

25 pts

Chemistry 1A - Key
Gases

Name Key

1) A child receives a helium balloon in a shopping mall. When he goes outside during a snowstorm, the balloon decreases in size. Which gas law is this an example of?

- A) Avogadro's Law; B) Ideal Gas Law;
C) Charles's Law; D) Boyle's Law; E) Dalton's Law

C

3

2) A large balloon is initially filled to a volume of 25.0 L at 353 K and a pressure of 2575 mm Hg. What volume of gas will the balloon contain at 1.35 atm and 253 K?

- A) 22.2 L; B) 87.5 L; C) 11.4 L; D) 45.0 L; E) 58.6 L

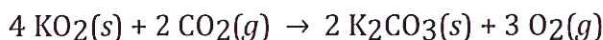
D

4

$$\frac{V_1 P_1}{T_1} = \frac{V_2 P_2}{T_2} \quad V_2 = \frac{V_1 P_1 T_2}{T_1 P_2}$$

$$= \frac{(25.0 \text{ L})(3.388 \text{ atm})(253 \text{ K})}{(353 \text{ K})(1.35 \text{ atm})}$$

3) Determine the theoretical yield and the percent yield if 21.8 g of K_2CO_3 is produced from reacting 27.9 g KO_2 with 29.0 L of CO_2 (at STP). The molar mass of $\text{KO}_2 = 71.10 \text{ g/mol}$ and $\text{K}_2\text{CO}_3 = 138.21 \text{ g/mol}$.



- A) 27.1 g, 80.4% yield; B) 179 g, 12.2% yield; C) 91.7 g, 23.8% yield; D) 206 g, 10.6% yield; E) 61.0 g, 35.7% yield

A

$$27.9 \text{ g KO}_2 \times \frac{1 \text{ mol KO}_2}{71.10 \text{ g}} \times \frac{2 \text{ mol K}_2\text{CO}_3}{4 \text{ mol KO}_2} = 0.1962 \text{ mol K}_2\text{CO}_3$$

$$n_{\text{CO}_2} = \frac{(0.082 \frac{\text{L atm}}{\text{mol K}})(273 \text{ K})}{(29.0 \text{ L})(1 \text{ atm})} \times \frac{2 \text{ mol K}_2\text{CO}_3}{2 \text{ mol CO}_2} = 1.2945$$

$$0.1962 \text{ mol K}_2\text{CO}_3 \times \frac{138.21 \text{ g}}{1 \text{ mol K}_2\text{CO}_3} = 27.117$$

$$\frac{21.8 \text{ g}}{27.1 \text{ g}} \cdot 100\% = 80.4\%$$

4) A 0.334 g sample of an unknown halogen occupies 109 mL at 398 K and 1.41 atm. What is the identity of the halogen?

A) Br₂; B) F₂; C) Cl₂; D) I₂; E) Ge

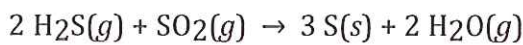
$PV=nRT$

$$n = \frac{(1.41 \text{ atm})(0.109 \text{ L})}{(0.082 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}})(398 \text{ K})} = 0.004705 \text{ mol}$$

$$\frac{0.334 \text{ g}}{0.004705 \text{ mol}} = 70.9779 \text{ g/mol}$$

C

5) Determine the volume of H₂S (at 375 K and 1.20 atm) needed to produce 55.0 g of S. Assume that there is excess SO₂ present.



A) 44.0 L; B) 29.3 L; C) 22.7 L; D) 34.1 L; E) 66.0 L

$PV=nRT$

$$55.0 \text{ g S} \times \frac{1 \text{ mol S}}{32.06 \text{ g}} \times \frac{2 \text{ mol H}_2\text{S}}{3 \text{ mol S}} = 1.143689 \text{ mol H}_2\text{S}$$

$$V = \frac{(1.143689 \text{ mol H}_2\text{S})(0.082 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}})(375 \text{ K})}{(1.20 \text{ atm})}$$

6) What pressure will 14.0 g of CO exert in a 3.5 L container at 75°C?

A) 4.1 atm; B) 5.0 atm; C) 6.4 atm; D) 1.1 atm; E) 2.3 atm

$PV=nRT$

$$14.0 \text{ g CO} \times \frac{1 \text{ mol CO}}{28.01 \text{ g}} = 0.49982 \text{ mol CO}$$

$$P = \frac{(0.49982 \text{ mol CO})(0.082 \frac{\text{L} \cdot \text{atm}}{\text{mol} \cdot \text{K}})(348 \text{ K})}{3.5 \text{ L}}$$

A

Cl₂

B

4

4

4