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Baltimore City in the early 1900's suffered from improper treatment of water supply systems. This contributed to major outbreaks in water-borne diseases. To solve this problem, the Montebello Water Filtration Plant (MWFP), built in 1915, began using slow sand filtration to clean water. One of the first chemicals introduced to disinfect contaminated water was chlorine. However, with the increase in population and industrial pollutants, other chemicals were added to the water treatment process before filtration. Since 2015, students in the Baltimore area have been introduced to the chemistry involved in water treatment and purification through tours of the MWFP. This poster makes emphasis on the physical chemistry and mathematics of water treatment and purification to emphasize STEM education. Physical chemistry provides a deeper understanding of the different steps during water treatment. Chemicals added for solid removal depend on the physical condition of the water to be treated. Parameters like molecule conglomeration through direct collision, van der Waals forces of attraction and repulsion and surface charge attraction or diffusion are considered. As a result, sand filtration, that uses gravity and pressure to capture particulate matter by sand grains, is more effective. Safe treatment of water depends on accurate measurements of the possible contaminants in the water and their removal. Contaminant removal explained from a mathematical perspective results in better comprehension of the quantities of chemicals used to treat different types of contaminated water. The MWFP, during its routine water treatment process encounters changes in the environment that create challenges for clean water keepers. This poster presents sample exercises that consider pH changes, thermal stratification and various environmental changes.

