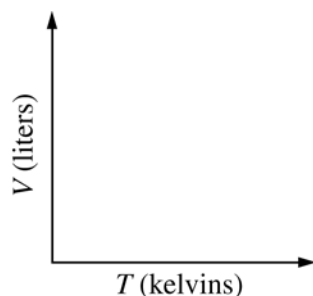
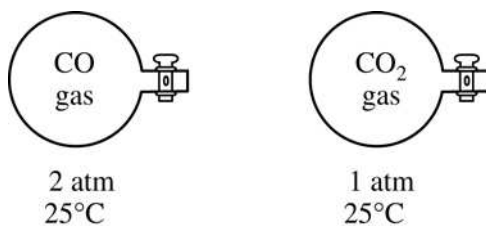


2004 AP[®] CHEMISTRY FREE-RESPONSE QUESTIONS

8. Answer the following questions about carbon monoxide, $\text{CO}(g)$, and carbon dioxide, $\text{CO}_2(g)$. Assume that both gases exhibit ideal behavior.
- (a) Draw the complete Lewis structure (electron-dot diagram) for the CO molecule and for the CO_2 molecule.
 - (b) Identify the shape of the CO_2 molecule.
 - (c) One of the two gases dissolves readily in water to form a solution with a pH below 7. Identify the gas and account for this observation by writing a chemical equation.
 - (d) A 1.0 mole sample of $\text{CO}(g)$ is heated at constant pressure. On the graph below, sketch the expected plot of volume versus temperature as the gas is heated.



- (e) Samples of $\text{CO}(g)$ and $\text{CO}_2(g)$ are placed in 1 L containers at the conditions indicated in the diagram below.



- (i) Indicate whether the average kinetic energy of the $\text{CO}_2(g)$ molecules is greater than, equal to, or less than the average kinetic energy of the $\text{CO}(g)$ molecules. Justify your answer.
- (ii) Indicate whether the root-mean-square speed of the $\text{CO}_2(g)$ molecules is greater than, equal to, or less than the root-mean-square speed of the $\text{CO}(g)$ molecules. Justify your answer.
- (iii) Indicate whether the number of $\text{CO}_2(g)$ molecules is greater than, equal to, or less than the number of $\text{CO}(g)$ molecules. Justify your answer.

END OF EXAMINATION