

A HAND BOOK OF CHEMICAL  
**ELEMENTS**

KELLAMPALLI NAGESWARA RAO

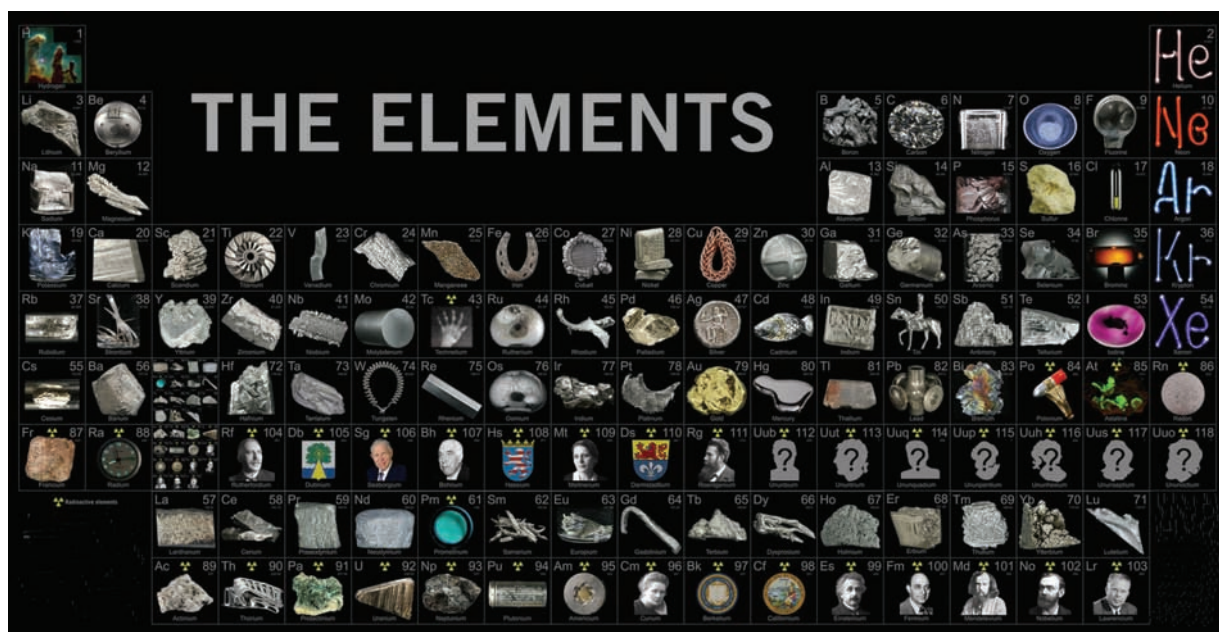
M.Sc. (M), M.Sc. (M), M.Sc. (P), B.Ed.

**EMESCO**

## Index

Sl. No.	Element Name	Element Symbol	Page No.	Sl. No.	Element Name	Element Symbol	Page No.
1	Hydrogen	H	13	37	Rubidium	Rb	163
2	Helium	He	16	38	Strontium	Sr	167
3	Lithium	Li	20	39	Yttrium	Y	171
4	Beryllium	Be	24	40	Zirconium	Zr	176
5	Boron	B	28	41	Niobium	Nb	180
6	Carbon	C	33	42	Molybdenum	Mo	184
7	Nitrogen	N	38	43	Technetium	Tc	188
8	Oxygen	O	42	44	Ruthenium	Ru	192
9	Fluorine	F	46	45	Rhodium	Rh	196
10	Neon	Ne	50	46	Palladium	Pd	200
11	Sodium	Na	53	47	Silver	Ag	204
12	Magnesium	Mg	57	48	Cadmium	Cd	209
13	Aluminium (Aluminum)	Al	61	49	Indium	In	214
14	Silicon	Si	65	50	Tin	Sn	217
15	Phosphorus	P	70	51	Antimony	Sb	221
16	Sulfur (Sulphur)	S	74	52	Tellurium	Te	225
17	Chlorine	Cl	79	53	Iodine	I	229
18	Argon	Ar	82	54	Xenon	Xe	233
19	Potassium	K	86	55	Caesium (Cesium)	Cs	237
20	Calcium	Ca	90	56	Barium	Ba	241
21	Scandium	Sc	95	57	Lanthanum	La	246
22	Titanium	Ti	99	58	Cerium	Ce	250
23	Vanadium	V	104	59	Praseodymium	Pr	255
24	Chromium	Cr	109	60	Neodymium	Nd	259
25	Manganese	Mn	113	61	Promethium	Pm	263
26	Iron	Fe	117	62	Samarium	Sm	266
27	Cobalt	Co	122	63	Europium	Eu	270
28	Nickel	Ni	126	64	Gadolinium	Gd	274
29	Copper	Cu	131	65	Terbium	Tb	278
30	Zinc	Zn	135	66	Dysprosium	Dy	282
31	Gallium	Ga	139	67	Holmium	Ho	285
32	Germanium	Ge	143	68	Erbium	Er	289
33	Arsenic	As	146	69	Thulium	Tm	293
34	Selenium	Se	150	70	Ytterbium	Yb	296
35	Bromine	Br	154		Short history of rare earth elements		300
36	Krypton	Kr	159	71	Lutetium	Lu	301
				72	Hafnium	Hf	305

