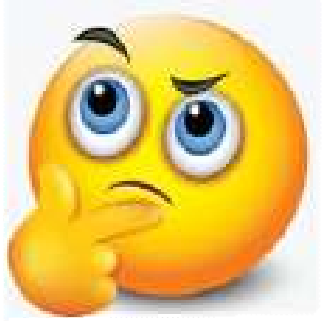
MODERN PERIODIC TABLE

Lecture ..

Q.1 – What is the significance of:

i. Atomic Number.

ii. Atomic Mass Number.



Answer:

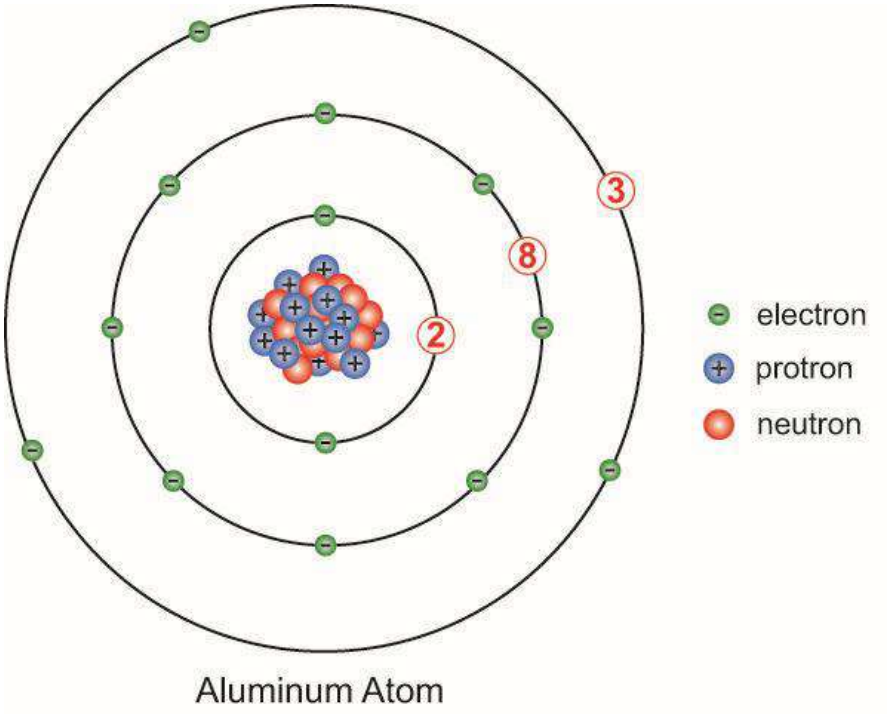
i. Atomic Number – Denotes number of electrons & protons.

ii. Atomic Mass – Denotes number of nucleons.



WHAT IS AN ATOM??

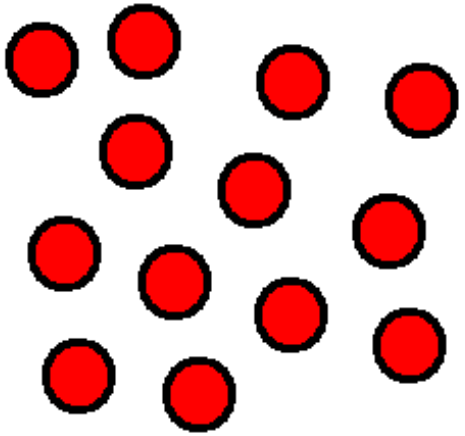
1. Matter has mass and takes up space.
2. Atoms are basic building blocks of matter, and cannot be chemically subdivided by ordinary means.
3. Even though an atom is really small, it is made of even smaller particles.
4. It's made of 3 tiny subatomic particles:
    i. Protons.
    ii. Neutrons.
    iii. Electrons.

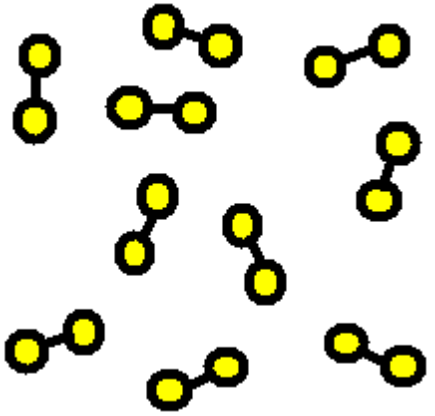


Aluminum Atom

WHAT IS AN ELEMENT?

