

NChO – Gas Laws

1999

21. The temperature of a gas sample is increased from 50 °C to 100 °C. By what factor must the pressure be changed if the volume is to be kept constant?

- (A) 0.5 (C) 1.15
(B) 0.87 (D) 2.0

22. What is the molar mass of a gas that diffuses twice as fast as SO₂? (The molar mass of SO₂ is 64 g mol⁻¹)

- (A) 16 g mol⁻¹ (C) 128 g mol⁻¹
(B) 32 g mol⁻¹ (D) 256 g mol⁻¹

1998

16. Which set of temperature and pressure conditions will cause a gas to exhibit the greatest deviation from ideal gas behavior?

- (A) 100 °C and 4 atm (C) -100 °C and 4 atm
(B) 100 °C and 2 atm (D) 0 °C and 2 atm

17. A mixture of 0.5 mol of CH₄, 0.5 mol of H₂ and 0.5 mole of SO₂ is introduced into a 10.0 L container at 25 °C. If the container has a pinhole leak, which describes the relationship between the partial pressures of the individual components in the container after 3 hours?

- (A) P_{SO2} > P_{CH4} > P_{H2} (C) P_{SO2} < P_{CH4} > P_{H2}
(B) P_{SO2} < P_{CH4} < P_{H2} (D) P_{SO2} = P_{CH4} = P_{H2}

18. Which factor affects the vapor pressure of a liquid?

- (A) Temperature
(B) atmospheric pressure
(C) Volume of the liquid
(D) surface area of the liquid

19. A 500 mL gas sample is collected over water at a pressure of 740mmHg and 25 °C. What is the volume of the dry gas at STP? (STP = 1 atm and 0 °C) Vapor Pressure at 25 ° of H₂O equals 24mmHg

| | |
|-----|--|
| (A) | $500 \times \frac{740 + 24}{760} \times \frac{298}{273}$ |
| (B) | $500 \times \frac{740 - 24}{760} \times \frac{273}{298}$ |
| (C) | $500 \times \frac{760}{740 - 24} \times \frac{273}{298}$ |
| (D) | $500 \times \frac{760}{740 + 24} \times \frac{298}{273}$ |

1997

20. A mixture of several gases is prepared for a series of photosynthesis experiments. If the mixture contains 0.060 mol of O₂(g), 0.30 mol of N₂(g), 0.030 mol of CO₂(g), and 0.010 mol of H₂O(g) and exerts a total pressure of 1.20 atm, what is the partial pressure of CO₂ in this mixture?

- (A) 1.2 atm (C) 0.090 atm
(B) 0.36 atm (D) 0.075 atm

21. The molar mass of a volatile liquid is to be determined by adding a sample of it to a pre-weighed 125 mL a conical flask covered with a piece of aluminum foil with a pinhole in it. After heating the flask in a boiling water bath to vaporize the liquid, the outside of the flask is dried and the flask is reweighed. What is the molar mass of the volatile liquid?

| Table of Data | |
|--------------------------|-----------|
| Mass of empty flask | 63.427 g |
| Mass of flask with vapor | 63.768 g |
| Atmospheric pressure | 748 mm Hg |

- (A) 44.0 g mol⁻¹
(B) 670 g mol⁻¹
(C) 84.9 g mol⁻¹
(D) 166 g mol⁻¹

22. Consider two 1.0 L flasks at the same temperature. One flask contains ammonia gas and the second contains an equal number of moles of sulfur dioxide gas. Which of these characteristics will be the same for both gases?

1. average molecular velocity
2. density
3. pressure

- (A) 1 only (C) 1 and 2 only
 (B) 3 only (D) 1 and 3 only

1996

20. What will happen to the volume of a bubble of air found underwater in a lake, where the temperature is 15 °C and the pressure is 1.5 atm, if the bubble then rises to the surface where the temperature is 25 °C and the pressure is 1.0 atm?

Its volume will become...

- (A) greater by a factor of 2.5.
 (B) greater by a factor of 1.6.
 (C) greater by a factor of 1.1.
 (D) smaller by a factor of 0.70.

1995

16. Which gas would be expected to have a density less than that of argon under the same conditions?

- I. carbon dioxide
- II. chlorine
- III. oxygen

- (A) II only (C) I and II only
 (B) III only (D) I, II, and III

19. An 81.4 mL sample of H₂ is collected over water at 23.0 °C and 752.3 mmHg. How many moles of H₂ are present?

Vapor pressure at 23.0 °C for H₂O equals 21.1 mmHg

- (A) 1.61×10^{-3} mol (C) 3.70×10^{-3} mol
 (B) 3.22×10^{-3} mol (D) 6.44×10^{-3} mol

20. Equal moles of hydrogen and oxygen gas are placed in a container with a pinhole through which both can escape. What fraction of the oxygen escapes in the time required for one-half of the hydrogen to escape?

- (A) 1/8 (B) 1/4 (C) 3/8 (D) 1/2

1994

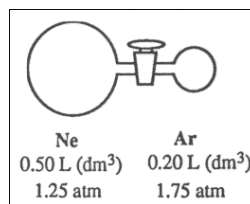
17. At the same temperature and pressure, samples of oxygen and carbon dioxide gas with equal masses

- (A) contain the same number of molecules
 (B) occupy equal volumes
 (C) possess molecules with the same average velocity
 (D) have molecules with the same average kinetic energy

18. The number of moles in 2.50 L (dm³) of nitrogen gas at 100 °C and 700 mm Hg is

- (A) 57.1 (C) 0.280
 (B) 2.11 (D) 0.0752

19. What is the final pressure (in atm) in this apparatus when equilibrium is reached after the stopcock has been opened? (Assume the volume of the connecting tube to be negligible.)



| Ne | Ar |
|---------------------------|---------------------------|
| 0.50 L (dm ³) | 0.20 L (dm ³) |
| 1.25 atm | 1.75 atm |

- (A) 0.5 (C) 1.5
 (B) 1.4 (D) 3.0

20. Real gases are most likely to deviate from ideal behavior at conditions of

- (A) low T and low P
 (B) low T and high P
 (C) high T and high P
 (D) high T and low P