

REVIEW-Gases KEY

I. Kinetic Molecular Theory & Gas Laws Concepts

1. What are the five assumptions of kinetic molecular theory?

Gases are mostly empty space; in constant rapid motion; not repulsive or attractive forces; collisions between particles are elastic; kinetic energy is directly proportional to temperature

2. Convert the following pressure values:

$$2.45 \text{ atm} \rightarrow \text{Pa}$$

$$\mathbf{248,000 \text{ Pa}}$$

$$12,300 \text{ Pa} \rightarrow \text{torr}$$

$$\mathbf{92.3 \text{ torr}}$$

$$659 \text{ mmHg} \rightarrow \text{atm}$$

$$\mathbf{0.867 \text{ atm}}$$

$$805 \text{ torr} \rightarrow \text{mmHg}$$

$$\mathbf{805 \text{ mmHg}}$$

3. Convert the following Celsius temperatures to Kelvin:

a. $200.0 \text{ }^\circ\text{C}$

$$\mathbf{473 \text{ K}}$$

b. $27.0 \text{ }^\circ\text{C}$

$$\mathbf{300.0 \text{ K}}$$

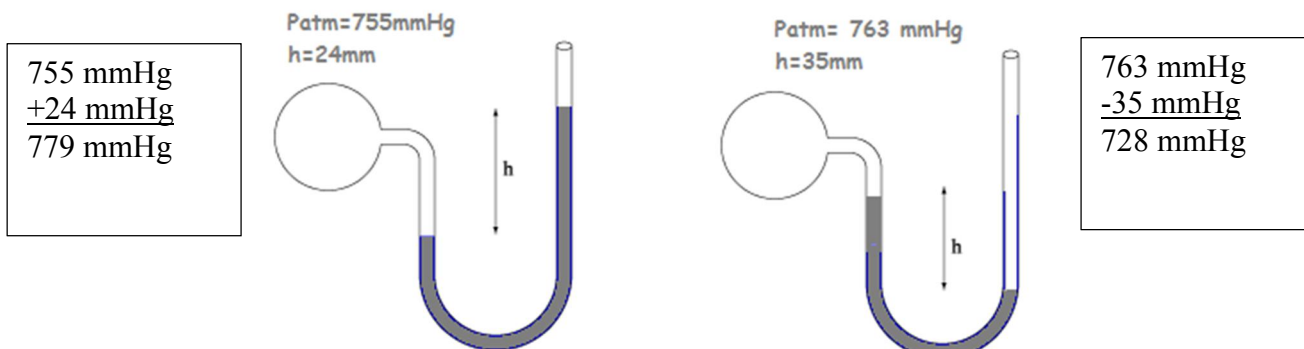
4. Explain how increasing the number of gas molecules in a container is related to collisions of gas molecules and pressure

As you add more particles, the number of collisions to the surface of the container will increase. Since pressure is due to the amount of collisions on the surface of a container, by increasing collisions you will also increase the pressure. Therefore, increasing particle number will increase pressure.

5. What is the relationship between pressure and altitude?

As you go higher in altitude the pressure decreases; an inverse relationship.

6. What is the name of the devices below? Determine the pressure for both.



Open manometer.

7. What is meant by STP? What are the values?

STP = Sandard Temperature and Pressure

ST = 273 K

SP = 1.00 atm

8. What units does temperature have to be in in order to use the gas laws equations? What is the equation for this conversion?

Temperature must always be in Kelvin.

$$\underline{\quad} \text{ }^\circ\text{C} + 273.15 = \underline{\quad} \text{ K}$$

9. If two containers have the same volume of gas at STP, what do you know about the number of moles (and therefore molecules) of gas in the containers?

They are the same

10. What is molar volume? What is it used for? Under what conditions can molar volume be used for?

***Molar volume = volume occupied by one mole
Used to find out volume occupied by specific amounts
@ STP 1 mole = 22.4 L***

11. How do you know which gas constant, R, value to use in the ideal gas law?

Look at the unit for pressure

12. What is the relationship for the following conditions:

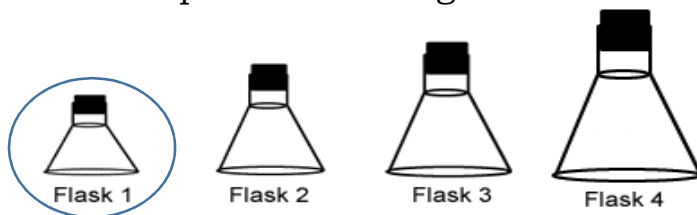
Constant	Compared conditions	Relationship
P	V & T	<i>Direct</i>
V	P & T	<i>Direct</i>
T	P & V	<i>Inverse</i>

13. Why does a balloon shrink in size when it is taken outside on a cold day?

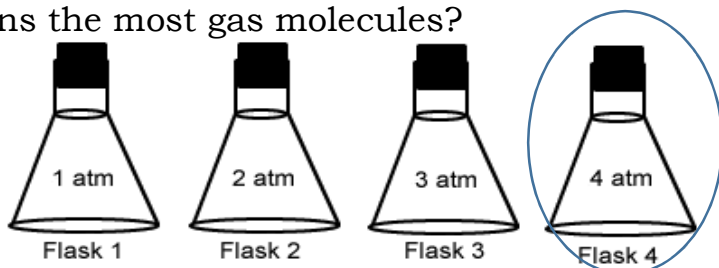
The molecules slow down and this causes less collisions with the surface of the container and occupying less space.

14. Which Gas Law is involved when a balloon pops after being sat on?
a. Charles Law b. **Boyle's Law** c. Gay-Lussac's Law d. Ideal Gas Law
15. As the volume of confined gas decreases at constant temperature, the pressure exerted by the gas _____.
a. decreases b. **increases** c. stay the same d. fluctuates

16. Each of these flasks contains the same number of gas molecules. In which container is the pressure the highest?



17. Each of these flasks is the same size and at the same temperature. Which one contains the most gas molecules?



18. Assuming that the temperature remains constant. How can you increase the pressure of a gas?

- Increase the container volume
- Add more molecules of the gas**
- Decreases the container volume**
- None of the above

19. Consider two gases, A and B, in containers of equal volume. Both are at the same volume, temperature and pressure.

A

B

a. mass: **0.34 g** **0.48 g**

Are the following statements true or false? *Why?*

T a) The number of molecules of A is equal to the number of molecules of B

volumes are equal so # molecules are equal

F b) The molar mass of A is greater than the molar mass of B

mass of B is larger so molar mass is larger

F c) Both samples have the same average kinetic energy.

molar mass of B is larger so kinetic energy is lower

T d) The molecules of A collide with the container walls more frequently than the molecules of B

A has higher speed so collisions more often

20. Compare the rates of effusion of oxygen gas to fluorine gas. Show calculations

Oxygen is 1.09 times faster than fluorine gas

21. Rank the gases from lowest to highest kinetic energy: He, Kr, I₂, SO₂

I₂, Kr, SO₂, He