Elements of '0' group.

Noble gases :→

Introduction :→ Noble gas comprises of helium, Neon, Argon, Krypton, Xenon and Radon, All these gases except Radon are present in atmosphere except Radon. Radon results from disintigration of radium and radioactive at self.

The At. No of these elements are. 2, 10, 18, 36, 54 and 86. The electronic configuration of these gases are given below.

$_{2}He \rightarrow 1s^2$

$_{10}Ne \rightarrow 1s^2\ 2s^2\ 2p^6$

$_{18}Ar \rightarrow 1s^2\ 2s^2\ 2p^6\ 3s^2\ p^6$

$_{36}Kr \rightarrow 1s^2\ 2s^2 p^6\ 3s^2 p^6 d^{10}\ 4s^2 p^6$

$_{54}Xe \rightarrow 1s^2\ 2s^2 p^6\ 3s^2 p^6 d^{10}\ 4s^2 p^6 d^{10}\ f^0\ 5s^2 p^6$

$_{86}Rn \rightarrow 1s^2 2s^2 p^6\ 3s^2 p^6 d^{10}\ 4s^2 p^6 d^{10} f^{14}\ 5s^2 p^6\ d^{10}\ 6s^2 p^6$

From electronic configuration it is evident that all element except He have $ns^2 p^6$ outer electronic configuration. i.e have do not Consist Valence electron due to this they are unable to react with other element or they are chemically inert; But modern researches have proved that some inert gases also forms chemical compounds. Fluorides of Xenon among them are very important, Now, it is not reasonable to call these gases "inert", Now these gases are Called noble gases. —

Position in Periodic table :→

Mendeleef had not left any blanck in his periodic Table for the noble gases in his periodic Table. Although he had left some space for several other elements which were not known at that time. The reason was that he could not imagine about the discoverer of these gases. Ramsay, the discoverer introduced a new group of these elements. This group is called Zero group.

Taking into view the atomic number of these elements, the Zero group is placed after the 7th group and before the first group i.e, between the most electronegative halogens and the most electropositive alkali metals.

Position of Noble gases w.r. to At. No.

Electronegative Halogens monovalent	Noble gases Zero valent	Electropositive alkali metals monovalent
F = 9	He = 2	Li = 3
Cl = 17	Ne = 10	Na = 11
Br = 35	Ar = 18	K = 19
I = 53	Kr = 36	Rb = 37
At = 85	Xe = 54	Cs = 55
	Rn = 86	Fr = 87

Occurrence → Noble gases occur in minute proportion in Atmosphere, Rn is obtained in radio-active disintegration of radium and it is radio active itself.

Helium being lighter of all the rare gases is found in the outer zone of atmosphere.

Helium also occurs in

(i) **Natural gas** → Helium occurs up to 7% in certain natural hydrocarbon gases, out from the wells of U.S.A.

(ii) **Minerals** → In small quantities. it occurs in a variety of minerals such as cleviē, monozitē, Pitchblend.

(iii) **Sun's atmosphere** → It is beleived that helium is present in large amount in suns atmosphere.

History of discovery of Noble gases →

Helium → In 1868 Lockyer observed a bright yellow line near D_1 and D_2 lines of Sodium in a Solar spectrum during a total eclipse. This line could not be attributed to any known element at that time. Lockyer called it D_3 line and concluded that this is due to the presence of a new element in the Sun. He called this element 'Helium' (in Greek Helios meaning sun). 20 years latter, Hille brand observed that Uranium minerals like cleviē and monozitē

gave off, on heating, a gas which he supposed to be nitrogen. He called it N which had been discovered by Lockyer in Sun. Ramasay was thus the first to find Helium on the earth.

Discovery of Argon, Neon and Krypton

The History of discovery of these gases start with the experiment of Cavendish. He passed electric sparks in a mixture of dry air free from CO_2 in excess of oxygen. His idea was to complete conversion of N_2 into NO_2 by the reaction.

$$N_2 + 2O_2 \rightarrow 2NO_2$$

He observed the result Nitrogen dioxide (NO_2) and the unused Oxygen in Potassium Penta sulphide. There should have been no residual gas left. But he found that $\frac{1}{120}$ th of the volume of the original volume was not soluble. Cavendish ~~Cavendish~~ Conceived this small volume to be unreacted nitrogen and left the experiment as such. The real explanation came about 100 year later.

In 1894 i.e. after 109 years of Cavendish experiment, Lord Rayleigh found that density of Nitrogen obtained from atm is greater than that of the density prepared in laboratory. The difference in density is very minute. Several investigators observed this discrepancy, but the neglected it. Reyleigh took this discrepancy carefully and repeated his experiment several times and each

On the basis of his observations, he concluded that nitrogen obtained from atmosphere contains some heavier elements other than nitrogen.

Rayleigh then worked in collaboration with Ramsay. He improved the earlier experiments of Cavendish. They showed that residual gas left after the complete conversion of N_2 into Nitrogen oxides was heavier than nitrogen. It's V.D was found to be 2.2 on assuming V.D. of Hydrogen one, where as V.D. of Nitrogen on hydrogen scale is 14.

The residual gas was also examined spectroscopically and found to be unknown gas. The gas was found to be chemically inert and it was called Argon.

Ramsay and Travers subjected argon, to be, in reality, a mixture of a number of similar constituents gases. Spectroscopic evidence convinced them that this was actually so. They fractionated there more for several years during which they carefully and repeatedly distilled the liquefied argon gas. The first fraction was found to contain a new element. Hence they named Neon. Its spectrum showed it to be undoubtedly as a rare element.