

4. Water has a mass per mole of 18.0 g/mol, and each water molecule (H₂O) has 10 electrons. **(a)** How many electrons are there in one liter (1.00 x 10⁻³ m³) of water? **(b)** What is the net charge of all these electrons?

$$N_{Total} = N_{moles} \left(\frac{10 e^-}{molecule} \right) N_A$$

$$N_A = 6.02 \times 10^{23} \text{ molecules/mole}$$

$$N_{moles} = \frac{\text{mass}}{\text{molecular weight}} = \frac{V\rho}{\text{mol wt}} = \frac{(1.00 \times 10^{-3} \text{ m}^3) (10^3 \text{ kg/m}^3)}{18.0 \text{ g/mole} \left(\frac{10^{-3} \text{ kg}}{\text{g}} \right)}$$

$$N_{moles} = 55.56 \text{ moles}$$

$$N_{Total} = N_{moles} \left(\frac{10 e^-}{molecule} \right) N_A$$

$$N_{Total} = (55.56 \text{ moles}) \left(\frac{10 e^-}{molecule} \right) (6.02 \times 10^{23} \text{ molecules/mole})$$

$$N_{Total} = 3.345 \times 10^{26} e^-$$

$$Q_{Total} = N_{Total}(-e) = (3.35 \times 10^{26})(-1.6 \times 10^{-19} \text{ C}) = -5.36 \times 10^7 \text{ C}$$

$N_{Total} = 3.345 \times 10^{26} e^-$ $Q_{Total} = -5.36 \times 10^7 \text{ C}$
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Page

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