Sl. No.	Element Name	Element Symbol	Page No.	Sl. No.	Element Name	Element Symbol	Page No.
73	Tantalum	Ta	309	97	Berkelium	Bk	396
74	Tungsten	W	313	98	Californium	Cf	399
75	Rhenium	Re	317	99	Einsteinium	Es	402
76	Osmium	Os	321	100	Fermium	Fm	404
77	Iridium	Ir	324	101	Mendelevium	Md	406
78	Platinum	Pt	328	102	Nobelium	No	408
79	Gold	Au	332	103	Lawrencium	Lr	410
80	Mercury	Hg	338	104	Rutherfordium	Rf	412
81	Thallium	Tl	343	105	Dubnium	Db	414
82	Lead	Pb	346	106	Seaborgium	Sg	416
83	Bismuth	Bi	350	107	Bohrium	Bh	417
84	Polonium	Po	354	108	Hassium	Hs	418
85	Astatine	At	357	109	Meitnerium	Mt	419
86	Radon	Rn	360	110	Darmstadtium	Ds	420
87	Francium	Fr	363	111	Roentgenium	Rg	422
88	Radium	Ra	365	112	Copernicium	Cp	424
89	Actinium	Ac	368	113	Ununtrium	Uut	426
90	Thorium	Th	371	114	Ununquadium / Flerovium	Uuq	428
91	Protactinium	Pa	375	115	Ununpentium	Uup	430
92	Uranium	U	379	116	Ununhexium / Livermorium	Uuh	432
93	Neptunium	Np	383	117	Ununseptium	Uus	434
94	Plutonium	Pu	386	118	Ununoctium	Uu	436
95	Americium	Am	390				
96	Curium	Cm	393				





# 1. HYDROGEN



## Basic Information :

Name : Hydrogen

Pronounced as : HI-dreh-jen

Symbol : H

Atomic Number : 1

Atomic weight :  $1.00794 \text{ g mol}^{-1}$

Melting point : 14.01 K,  $-259.14^{\circ}\text{C}$ ,  $-434.45^{\circ}\text{F}$

Boiling point : 20.28 K,  $-252.87^{\circ}\text{C}$ ,  $-423.17^{\circ}\text{F}$

Van der waals radius : 0.12 nm

Ionic radius : 0.208 (-1 nm)

Atomic volume :  $14.4 \text{ cm}^3 \text{ mol}^{-1}$

Density@ $20^{\circ}\text{C}$  :  $0.0000899 \text{ g cm}^{-3}$ ,  $88 \text{ Kg m}^{-3}$

Colour : Colourless

Standard state at 298 K : Gas

Element classification : Non-metallic

Period number : 1

Group number : 1

Group name : None

Block in periodic table : S-Block

Shells : 1

Electronic Configuration :  $1\text{S}^2$

Oxidation state : +1, -1

Valence : 1

Pauling electro negativity : 2.20

First Ionization Energy :  $1312.0 \text{ kJ mol}^{-1}$

Second ionization Energy : No data

No. of isotopes : 3

No. of stable isotopes : 2

CAS Registry ID : 1333-74-0

Standard potential : 0

Structure : Simple hexagonal

Discovered by : Henry Cavendish

Year of discovery : 1766

Named by : Antonie Laurent Lavoisier

In the year of : 1783

## History :

A favourite school chemistry experiment is to add a metal such as magnesium to an acid. The metal reacts with the acid, forming a salt and releases hydrogen from an acid. The hydrogen gas bubbles up from the liquid and students collect it in small quantities for further experiments, such as the 'pop-test'. The first recorded instance of hydrogen made by human action was in the first half of the 1500's by a similar method to that used in schools now.

Hydrogen was probably discovered many times. Many early chemists reported finding a 'flammable gas' in some experiments.

Scientists has been producing hydrogen for years before it was recognised as an element. Written records indicate that Robert Boyle produced hydrogen gas as early as 1671 while experimenting with iron and hydrochloric acid and sulphuric acid. In both cases a gas that burned easily with a pale blue flame was produced. The problem with these early discoveries was that chemists did not understand the nature of gas very well. They had not learned that there are many kinds of gases. They thought that all the 'gases', they saw were some form of air with impurities in it.

Hydrogen was first recognised as distinct element by Henry Cavendish in 1766. Cavendish discovered hydrogen in experiments like those Boyle performed. Lavoisier later named the element in 1783. The name comes from the Greek '*hydro*' meaning water and '*genes*' meaning 'forming'. Hydrogen is one of the two water forming elements.

In 1806 with hydrogen, well established as an element, Humphrey Davi pushed a strong electric current through purified water. He found hydrogen and oxygen were formed.