

Chemistry 20 – Lesson 18
Dilution

/42

1. $c_i v_i = c_f v_f$

/3 $v_i = \frac{c_f v_f}{c_i}$

$$v_i = \frac{10.0 \text{ mol/L} (8.0 \text{ L})}{24.7 \text{ mol/L}}$$

$v_i = 3.24 \text{ L}$

2. $c_i v_i = c_f v_f$

/3 $c_f = \frac{c_i v_i}{v_f}$

$$c_f = \frac{19.1 \text{ mol/L} (10 \text{ L})}{400 \text{ L}}$$

$c_f = 0.48 \text{ mol/L}$

3. $c_i v_i = c_f v_f$

/3 $v_i = \frac{c_f v_f}{c_i}$

$$v_i = \frac{0.70 \text{ mol/L} (5.0 \text{ L})}{14.8 \text{ mol/L}}$$

$v_i = 0.24 \text{ L}$

4. $c_i v_i = c_f v_f$

/3 $v_f = \frac{c_i v_i}{c_f}$

$$v_f = \frac{17.2 \text{ mol/L} (10.0 \text{ mL})}{24.7 \text{ mol/L}}$$

$v_f = 16.7 \text{ mL}$

5. $v_f = 5.0 \text{ L} + 2.5 \text{ L} = 7.5 \text{ L}$

/4 $c_i v_i = c_f v_f$

$$c_f = \frac{c_i v_i}{v_f}$$

$$c_f = \frac{0.70 \text{ mol/L} (5.0 \text{ L})}{7.5 \text{ L}}$$

$c_f = 0.47 \text{ mol/L}$

$$6. \quad c_i v_i = c_f v_f$$

$$/3 \quad c_f = \frac{c_i v_i}{v_f}$$

$$c_f = \frac{2.50 \text{ mol/L} (60.0 \text{ L})}{5.00 \times 10^3 \text{ L}}$$

$$\boxed{c_f = 0.030 \text{ mol/L}}$$

$$7. \quad c_i v_i = c_f v_f$$

$$/3 \quad v_f = \frac{c_i v_i}{c_f}$$

$$v_f = \frac{2.50 \text{ mol/L} (60.0 \text{ L})}{1.00 \times 10^{-6} \text{ mol/L}}$$

$$\boxed{v_f = 1.50 \times 10^8 \text{ L}}$$

$$8. \quad n = \frac{m}{M} \quad n = c v \quad c_f = \frac{n_{\text{solid}} + n_{\text{solution}}}{v}$$

$$/6 \quad n_{\text{solid}} = \frac{15.6 \text{ g}}{40.00 \text{ g/mol}} \quad n_{\text{solution}} = 1.00 \text{ mol/L} (3.60 \text{ L}) \quad c_f = \frac{0.39 \text{ mol} + 3.60 \text{ mol}}{3.60 \text{ L}}$$

$$n_{\text{solid}} = 0.39 \text{ mol} \quad n_{\text{solution}} = 3.60 \text{ mol} \quad \boxed{c_f = 1.11 \text{ mol/L}}$$

$$9. \quad n = \frac{m}{M} \quad n = c v \quad c_f = \frac{n_{\text{solid}} + n_{\text{solution}}}{v}$$

$$/6 \quad n_{\text{solid}} = \frac{5.00 \text{ g}}{60.06 \text{ g/mol}} \quad n_{\text{solution}} = 3.00 \text{ mol/L} (0.150 \text{ L}) \quad c_f = \frac{0.08325 \text{ mol} + 0.450 \text{ mol}}{0.150 \text{ L} + 0.850 \text{ L}}$$

$$n_{\text{solid}} = 0.08325 \text{ mol} \quad n_{\text{solution}} = 0.450 \text{ mol} \quad \boxed{c_f = 0.533 \text{ mol/L}}$$

$$10. \quad n_{\text{already in solution}} = c v \quad n_{\text{required}} = n_{\text{necessary}} - n_{\text{already in solution}}$$

$$/8 \quad n_{\text{already in solution}} = 0.00350 \text{ mol/L} (0.0756 \text{ L}) \quad n_{\text{required}} = 0.00756 \text{ mol} - 0.00265 \text{ mol}$$

$$n_{\text{already in solution}} = 0.00265 \text{ mol} \quad n_{\text{required}} = 0.004914 \text{ mol}$$

$$n_{\text{necessary}} = c v \quad m = n M$$

$$n_{\text{necessary}} = 0.100 \text{ mol/L} (0.0756 \text{ L}) \quad m_{\text{NH}_3} = 0.004914 \text{ mol} (17.04 \text{ g/mol})$$

$$n_{\text{necessary}} = 0.00756 \text{ mol} \quad \boxed{m_{\text{NH}_3} = 0.0837 \text{ g}}$$