous mixtures**: in which the different components are clearly visible
b) **Homogeneous mixtures**: in which the components are blended together really well that the mixture look like just one substance.



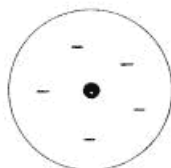
Part III: Atomic Model History



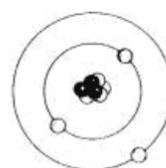
(a) Dalton's model (1803)



(b) Thomson's plum-pudding model (1897)



(c) Rutherford's model (1909)



(d) Bohr's model (1913)



(e) charge-cloud model (present)

**Democritus 460 BC
and Dalton 1803 AD**



**Thomson
1897**



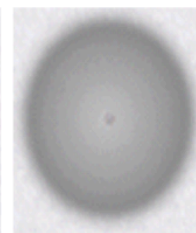
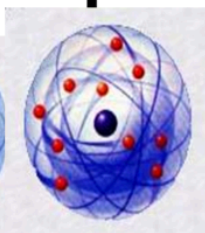
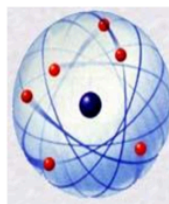
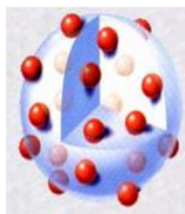
**Rutherford
1912**



**Bohr
1913**



**Modern
Quantum
Cloud Model
post 1930**



<https://www.youtube.com/watch?v=thnDxFdkzZs>



Part III: Periodic table

1. Atomic symbol:

$$\begin{array}{l} \text{Atomic mass number} \rightarrow A \\ \text{Atomic number} \rightarrow Z \end{array} X$$

Number of neutrons = Mass number – atomic number = $A - Z$

Number of proton = number of electron in neutral charged atom.

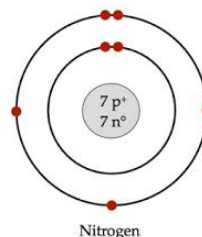
2. Periodic table (the term you should know)

- a) Main group metals
- b) Transition metals
- c) Metalloids
- d) Nonmetals
- e) Alkali group
- f) Halogen group
- g) Nobel gas group

3. Bohr diagram

- Diagram showing arrangement of subatomic particles in an atom.
- Electron arrangement for first 20 elements is 2, 8, 8, 2.
- Arrangement within the atom is reflected in the row and period number on the periodic table.
- Row # = number of orbitals (energy levels)
- Period # number of valence electrons.

	1A	2A	3A	4A	5A	6A	7A	8A
1	H 1 							He 2
2	Li 3 	Be 4 	B 5 	C 6 	N 7 	O 8 	F 9 	Ne 10



Practice: Draw Bohr-Rutherford Diagrams for the following:

- a) magnesium atom b) the noble gas in the 3rd row c) sodium ion d) fluorine ion

4. Lewis diagram

- Lewis diagram is a much simpler model to represent elements and the valence electrons.
- To draw a Lewis structures, you replace the nucleus and inner energy levels of an atom with its atomic symbol. Then you place dots around the atomic symbol to represent the valence electrons.





MAIN GROUP ELEMENTS													MAIN-GROUP ELEMENTS												
	1 (IA)																				18 (VIIIA)				
1	1 H 1.01																			2 He 4.003					
2	3 Li 6.941	4 Be 9.012																			10 Ne 20.18				
3	11 Na 22.99	12 Mg 24.13																			18 Ar 39.95				
													TRANSITION ELEMENTS												
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80							
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3							
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)							
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Uun (269)	111 Uuu (272)	112 Uub (277)		114 Uuq (285)		116 Uuh (289)		118 Uuo (293)							

metals (main group)
metals (transition)
metals (inner transition)
metalloids
nonmetals

INNER TRANSITION ELEMENTS														
6	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
7	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)

- Each element is in a separate box, with its atomic number, atomic symbol, and atomic mass. (Different versions of the periodic table provide additional data and details.)
- Elements are arranged in seven numbered periods (horizontal rows) and 18 numbered groups (vertical columns).
- Groups are numbered according to two different systems. The current system numbers the groups from 1 to 18. An older system numbers the groups from I to VIII, and separates them into two categories labelled A and B. Both of these systems are included in this textbook.
- The elements in the eight A groups are the main-group elements. They are also called the representative elements.

The elements in the ten B groups are known as the transition elements. (In older periodic tables, Roman numerals are used to number the A and B groups.)

Within the B group transition elements are two horizontal series of elements called inner transition elements. They usually appear below the main periodic table. Notice, however, that they fit between the elements in Group 3 (IIIB) and Group 4 (IVB).

A bold "staircase" line runs from the top of Group 13 (IIIA) to the bottom of Group 16 (VIA). This line separates the elements into three broad classes: metals, metalloids (or semi-metals), and non-metals. (See Figure 2.7 on the next page for more information.)

- Group 1 (IA) elements are known as **alkali metals**. They react with water to form alkaline, or basic, solutions.
- Group 2 (IIA) elements are known as **alkaline earth metals**. They react with oxygen to form compounds called oxides, which react with water to form alkaline solutions. Early chemists called all metal oxides "earths."
- Group 17 (VIIA) elements are known as **halogens**, from the Greek word *hals*, meaning "salt." Elements in this group combine with other elements to form compounds called salts.
- Group 18 (VIIIA) elements are known as **noble gases**. Noble gases do not combine in nature with any other elements.