Abstract
The purpose of my project is to calculate the flow rate of underground water using Darcy's formula. I also want to find the relation between the flow rate and head difference, and length of the flow path.

Methods/Materials
I made an apparatus using two bottles to simulate the underground water flow path. I used one bottle for inlet and one for outlet. I filled inlet with sand. Put the inlet underneath a faucet with the water running for the whole duration of experiment to maintain a constant water level and pressure in the inlet.(15 minutes each experiment). By moving the outlet's position up and down, I made head differences and calculate flow rate (Q). In second set of experiments I changed flow path length by changing the length of the sand filled in the inlet bottle, and calculated (Q).
I used Darcy's formula $Q = K \cdot A \cdot (h_2 - h_1)/L$ to calculate the flow rate.

h1: inlet head  h2: outlet head  A: cross sectional Area
K: permeability coefficient

Results
I learned that Darcy's law does not work with turbulent flow of water, it applies only to calm water. I learned from my experiments that the relation between head difference and flow rate is linear, and flow rate is inversely related to length of flow path.

Conclusions/Discussion
Through the research I learned that Darcy's Law has other applications. The formula could be used in petroleum industry to calculate the flow rate of underground petroleum.