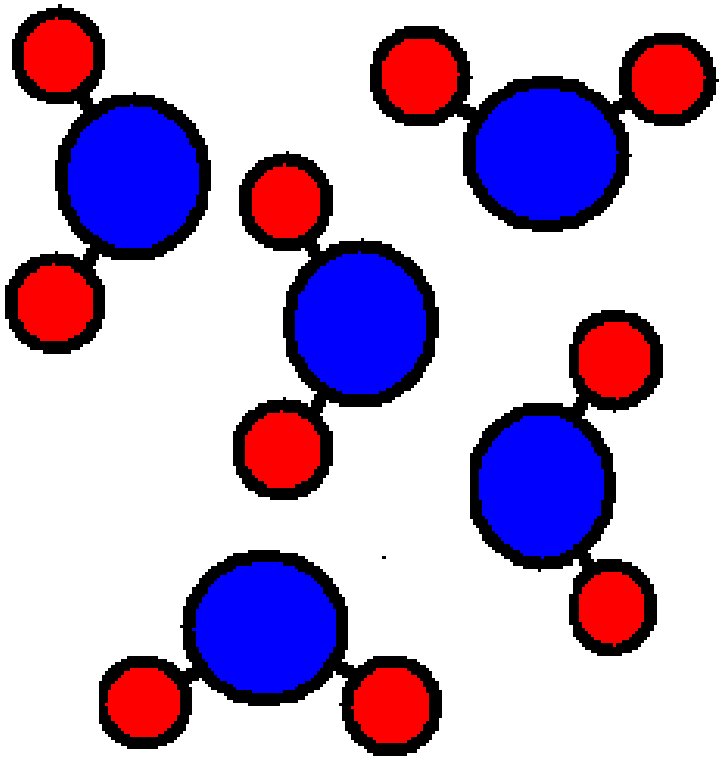
- A substance composed of a single kind of atom.
- Cannot be broken down into another substance by chemical or physical means.
- Smallest part of an element is an ATOM.
- Example: Hydrogen, Carbon, Sodium, Magnesium etc.,.





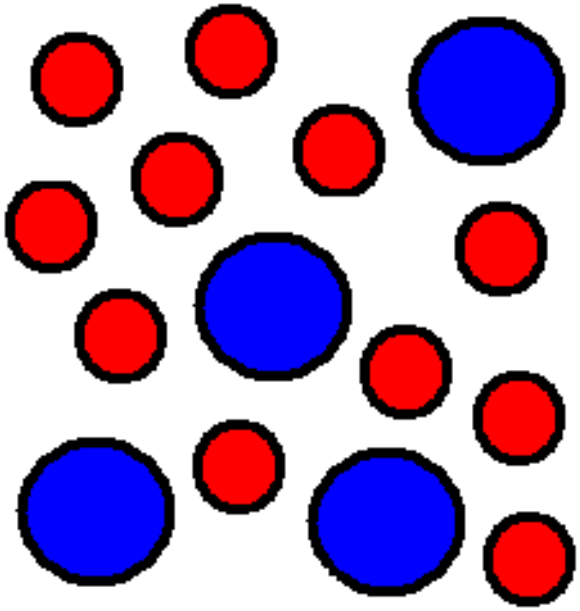
WHAT IS A COMPOUND?

- A substance in which two or more different elements are CHEMICALLY bonded together.
- Example: Water, Ammonia, Methane, Carbon Dioxide etc.,.

