Answer Key: Calculating Efficiency

Step 1: We start by recalling the formula for chemical efficiency, which is equal to the kinetic energy of the expelled exhaust exhaust over the potential energy contained within the fuel: ½ * m * v^2 / mq.

Step 2: Next, since we assume that the mass of the original fuel is the same as the mass of the exhaust, we can cancel out the masses, leaving us with the formula efficiency = v^2 / 2q

Step 3: Now we can just plug in our numbers: efficiency = (600)(600)/(2)(5*10^6) = .035 = 3.5%

For those interested, this is a little bit higher than the true measured efficiency of Goddard's early rockets of around 2%. This is likely due to the assumption we made: in reality, the mass of the exhaust ejected will be smaller than the mass of the fuel, as debris from combustion will be left within the combustion chamber and nozzle,