Answer on Question #43506 - Chemistry - Inorganic Chemistry

Question:

state the discovery of the electrons, protons, and neutrons.

Solution:

Famous scientist J.J Thomson discovered the electrons in the experiment performed in 1896 with his colleagues J.S. Townsend and H.A. Wilson in the Cavendish Laboratory at the Cambridge University. Cathode rays moving from cathode to anode, passed between plates and coils generating electric and magnetic fields respectively. It was shown that rays diverged from direct way under the influence of the field. Thompson concluded that the particles had more corpuscle properties than wave one, especially when he calculated that speed of the rays were less that speed of light. In addition, Thomson calculated the charge and the mass of the electrons showing that ratio charge/mass was independent to the cathode material.

The protons were discovered by E. Rutherford in 1917. When pure nitrogen was shot by alpha particles, the sensors detected hydrogen formation. The reaction was the following:

$$^{14}_{7}\mathrm{N} + {}^{4}_{2}\alpha \rightarrow {}^{17}_{8}\mathrm{O} + {}^{1}_{1}p$$

At first, Rutherford shot air by alpha particles. He knew that air consisted of 79% of nitrogen. He decided to change air to pure nitrogen and noticed that effect of hydrogen formation increased. Rutherford concluded that hydrogen particles formed other nuclei, like nitrogen nucleus for example.

Neutrons were discovered in 1932. At first, W. Bothe and H. Becker found formation of very penetrating radiation after irradiation beryllium by protons from polonium. They thought that it was sort of gamma radiation, but it's penetrating ability was higher than for any known sorts of gamma radiation. Then, I. Joliot-Curie and F. Jolio showed that if this radiation fell on the paraffin, alpha particles would be produced with very high energy. In 1932, J. Chadwick performed experiments and showed that the amount of the energy of protons produced was about 5.7 MeV. If these protons were result of photons, the photons must have 90 MeV of energy. It was impossible, so Chadwick proposed it was a result of formation of particles that had a mass similar to proton's one and had no charge.