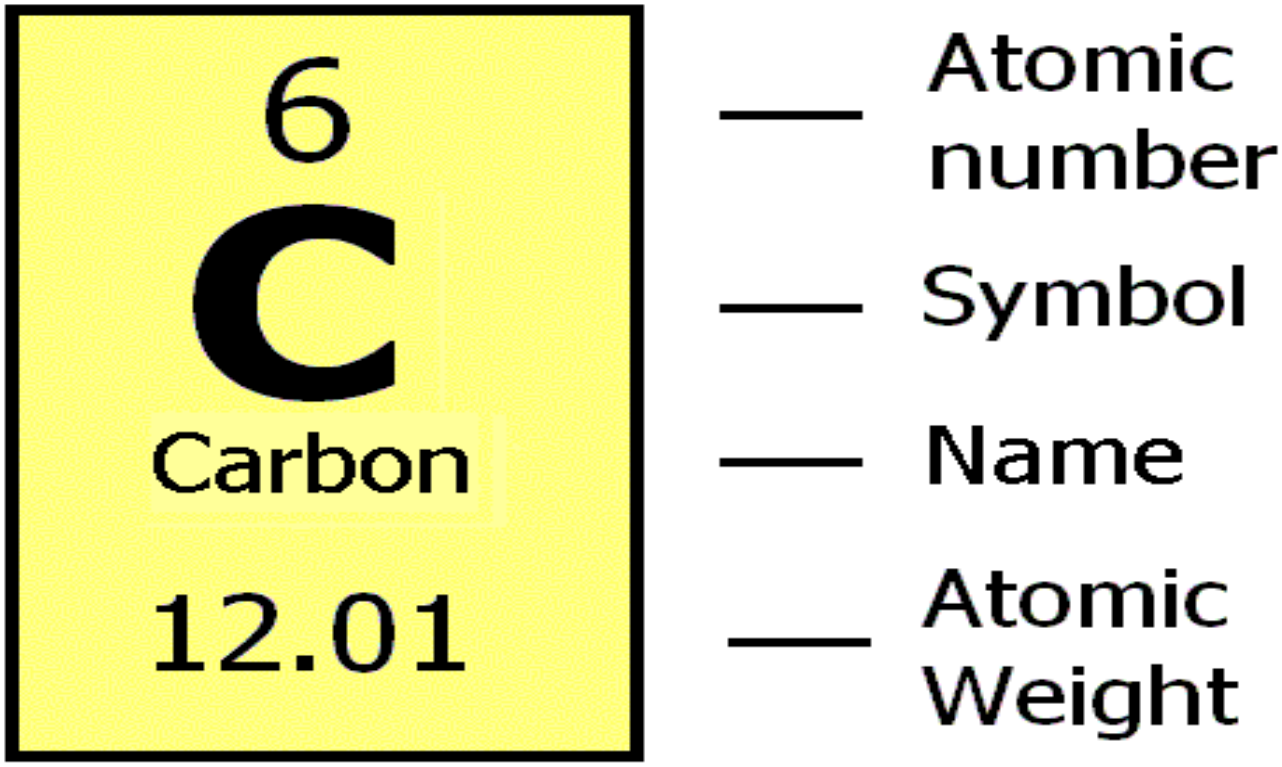


WHAT IS A MIXTURE?

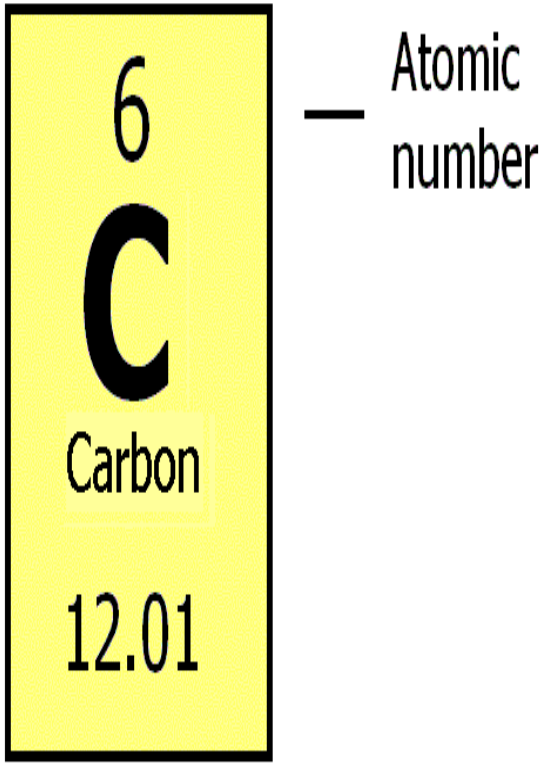
- Two or more substances that are mixed together but are NOT chemically bonded.
- Example: Air, Water in Oil, Ice in Water etc.,.



REPRESENTATION OF AN ELEMENT:



ATOMIC NUMBER:



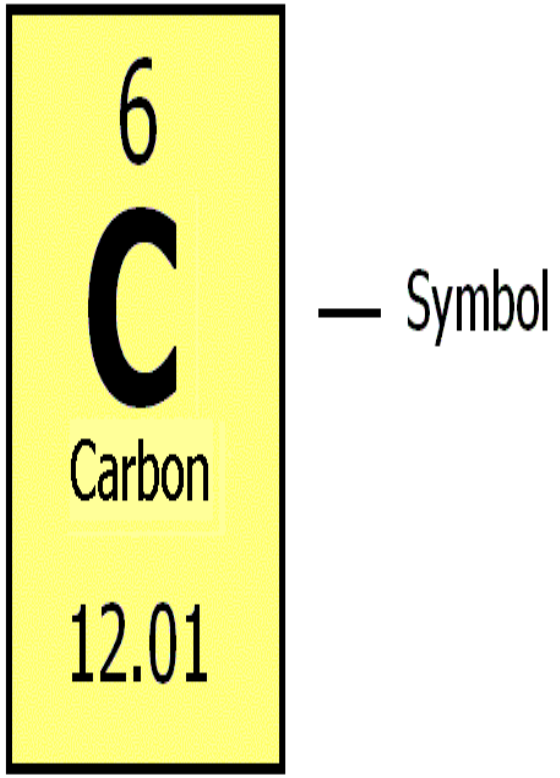
- The number of protons found in the nucleus of an atom.

