

1. A sealed, rigid container contains three gases: 28.0 g of nitrogen, 40.0 g of argon, and 36.0 g of water vapor. If the total pressure exerted by the gases is 2.0 atm, what is the partial pressure of the nitrogen?

- A. 0.33 atm
- B. 0.40 atm
- C. 0.50 atm
- D. 2.0 atm

2. Which of the following pairs of elements is most likely to create an interstitial alloy?

- A. Titanium and copper
- B. Aluminum and lead
- C. Silver and tin
- D. Magnesium and calcium

3. Why can a molecule with the structure of  $\text{NBr}_5$  not exist?

- A. Nitrogen only has two energy levels and is thus unable to expand its octet.
- B. Bromine is much larger than nitrogen and cannot be a terminal atom in this molecule.
- C. It is impossible to complete the octets for all six atoms using only valence electrons.
- D. Nitrogen does not have a low enough electronegativity to be the central atom of this molecule.

**Questions 4-6 refer to the following information.**

An evacuated rigid container is filled with exactly 2.00 g of hydrogen and 10.00 g of neon. The temperature of the gases is held at  $0^\circ\text{C}$  and the pressure inside the container is a constant 1.0 atm.

4. What is the mole fraction of neon in the container?

- A. 0.17
- B. 0.33
- C. 0.67
- D. 0.83

5. What is the volume of the container?

- A. 11.2 L
- B. 22.4 L
- C. 33.5 L
- D. 48.8 L

6. Which gas particles have a higher RMS velocity and why?

- A. Hydrogen, because it has a lower molar mass
- B. Neon, because it has a higher molar mass
- C. Hydrogen, because it has a larger atomic radius
- D. Neon, because it has a smaller atomic radius

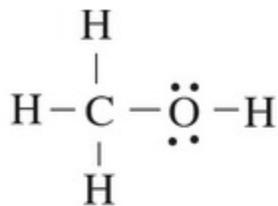
7. A sample of liquid  $\text{NH}_3$  is brought to its boiling point. Which of the following occurs during the boiling process?

- A. The N-H bonds within the  $\text{NH}_3$  molecules break apart.
- B. The overall temperature of the solution rises as the  $\text{NH}_3$  molecules speed up.
- C. The amount of energy within the system remains constant.
- D. The hydrogen bonds holding separate  $\text{NH}_3$  molecules together break apart.

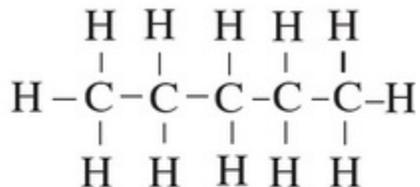
8. Which of the following compounds would have the highest lattice energy?

- A.  $\text{LiF}$
- B.  $\text{MgCl}_2$
- C.  $\text{CaBr}_2$
- D.  $\text{C}_2\text{H}_6$

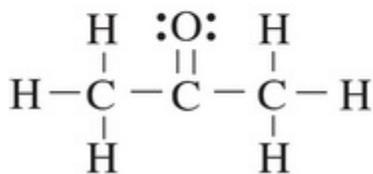
9. The following diagrams show the Lewis structures of four different molecules. Which molecule would travel the farthest in a paper chromatography experiment using a polar solvent?



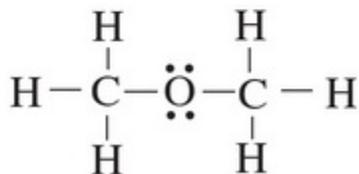
Methanol



Pentane



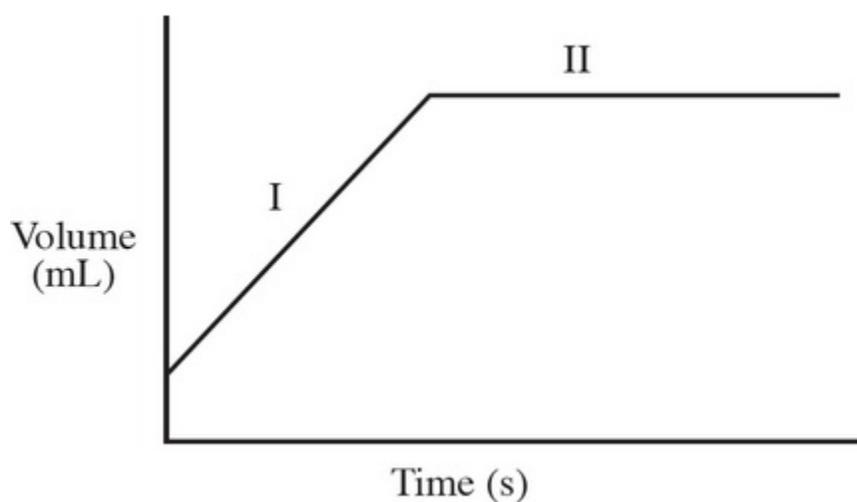
Acetone



Ether

- A. Methanol
- B. Pentane
- C. Acetone
- D. Ether

10.



The volume of a gas is charted over time, giving the above results. Which of the following options provides a possible explanation of what was happening to the gas during each phase of the graph?

- A. During phase I, the temperature decreased while the pressure increased. During phase II, the temperature was held constant as the pressure decreased.
- B. During phase I, the temperature increased while the pressure was held constant. During phase II, the temperature and pressure both decreased.
- C. During phase I, the temperature was held constant while the pressure increased. During phase II, the temperature and pressure both decreased.
- D. During phase I, the temperature and pressure both increased. During phase II, the temperature was held constant while the pressure decreased.