Helium He

General Information

Discovery

Helium was first detected by Janssen in 1868 during the solar eclipse as a new line in the solar spectrum, and named by Lockyer and Frankland. It was discovered in the uranium mineral cleveite independently by Ramsay and the Swedish chemists Cleve and Langlet.

Appearance

Helium is a colourless gas, lighter than air.

Source

After hydrogen, helium is the second most abundant element in the universe. It has been detected spectroscopically in great abundance, especially in the hotter stars. It is present in the Earth's atmosphere in about 1 part in 200,000. It is present in various radioactive minerals as a decay product, but the major sources are from wells in Texas, Oklahoma and Kansas.

Uses

Helium is widely used as an inert gas shield for arc welding; as a protective gas in growing silicon and germanium crystals, and in titanium and zirconium production. It is also used as a cooling medium for nuclear reactors, and as a gas for supersonic wind tunnels. A mixture of 80% helium and 20% oxygen is used as an artificial atmosphere for divers and others working under pressure. Helium is extensively used for filling balloons as it is a much safer gas than hydrogen. One of the recent largest uses for helium has been for pressurising liquid fuel rockets.

Biological Role

Helium has no known biological function, but it is non-toxic.

General Information

Helium has the lowest melting point of any element and has found wide use in cryogenic research, as its boiling point is close to absolute zero. Its use in the study of superconductivity is vital.

Liquid helium (^{4}He) exists in two forms, ^{4}He I and ^{4}He II, above and below 2.174K respectively. The latter is unlike any other known substance. It expands on cooling, its conductivity for heat is enormous and neither its heat conduction nor viscocity obeys normal rules. It remains liquid down to absolute zero at ordinary pressures, but can readily be solidified by increasing the pressure.

Physical Information

Atomic Number	2
Relative Atomic Mass (^{12}C=12.000)	4.003
Melting Point/K	0.95
Boiling Point/K	4.216
Density/kg m^{-3}	0.179 (gas, 273K)
Ground State Electron Configuration	1s^2
Electron Affinity (M-M$^-$)/kJ mol^{-1}	+21

Key Isotopes

Nuclide	^{3}He	^{4}He
Atomic mass	3.016	4.003
Natural abundance	1.38x10^{-4}%	99.999%
Half-life	stable	stable

Ionisation Energies/kJ mol $^{-1}$

M	- M$^+$	2372.3
M$^+$	- M^{2+}	5250.4

Other Information

Enthalpy of Fusion/kJ mol^{-1}	0.021
Enthalpy of Vaporisation/kJ mol^{-1}	0.082