

Discovery of protons essay sample



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The proton is a subatomic particle with the symbol p or p^+ and a positive electric charge of 1 elementary charge. The name proton was given to the hydrogen nucleus by Ernest Rutherford in 1920. The concept of a hydrogen-like particle as a constituent of other atoms was developed over a long period. As early as 1815, William Proust proposed that all atoms are composed of hydrogen atoms, based on a simplistic interpretation of early values of atomic weights, which was disproved when more accurate values were measured. In 1886, Eugene Goldstein discovered canal rays and showed that they were positively charged particles (ions) produced from gases. However, since particles from different gases had different values of charge-to-mass ratio (e/m), they could not be identified with a single particle, unlike the negative electrons discovered by J. J. Thomson. Following the discovery of the atomic nucleus by Ernest Rutherford in 1911, Antonius van den Broke proposed that the place of each element in the periodic table (its atomic number) is equal to its nuclear charge.

This was confirmed experimentally by Henry Moseley in 1913 using X-ray spectra. In 1917, (in experiments reported in 1919) Rutherford proved that the hydrogen nucleus is present in other nuclei, a result usually described as the discovery of the proton. Rutherford had earlier learned to produce hydrogen nuclei as a type of radiation produced as a product of the impact of alpha particles on hydrogen gas, and recognize them by their unique penetration signature in air and their appearance in scintillation detectors. These experiments were begun when Rutherford had noticed that, when alpha particles were shot into air (mostly nitrogen), his scintillation detectors showed the signatures of typical hydrogen nuclei as a product.

After experimentation Rutherford traced the reaction to the nitrogen in air, and found that when alphas were produced into pure nitrogen gas, the effect was larger. Rutherford determined that this hydrogen could have come only from the nitrogen, and therefore nitrogen must contain hydrogen nuclei. One hydrogen nucleus was being knocked off by the impact of the alpha particle, producing oxygen-17 in the process. Rutherford was asked by Oliver Lodge for a new name for the positive hydrogen nucleus to avoid confusion with the neutral hydrogen atom. He initially suggested both proton and prouton (after Prout). Rutherford later reported that the meeting had accepted his suggestion that the hydrogen nucleus be named the "proton," following Proust's word "protyle." The first use of the word "proton" in the scientific literature appeared in 1920.