OR

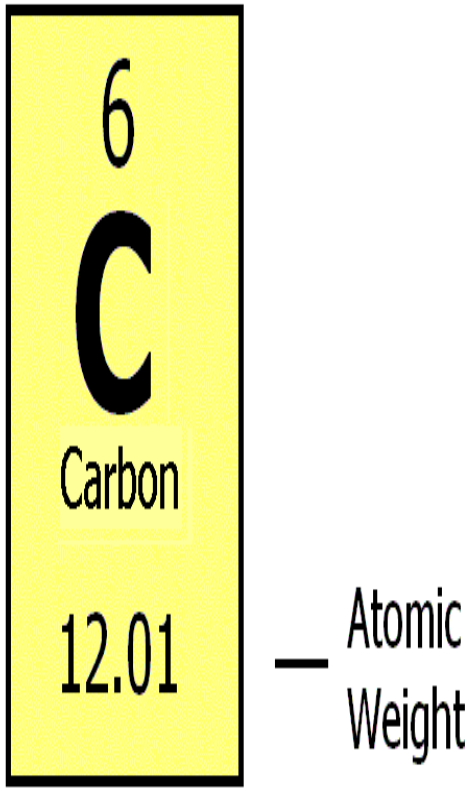
- The number of electrons surrounding the nucleus of an atom.

SYMBOL:

- An abbreviation of the element name.



ATOMIC MASS:



- The number of protons and neutrons in the nucleus of an atom.

SIGNIFICANCE:

- Number of PROTONS = ATOMIC NUMBER
- Number of ELECTRONS = ATOMIC NUMBER
- Number of NEUTRONS = ATOMIC MASS – ATOMIC NUMBER

Why is the Periodic Table important to me?



- The periodic table is the most useful tool to a chemist.
- You get to use it on every test.
- It organizes lots of information about all the known elements.

Pre-Periodic Table Chemistry …

- …was a mess!!!
- No organization of elements.
- Imagine going to a grocery store with no organization!!
- Difficult to find information.
- Chemistry didn't make sense.



Organizing the Elements

- Chemists used the properties of elements to sort them into groups.
- JW. Dobreiner grouped elements into triads.
- A triad is a set of three elements with similar properties.



Chlorine 35.453 amu | Bromine 79.904 amu | Iodine 126.90 amu

Newlands' Law of Octaves

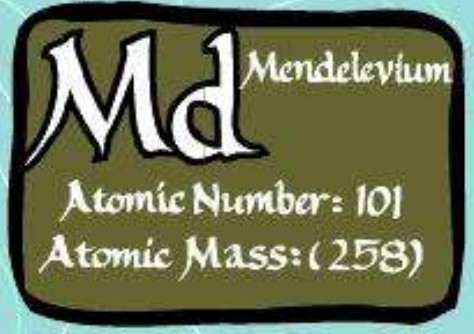
If the chemical elements are arranged according to increasing atomic weight, those with similar physical and chemical properties occur after each interval of seven elements. Newlands was one of the first to detect a periodic pattern in the properties of the elements and anticipated later developments of the periodic law.

sa (do)	re (re)	ga (mi)	ma (fa)	pa (so)	da (la)	ni (ti)
H	Li	Be	B	C	N	O
F	Na	Mg	Al	Si	P	S
Cl	K	Ca	Cr	Ti	Mn	Fe
Co & Ni	Cu	Zn	Y	In	As	Se
Br	Rb	Sr	Ce & La	Zr	–	–

Dmitri Mendeleev: Father of the Table

HOW HIS WORKED…

- Put elements in rows by increasing atomic weight.
- Put elements in columns by the way they reacted.



SOME PROBLEMS…

- He left blank spaces for what he said were undiscovered elements. (Turned out he was right!)
- He broke the pattern of increasing atomic weight to keep similar reacting elements together.

Mendeleev: Developing a Periodic Table

- In 1869 a Russian chemist, inventor and teacher names Dimitri Mendeleev. formulated the Periodic Law. He used it to correct the properties of some already discovered elements and also to predict the properties of elements yet to be discovered.



