

**Problem Set 6: Real Gases: Deviations from Ideal Behavior**

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<p>10.83 (a) List two experimental conditions under which gases deviate from ideal behavior. (b) List two reasons why the gases deviate from ideal behavior. (c) Explain how the function <math>PV/RT</math> can be used to show how gases behave nonideally.</p>	<p>10.86 Briefly explain the significance of the constants <math>a</math> and <math>b</math> in the van der Waals equation.</p> $\left(P + \frac{n^2a}{V^2}\right)(V - nb) = nRT$
3	4
<p>32. Which of the following statements is(are) <i>true</i>? For the false statements, correct them.</p> <ol style="list-style-type: none"><li>At constant temperature, the lighter the gas molecules, the faster the average velocity of the gas molecules.</li><li>At constant temperature, the heavier the gas molecules, the larger the average kinetic energy of the gas molecules.</li><li>A real gas behaves most ideally when the container volume is relatively large and the gas molecules are moving relatively quickly.</li><li>As temperature increases, the effect of interparticle interactions on gas behavior is increased.</li><li>At constant <math>V</math> and <math>T</math>, as gas molecules are added into a container, the number of collisions per unit area increases resulting in a higher pressure.</li><li>The kinetic molecular theory predicts that pressure is inversely proportional to temperature at constant volume and moles of gas.</li></ol>	<p>10.106 Consider the following gases, all at STP: Ne, SF<sub>6</sub>, N<sub>2</sub>, CH<sub>4</sub>. (a) Which gas is most likely to depart from assumption 3 of the kinetic molecular theory (Section 10.7)? (b) Which one is closest to an ideal gas in its behavior? (c) Which one has the highest root-mean-square molecular speed? (d) Which one has the highest total molecular volume relative to the space occupied by the gas? (e) Which has the highest average kinetic molecular energy? (f) Which one would effuse more rapidly than N<sub>2</sub>?</p>
5	6
<p>10.109 Which of the noble gases other than radon would you expect to depart most readily from ideal behavior? Explain.</p>	<p>10.107 Does the effect of intermolecular attraction on the properties of a gas become more significant or less significant if (a) the gas is compressed to a smaller volume at constant temperature; (b) the temperature of the gas is increased at constant volume?</p>