Answer on Question #67127-Physics-Other

A pump moves water from a basement under pressure up to the first floor where it exits an open faucet. r1= 5cm, r2= 2cm, h1= 1m, h2= 5m, v1= 5m/s, Density of water is 1000 kg/m^3 .

(a) Determine v2

(b) Determine the pressure at the pump P1.

Solution

(a)

$$A_1 v_1 = A_2 v_2$$

$$v_2 = \frac{A_1}{A_2} v_1 = \left(\frac{r_1}{r_2}\right)^2 v_1 = \left(\frac{5}{2}\right)^2 5 = 31.25 \frac{m}{s}.$$

(b) $P_2 = 101325\ Pa$

From the Bernoulli equation:

$$P_1 = P_2 + \frac{1}{2}\rho(v_2^2 - v_1^2) + \rho g(h_2 - h_1) = 101325 + \frac{1}{2}1000(31.25^2 - 5^2) + 1000(9.8)(5 - 1)$$
$$= 616306\ Pa.$$