A quantity of an ideal gas is contained in a balloon. Initially the gas temperature is 27°C.

You double the pressure on the balloon and change the temperature so that the balloon shrinks to one-quarter of its original volume. What is the new temperature of the gas?

A. 54°C  
B. 27°C  
C. 13.5°C  
D. 123°C  
E. 198°C
A quantity of an ideal gas is contained in a balloon. Initially the gas temperature is 27°C.

You double the pressure on the balloon and change the temperature so that the balloon shrinks to one-quarter of its original volume. What is the new temperature of the gas?

A. 54°C  
B. 27°C  
C. 13.5°C  
D. 123°C  
E. 198°C
This $pV$ diagram shows three possible states of a certain amount of an ideal gas.

Which state is at the highest temperature?

A. state #1
B. state #2
C. state #3
D. Two of these are tied for highest temperature.
E. All three of these are at the same temperature.
This $pV$ diagram shows three possible states of a certain amount of an ideal gas.

Which state is at the highest temperature?

A. state #1
B. state #2
C. state #3
D. Two of these are tied for highest temperature.
E. All three of these are at the same temperature.
Consider two specimens of ideal gas at the same temperature. The molecules in specimen #1 have greater molar mass than the molecules in specimen #2. How do the rms speed of molecules ($v_{\text{rms}}$) and the average translational kinetic energy per molecule (KE) compare in the two specimens?

A. $v_{\text{rms}}$ and KE are both greater in specimen #2.

B. $v_{\text{rms}}$ is greater in specimen #2; KE is the same in both specimens.

C. $v_{\text{rms}}$ is greater in specimen #2; KE is greater in specimen #1.

D. Both $v_{\text{rms}}$ and KE are the same in both specimens.

E. None of the above is correct.
Consider two specimens of ideal gas at the same temperature. The molecules in specimen #1 have greater molar mass than the molecules in specimen #2. How do the rms speed of molecules \( \nu_{\text{rms}} \) and the average translational kinetic energy per molecule (KE) compare in the two specimens?

A. \( \nu_{\text{rms}} \) and KE are both greater in specimen #2.

B. \( \nu_{\text{rms}} \) is greater in specimen #2; KE is the same in both specimens.  

C. \( \nu_{\text{rms}} \) is greater in specimen #2; KE is greater in specimen #1.

D. Both \( \nu_{\text{rms}} \) and KE are the same in both specimens.

E. None of the above is correct.
Consider two specimens of ideal gas at the same temperature. Specimen #1 has the same total mass as specimen #2, but the molecules in specimen #1 have greater molar mass than the molecules in specimen #2. In which specimen is the total translational kinetic energy of the entire gas greater?

A. specimen #1

B. specimen #2

C. The answer depends on the particular mass of gas.

D. The answer depends on the particular molar masses.

E. Both C. and D. are correct.
Consider two specimens of ideal gas at the same temperature. Specimen #1 has the same total mass as specimen #2, but the molecules in specimen #1 have greater molar mass than the molecules in specimen #2. In which specimen is the total translational kinetic energy of the entire gas greater?

A. specimen #1
B. specimen #2
C. The answer depends on the particular mass of gas.
D. The answer depends on the particular molar masses.
E. Both C. and D. are correct.
You have a quantity of ideal gas in a cylinder with rigid walls that prevent the gas from expanding or contracting. If you double the rms speed of molecules in the gas, the gas pressure

A. increases by a factor of 16.
B. increases by a factor of 4.
C. increases by a factor of 2.
D. increases by a factor of $2^{1/2}$. 
A18.5

You have a quantity of ideal gas in a cylinder with rigid walls that prevent the gas from expanding or contracting. If you double the rms speed of molecules in the gas, the gas pressure

A. increases by a factor of 16.

B. increases by a factor of 4.

C. increases by a factor of 2.

D. increases by a factor of $2^{1/2}$. 

✓
Q18.6

You have 1.00 mol of an ideal monatomic gas and 1.00 mol of an ideal diatomic gas whose molecules can rotate. Initially both gases are at room temperature. If the same amount of heat flows into each gas, which gas will undergo the greatest increase in temperature?

A. the monatomic gas
B. the diatomic gas
C. Both will undergo the same temperature change.
D. The answer depends on the molar masses of the gases.
A18.6

You have 1.00 mol of an ideal monatomic gas and 1.00 mol of an ideal diatomic gas whose molecules can rotate. Initially both gases are at room temperature. If the same amount of heat flows into each gas, which gas will undergo the greatest increase in temperature?

A. the monatomic gas
B. the diatomic gas
C. Both will undergo the same temperature change.
D. The answer depends on the molar masses of the gases.
Q18.7

The molar heat capacity at constant volume of diatomic hydrogen gas ($\text{H}_2$) is $5R/2$ at 500 K but only $3R/2$ at 50 K. Why is this?

A. At 500 K the molecules can vibrate, while at 50 K they cannot.
B. At 500 K the molecules cannot vibrate, while at 50 K they can.
C. At 500 K the molecules can rotate, while at 50 K they cannot.
D. At 500 K the molecules can rotate, while at 50 K they cannot.
The molar heat capacity at constant volume of diatomic hydrogen gas ($H_2$) is $5R/2$ at 500 K but only $3R/2$ at 50 K. Why is this?

A. At 500 K the molecules can vibrate, while at 50 K they cannot.

B. At 500 K the molecules cannot vibrate, while at 50 K they can.

C. At 500 K the molecules can rotate, while at 50 K they cannot.

D. At 500 K the molecules can rotate, while at 50 K they cannot.
If the pressure of the atmosphere is below the triple-point pressure of a certain substance, that substance can exist (depending on the temperature)

A. as a liquid or as a vapor, but not as a solid.
B. as a liquid or as a solid, but not as a vapor.
C. as a solid or as a vapor, but not as a liquid.
D. as a solid, a liquid, or a vapor.
If the pressure of the atmosphere is below the triple-point pressure of a certain substance, that substance can exist (depending on the temperature)

A. as a liquid or as a vapor, but not as a solid.
B. as a liquid or as a solid, but not as a vapor.
C. as a solid or as a vapor, but not as a liquid.
D. as a solid, a liquid, or a vapor.

A18.8