energy of that electrons. To overcome this problem, Pauli suggested that another particle should be emitted during beta decay. This particle is carrying no charge to conserve charge, but carries the missing energy. After this Fermi presented a theory of the beta decay that incorporated Pauli particle which called neutrino.

In mid-fifties Cowan and Reines developed a method to watch the inverse beta reaction; $\upsilon + p^{+} \rightarrow n + e^{+}$; their results provided unambiguous confirmation of the neutrons existence [1;5]. After this Davis looked for analogous reaction using antineutrinos $\bar{\upsilon} + n \rightarrow p^{+} + e^{+}$. He found this reaction does not occur. This problem is solved by Konopinski and Mahmoud [1;6] in 1953 by introducing a simple rule for determining which reaction will work. They assigned the lepton number $L = +1$ for electron, muon and neutrino, $L = -1$ for positron , positive muon and antineutrino but for all other particles $L = 0$. This number is conserved in any physical process.

Also the decay of muon into an electron plus photon is never observed $u^{-} \rightarrow \gamma + e^{-}$. Although it conserves the charge and lepton number. The reason is explained in the last fifties and early sixties. They suggested that there are two different kinds of neutrinos, one associated with the electron υ_e and the other with the muon υ_u. If we assign a muon number $L_u = 1$ to u^{-} and υ_u and $L_u = -1$ to u^{+} and $\bar{\upsilon}_u$. At the same time electron number $L_e = 1$ to e^{-} and υ_e, and $L_e = -1$ to e^{+} and $\bar{\upsilon}_e$. In 1975 a new lepton was discovered [1;7] called tau, and its own neutrino. Then we have another quantum number called tau number L_τ . $L_\tau = 1$ for τ^{-} and υ_τ, while $L_\tau = -1$ for τ^{+} and $\bar{\upsilon}_\tau$. These numbers are conserved into all physical process. Electrons, muons, taus and their neutrinos form what so called "lepton family". A lepton family characterized by the fact that, they don't participate in strong interaction. These quantum numbers explain all the reactions related to the lepton particles.

In December 1947 Rechester and Butler [1;8] produced a neutral particles in the cloud chamber using a cosmic ray. These particles are detected when decay into two charged secondary particles. Analysis show that these charged particles are π^{+} and π^{-}. The mass of the neutral particle with at least twice the mass of the pion and called keon k^{0}. In 1950 another neutral particle was found by Anderson's group at Cal Tech, which decays into π^{-} and p^{+}. That particle is heavier than proton called lombda Λ. Keon and lombda belong with the proton and neutrons in what so called "baryon family".

Another problem is the stability of the proton, i,e, it does not decay into positron and photon. Stuckelberg [1;9] explained this behavior of the proton by asserting a law of conservation of baryon number. To all baryons $A=1$ and to all antiparticles $A=-1$, and equal to zero for all leptons and mesons. Since the proton is the lightest baryon, it has no way to decay. The baryon number is conserved in any physical process. Over the next years many and more heavy baryons were discovered as Σ,Ξ and Δ and so on.

In 1952 the first of the modern particle accelerators began operating, another strange particles are produced. They are strange particles because they are produced copiously on a time scale about 10^{-23} sec, decay relatively slowly on a time scale about 10^{-10} sec, this is because they are produced by strong force and decay by weak one, and also are produced in pairs. In 1953 Gell-Mann [1,10] and Nishijima [1;11] assigned to such particles a new property called "strangeness" which is conserved in any strong interactions but not conserved in weak interactions. In a pion-proton collision for example, we might produce two strange particles $\pi^- + p \rightarrow k^+ + \Sigma^-$, $k^0 + \Sigma^0$ or $k^0 + \Lambda$, where k's carry strangeness $s = 1$ and Σ and Λ have $s = -1$,while ordinary particles π, p and n have $s = 0$. on the other hand, these particles decay in weak interactions; in which strangeness is not conserved; such as $\Lambda \rightarrow p^+ + \pi^-$ and $\Sigma^+ \rightarrow p^+ + \pi^0$ or $n + \pi^+$. Now we have a large number of baryons and mesons.

In 1961 Gell-Mann introduced what so called "Eightfold way". In which he arranged the baryons and mesons into a geometrical pattern according to their charge and strangeness. The lightest baryons fit into hexagonal array on the $Y - I_3$plane with two particles at the center, where I_3 and Yrepresent isospin and hypercharge, respectively, as shown in figure (1-1).

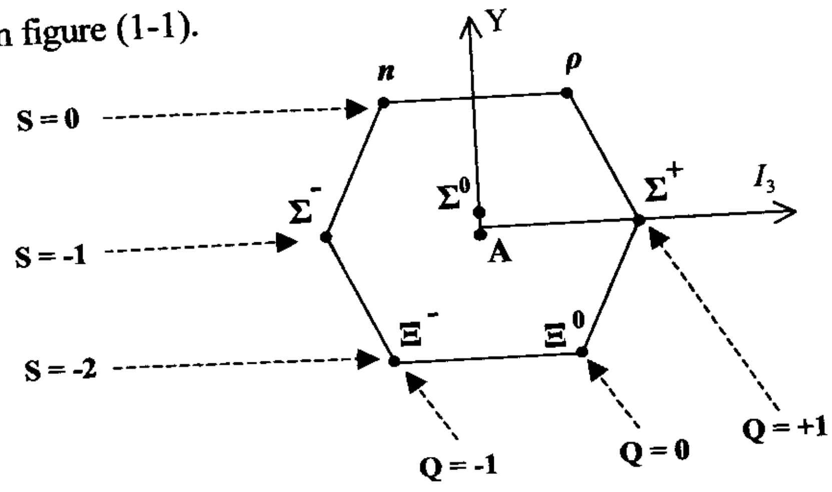

Figure (1-1): The $J^P = \frac{1}{2}^+$,B = +1 **baryon octet plotted on the** $Y - I_3$**plane.**

Also the eight lightest mesons fill a similar hexagonal pattern forming a meson octet, as shown in figure (1-2).