

CHAPTER 4	Ideal Gas Law Answer Key	BLM 4.2.1A
ANSWER KEY		

1. $PV = nRT$

$$P = \frac{nRT}{V}$$

$$P = \frac{(4.25 \text{ mol}) \left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} \right) (293.15 \text{ K})}{25.0 \text{ L}}$$

$$P = 414 \text{ kPa}$$

2. $M_{\text{NO}} = 14.01 \frac{\text{g}}{\text{mol}} + 16.00 \frac{\text{g}}{\text{mol}}$

$$M_{\text{NO}} = 30.01 \frac{\text{g}}{\text{mol}}$$

$$n = \frac{m}{M}$$

$$n = \frac{30.0 \text{ g}}{30.01 \frac{\text{g}}{\text{mol}}}$$

$$n = 1.00 \text{ mol}$$

$$PV = nRT$$

$$V = \frac{nRT}{P}$$

$$V = \frac{(1.00 \text{ mol}) \left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} \right) (292.15 \text{ K})}{(3.26 \text{ atm}) \left(101.325 \frac{\text{kPa}}{\text{atm}} \right)}$$

$$V = 7.35 \text{ L}$$

3. $M_{\text{NH}_3} = 14.01 \frac{\text{g}}{\text{mol}} + 3 \left(1.01 \frac{\text{g}}{\text{mol}} \right)$

$$M_{\text{NH}_3} = 17.04 \frac{\text{g}}{\text{mol}}$$

$$n = \frac{m}{M}$$

$$n = \frac{45.3 \text{ g}}{17.04 \frac{\text{g}}{\text{mol}}}$$

$$n = 2.66 \text{ mol}$$

$$PV = nRT$$

$$T = \frac{PV}{nR}$$

$$T = \frac{(150 \text{ kPa})(64.2 \text{ L})}{(2.66 \text{ mol}) \left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} \right)}$$

$$T = 435 \text{ K}$$

CHAPTER 4	Ideal Gas Law Answer Key (continued)	BLM 4.2.1A
ANSWER KEY		

4. $PV = nRT$

$$n = \frac{PV}{RT}$$

$$n = \frac{(150 \text{ kPa})(4.8 \text{ L})}{\left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}}\right)(328.15 \text{ K})}$$

$$n = 0.264 \text{ mol}$$

$$M_{\text{SO}_3} = 32.07 \frac{\text{g}}{\text{mol}} + 3 \left(16.00 \frac{\text{g}}{\text{mol}} \right)$$

$$M_{\text{SO}_3} = 80.07 \frac{\text{g}}{\text{mol}}$$

$$n = \frac{m}{M}$$

$$m = nM$$

$$m = (0.264 \text{ mol}) \left(80.07 \frac{\text{g}}{\text{mol}} \right)$$

$$m = 21 \text{ g}$$

5. $PV = nRT$

$$n = \frac{PV}{RT}$$

$$n = \frac{(100 \text{ kPa})(70.0 \text{ L})}{\left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}}\right)(298.15 \text{ K})}$$

$$n = 2.82 \text{ mol}$$

6. $PV = nRT$

$$T = \frac{PV}{nR}$$

$$T = \frac{(101.5 \text{ kPa})(15 \text{ L})}{(0.61 \text{ mol}) \left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} \right)}$$

$$T = 3.0 \times 10^2 \text{ K or } 27^\circ \text{ C}$$

7. $PV = nRT$

$$V = \frac{nRT}{P}$$

$$V = \frac{(1.05 \times 10^5 \text{ mol}) \left(8.314 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} \right) (373.15 \text{ K})}{102 \text{ kPa}}$$

$$V = 3.19 \times 10^6 \text{ L}$$