1. The energy in a gas that keeps the molecules of the gas apart is supplied by _____.

(A) electrical repulsion between the gas molecules
(B) heat energy
(C) nuclear energy
(D) potential energy

Hint: Gas molecules are often non-polar so electrical forces could not be repelling them apart.

Even if molecules did have a charge on them, according to Coulomb's law, electrical repulsion falls off rapidly with distance.

What makes atoms and molecules bounce about is heat energy which provides them with kinetic energy.

2. Electrical repulsion between any two electrical charges falls off by _____ every time the distance between the electrical charges is doubled.

(A) one-half
(B) one-quarter
(C) one-eighth
(D) one-tenth

Hint: According to Coulomb's law, electrical repulsion falls off by the square of the distance, as if the energy projecting from an object were spreading out and passing through a square window.

3. The average kinetic energy of a gas molecule is measured by the _____.

(A) pressure of the gas
(B) number of gas molecules in the gas
(C) pressure times volume of the gas
(D) temperature of the gas

Hint: Kinetic energy is provided by heat energy and we measure heat energy with a thermometer.

4. The total energy of a gas can be calculated from its pressure and volume, or from its _____.

(A) temperature and moles
(B) temperature alone
(C) moles alone
(D) total potential energy

Hint: In the formula PV = nRT, where P is pressure, V is volume, n is moles, R is the gas constant, T is temperature in Kelvins, PV and nRT are both measures of a gas' energy.

This means we can measure a gas' energy by knowing its pressure and volume, or by knowing the number of moles in the gas and its temperature.

5. If 1.5 L of a gas at 25°C exerts a pressure of 425 mm Hg, how many moles of the gas are there?

(A) 0.034 moles
(B) 0.043 moles
(C) 0.34 moles
(D) 0.43 moles

Hint: 1 atmosphere is 760mg Hg, so 425 mm Hg is only 425/760 or 0.56 atm. The temperature of the gas in Kelvins is 273 + 23, or 298 Kelvins.

Plugging in the numbers into PV = nRT, (0.56 atm)(1.5L) = n(0.0826 atm/mol K) (298 K), n works out to be 0.034 moles.

6. Which statement is untrue?

(A) Density refers to the mass of only a single substance divided by its volume.
(B) One measure of density is number of particles (e.g., moles) divided by its volume.
(C) Concentration only refers to one substance mixed with or dissolved in another substance.
(D) One common measure of concentration compares the moles of solute to the volume of total solution.

Hint: Look at the different units for density. do they refer to mass or number of particles?

7. STP stands for standard temperature (273 Kelvin or 0 degrees Celsius) and pressure (1 atmosphere). What is the volume of 1 mole of a gas at STP?

(A) 14.4 L
(B) 22.4 L
(C) 34.4 L
(D) 44.4 L

Hint: 1 mole of any gas under 1 atmosphere of pressure (760mm Hg) at 273 Kelvins, which is the same is 0° Celsius, occupies 22.4 liters of space.

8. The partial pressure of a gas is the pressure that a gas exerts when _____.

(A) it is one of several gases in a mixture of gases
(B) its pressure is measured at other than standard temperature
(C) its pressure is measured at other than 22.4 L
(D) more or less than a mole of the gas is being measured at standard temperature

Hint: Because gas molecules are so far apart from each other, a mixture of gases acts like a gas made up of only one type of molecule.

Each type of molecule in the gas contributes its share to the total pressure of the gas.

9. The kinetic energy of a moving object is equal to _____.

(A) mv
(B) mv^2
(C) ½ mv^2
(D) $2mv^2$

Hint: Momentum is mass times velocity.

When energy is applied to a stationary object, which has zero momentum, the object reaches a final velocity of v.

The energy needed to do this is one-half its final momentum, mv, times its final velocity, or ½ mv^2.

10. In a mixture of equal numbers of large and small gas molecules, the energy of the small gas molecules is _____ the energy of the large gas molecules.

(A) more than
(B) less than
(C) the same as

Hint: Not only do all gas molecules contribute equally to the pressure of a gas, they also contribute equally to the energy of a gas.

11. Vapor pressure, the pressure exerted by a liquid when it evaporates in a closed container, _____.

(A) depends on the temperature but not on the volume of the space above the liquid
(B) increases as the volume of the liquid exceeds the volume of the gas over the liquid
(C) is independent of the rate of condensation
(D) rises when solutes are dissolved in the liquid

Hint: Vapor pressure is a measure of the heat energy a gas needs to form bubbles with a pressure equal to atmospheric pressure (which is the pressure that was preventing the bubbles from forming in the first place).

12. A gas at 25°C is 50ml in volume. What is its temperature after its volume rises to 75ml under constant pressure?

(A) 25°C *x* 75ml/50ml
(B) 298 Kelvin *x* 75ml/50ml
(C) 25°C *x* 50ml/75ml
(D) 298 Kelvin *x* 50ml/75ml

Hint: PV always equal nRT, where T is measured in Kelvins.
If no new gas molecules are added or subtracted, n remains constant.
R is always constant, and P, were are told, remained constant.
If PV = nRT, and n, R, and P are constant, then V/T, which equals nR/P, is constant -- before and after the gas expanded.
P/V before is 298 Kelvin/50ml and after, T/75ml. Cross multiplying, T = 298 Kelvin x 75ml/50ml.