

Iodine



General Information

Discovery

Iodine was discovered by B. Courtois in 1811 in Paris, France.

Appearance

Iodine is a blue-black, shiny crystalline solid which sublimes at room temperature into a purple gas with an irritating odour.

Source

Iodine (as iodide) occurs sparingly (0.05 parts per million) in sea-water. From this source it is assimilated by seaweeds. It is also found in brines from deposits left by the evaporation of old seas, and in brackish waters from oil and salt wells.

Iodine is obtained commercially by extracting iodine vapour from processed brine, by ion exchange of brine or by liberating iodine from iodate obtained from nitrate ores.

Uses

Iodine has many commercial uses including pharmaceuticals, photographic chemicals, printing inks and dyes, catalysts and animal feeds. Iodide in small amounts is added to table salt in order to avoid thyroid disease.

Biological Role

Iodine is an essential element, lack of which causes problems with the thyroid gland. The artificial radioisotope, ^{131}I , with a half-life of 8 days, is used in treating cancerous thyroid glands.

A solution of potassium iodide and iodine, or of iodine in ethanol, has germicidal effects and was used for the external treatment of wounds.

If iodine is in contact with the skin it can cause lesions, and iodine vapour is extremely irritating to the eyes and mucous membranes.

General Information

Iodine forms compounds with many elements, but is less active than the other halogens. It dissolves readily in chloroform, carbon tetrachloride and carbon disulphide to form beautiful purple solutions. It is only sparingly soluble in water. Organic iodine compounds are important in organic chemistry.

Physical Information

Atomic Number	53
Relative Atomic Mass ($^{12}\text{C}=12.000$)	126.9
Melting Point/K	387
Boiling Point/K	458
Density/kg m ⁻³	4930 (293K)
Ground State Electron Configuration	[Kr]4d ¹⁰ 5s ² 5p ⁵
Electron Affinity (M-M ⁻)/kJ mol ⁻¹	-295

Key Isotopes

Nuclide	¹²³ I	¹²⁵ I	¹²⁷ I	¹²⁹ I	¹³¹ I
Atomic mass			126.9		
Natural abundance	0%	0%	100%	0%	0%
Half-life	13.3 h	60.2 days	stable	1.7x10 ⁷ yrs	8 days

Ionisation Energies/kJ mol⁻¹

M - M ⁺	1008.4
M ⁺ - M ²⁺	1845.9
M ²⁺ - M ³⁺	3200
M ³⁺ - M ⁴⁺	4100
M ⁴⁺ - M ⁵⁺	5000
M ⁵⁺ - M ⁶⁺	7400
M ⁶⁺ - M ⁷⁺	8700
M ⁷⁺ - M ⁸⁺	16400
M ⁸⁺ - M ⁹⁺	19300
M ⁹⁺ - M ¹⁰⁺	22100

Other Information

Enthalpy of Fusion/kJ mol⁻¹ 15.27

Enthalpy of Vaporisation/kJ mol⁻¹ 41.67

Oxidation States

Main I⁻¹

Others I⁰, I⁺³, I⁺⁵, I⁺⁷

Covalent Bonds/kJ mol⁻¹

I - H 299

I - C 218

I - O 234

I - F 280

I - Cl 208

I - I 151

I - Si 234

I - P 184