

Calculations:

Volume of a cylinder: $V = \pi r^2 h$

Bulk density = mass/volume (grams/cubic centimeters)

As an example we have a 1000 cm³ volume of soil

A wet bulk density of 1.7 g/cm³

A dry bulk density of 1.4 g/cm³

Particle density = 2.65g/cm³

Wet soil weight = 1000 cm³ x 1.7 g/cm³ = 1700 g

Dry soil weight = 1000 cm³ x 1.4 g/cm³ = 1400 g

Mass of soil water = 1700 g – 1400 g = 300 g (density of water = 1 g/cm³)

Volume of water = 300 g x 1 cm³/g = 300 cm³

Gravimetric water content (mass of water : mass of solids) = 300 g/1400 g = 21.4%

Volumetric water content (volume of water : total volume) = 300 cm³/1000 cm³ = 30%

Volume of solids = mass/density = 1400 g/2.65 g/cm³ = 528.3 cm³

Air porosity = (1000 cm³ – 528.3 cm³ – 300 cm³)/1000 cm³ = 171.7 cm³/1000 cm³ = 17.2%

Total porosity = (171.7 cm³ + 300 cm³)/1000 cm³ = 47.3%

As a class, we will go and collect soil cores. We will measure the soil moisture of the soil core using a TDR and make note of it. Soil cores will be trimmed if needed and weighed. This will allow us to calculate the wet bulk density. Soil cores will then be placed in the oven and re-weighed next week to get a dry bulk density.

Calculate the following:

Volume of soil core

Wet Bulk Density

Dry Bulk Density

Wet Soil Weight

Dry Soil Weight

Mass of Soil Water

Volume of Water

Gravimetric Water Content

Volumetric Water Content

Volume of Solids

Air Porosity

Total Porosity