Mendeleev: Developing a Periodic Table

- Mendeleev studied the physical properties such as density, colour, melting point and atomic mass of each element.
- Mendeleev also studied chemical properties such as how each element reacted with other elements.
- He arranged the elements in a list using their atomic masses.
- He noticed that the properties of the elements seemed to repeat in a pattern.
- When Mendeleev placed his list of elements into a table, he arranged them in rows of increasing atomic mass. Elements with similar properties were grouped in the same columns

Mendeleev's Periodic Table

- In 1869, a Russian chemist and teacher published a table of the elements.
- Mendeleev arranged the elements in the periodic table in order of increasing atomic mass.



ОПЫТЪ СИСТЕМЫ ЭЛЕМЕНТОВЪ.

ОСНОВАННОЙ НА ИХЪ АТОМНОМЪ ВѢСѢ И ХИМИЧЕСКОМЪ СХОДСТВѢ.

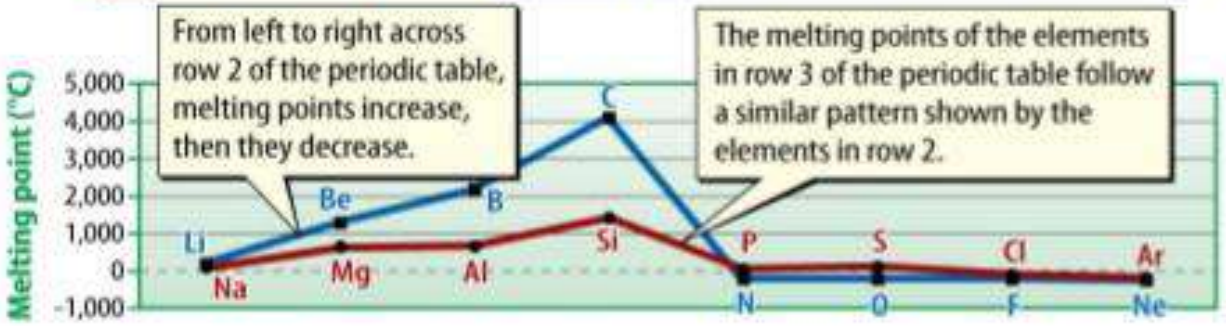
			Ti = 50	Zr = 90	? = 180.	
			V = 51	Nb = 94	Ta = 182.	
			Cr = 52	Mo = 96	W = 186.	
			Mn = 55	Rh = 104,4	Pt = 197,1.	
			Fe = 56	Ru = 104,4	Ir = 198.	
			Ni = Co = 59	Pl = 106,6	O = 199.	
H = 1			Cu = 63,4	Ag = 108	Hg = 200.	
	Be = 9,4	Mg = 24	Zn = 65,2	Cd = 112		
	B = 11	Al = 27,4	? = 68	Ur = 116	Au = 197?	
	C = 12	Si = 28	? = 70	Sn = 118		
	N = 14	P = 31	As = 75	Sb = 122	Bi = 210?	
	O = 16	S = 32	Se = 79,4	Te = 128?		
	F = 19	Cl = 35,5	Br = 80	I = 127		
Li = 7	Na = 23	K = 39	Rb = 85,4	Cs = 133	Tl = 204.	
		Ca = 40	Sr = 87,6	Ba = 137	Pb = 207.	
		? = 45	Ce = 92			
		?Er = 56	La = 94			
		?Yt = 60	Di = 95			
		?In = 75,6	Th = 118?			

Д. Менделѣевъ

Periodic Table: Patterns in Properties

- Mendeleev noticed that melting point is one property that shows a repeating pattern.

Row 2	Lithium 3 Li	Beryllium 4 Be	Boron 5 B	Carbon 6 C	Nitrogen 7 N	Oxygen 8 O	Fluorine 9 F	Neon 10 Ne
Row 3	Sodium 11 Na	Magnesium 12 Mg	Aluminum 13 Al	Silicon 14 Si	Phosphorus 15 P	Sulfur 16 S	Chlorine 17 Cl	Argon 18 Ar



- Boiling point and reactivity also follow a periodic pattern.

The Current Periodic Table

- Mendeleev wasn't too far off.
- Now the elements are put in rows by increasing **ATOMIC NUMBER!!**
- The horizontal rows are called periods and are labeled from 1 to 7.
- The vertical columns are called groups are labeled from 1 to 18.

Groups…Here's Where the Periodic Table Gets Useful!!

- **Elements in the same group have similar chemical and physical properties!!**
- **(Mendeleev did that on purpose.)**

Why??

- They have the same number of valence electrons.
- They will form the same kinds of ions.

Next Lecture:

1. Moseley's Periodic Table.
2. Trends in the MPT.

Any Question



“It is not the answer that enlightens, but the question.”

- Eugene Ionesco