

Answer on Question #82336, Chemistry/ General Chemistry

a core ring with diameter of 4cm and a height of 5cm, the weight of the core ring with the undisturbed soil is 120g. the weight of the core ring with soil after oven drying for 24 hours is 105g. the volume occupied by air (V_a) in the undisturbed soil sample is 16cm³. taking a particle density of the soil to be 2.65g/cm³, calculate the porosity and gravitational volume?

Solution

Porosity, $n = \frac{V_v}{V_t}$, where V_v – volume of voids ($V_w + V_a$), V_t – total volume

$$V_t = V_{\text{core ring}} = \pi r^2 \times h = \pi (d/2)^2 \times h = 3.14 \times (4/2)^2 \times 5 = 62.8 \text{ cm}^3$$

$$V_a = 16 \text{ cm}^3$$

$$V_w = \frac{M_w}{\rho_w}$$

$$M_w = M_t - M_s = 120 \text{ g} - 105 \text{ g} = 15 \text{ g}$$

$$V_w = \frac{15 \text{ g}}{1 \text{ g/cm}^3} = 15 \text{ cm}^3$$

$$V_v = V_w + V_a = 16 \text{ cm}^3 + 15 \text{ cm}^3 = 31 \text{ cm}^3$$

$$n = \frac{31}{62.8} = 0.49$$

Gravitational volume :

$$\rho_s = \frac{M_s}{V_s} = G_s \rho_w$$

$$\therefore V_s = \frac{M_s}{G_s \rho_w} = \frac{120}{2.65 \times 1} = 45.28 \text{ cm}^3$$

Answer: 0.49 ; 45.28 cm³