Answer on Question 52989, Physics, Mechanics | Kinematics | Dynamics

Question:

A reservoir of carbon tetrachloride (CCl_4) has a mass of $500kg$ and a volume of $0.315m^3$. Find the carbon tetrachloride weight, density, specific weight, specific volume and specific gravity. It is given that the specific weight of water at $4°C$ is $9810 \, N/m^3$.

Solution:

1) Let's find the weight of carbon tetrachloride:

$$W = mg = 500kg \cdot 9.81 \, m/s^2 = 4905N = 4.905kN.$$

2) The density of carbon tetrachloride is its mass per unit volume:

$$\rho = m/V = 500 \, kg/0.315m^3 = 1587 \, kg/m^3.$$

3) The specific weight of carbon tetrachloride is its weight per unit volume:

$$\gamma = W/V = 4.905 \cdot 10^3 N/0.315m^3 = 15.57 \, kN/m^3.$$

4) The specific volume of carbon tetrachloride is the ratio of its volume to its mass:

$$v = V/m = \rho^{-1} = (1587 \, kg/m^3)^{-1} = 0.00063 \, m^3/kg.$$

5) The specific gravity is defined as the ratio of the density of fluid to the density of a standard fluid. For liquids, the standard fluid is taken water. So, let's obtain the specific gravity of carbon tetrachloride:

$$s.g. = \rho/\rho_{water \, at \, 4°C} = 1587 \, kg/m^3/1000 \, kg/m^3 = 1.59.$$

But, we can also define the specific gravity as the ratio of the specific weight of fluid to the specific weight of a standard fluid:

$$s.g. = \gamma/\gamma_{water \, at \, 4°C} = 15.57 \cdot 10^3 \, N/m^3/9.81 \cdot 10^3 \, N/m^3 = 1.59.$$

Answer:

1) $W = 4.905kN.$

2) $\rho = 1587 \, kg/m^3.$

3) $\gamma = 15.57 \, kN/m^3.$

4) $v = 0.00063 \, m^3/kg.$

5) $s.g. = 1.59.$