AGS 2110

INTRODUCTION TO SOIL SCIENCE

ASSIGNMENT NO 3- SOIL PHYSICAL PROPERTIES

November 2020

Answer all question: **Marks: 100**

Due: 3 December 2020

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1. Answer the following. (25 marks)
    a. How man nanometers are present in 10 decimeters? (2.5 marks)
    b. In a 15 kilometer race how many micrometers are the contestants expected to run? (2.5 marks)
    c. Express 1 hectare in square inches, given than 1 inch = 2.541 cm. (5 marks)
    d. Express 3 decilitres in milliliters (5 marks)
    e. How many kilograms of a soil with a bulk density of would occupy a 1 m^2 area to a depth of 25 cm? (10 marks)
2. A soil has an A horizon 15 cm deep and a particle density of 2.65g.cm^{-2}. At saturation, a 100 cm^3 of this soil contains 43 cm^3 of water. Answer the following. (60 marks)

    a. What is the dry bulk density of this soil? (5 marks)

    b. When this soil contains 5 % water on a gravimetric basis, how many litres of water are present in in 1 hectare of this soil horizon? (10 marks)

    c. If this horizon, with an initial gravimetric moisture content of 5 % receives 7 mm of rainfall all of which remains in the soil layer, what is the gravimetric moisture content of the soil after the rainfall, if no water is lost from the soil horizon after the rainfall. (15 marks)

    d. If the amount of oxygen in the soil air is 19 % soil layer and the soil temperature is 20^oC, how many kilograms of oxygen are present in one hectare of the soil layer after, after receiving the rainfall? (15 marks)

    e. If the soil horizon described in question 1c after receiving 7 mm of rainfall losses water by evapotranspiration at the rate of 4 mm/day. What will be the volumetric moisture content of the soil 3 days, after the rainfall? (15 marks)

3. When groundwater is present soil, water tends to rise above the surface of the water table by capillary rise to a certain height h, depending on the size of the pores in contact with the water table.

    a. The smallest macrospores are filled with water. (5 marks)
    b. The smallest mesopores are filled with water (5 marks)
    c. When micropores with a diameter of 15μm are filled with water. (5 marks)

4. How if 200 J/kg is required to extract water from a solution of $NaNO_3$ at 20 ^oC, what is the concentration of this solution in moles /kg of water.

USEFUL DATA: 22.4 litres is volume of one mole of gas at 20oC.
Avogadro's constant: $6.022140857 \times 10^{23}$

SOIL SCIENCE IS FUN