# Gas Chemistry Questions with Solutions

**Q1. Which of the following gases is used in refrigeration and in fire extinguishers?**

a.) Nitrogen
b.) Hydrogen
c.) Carbon dioxide
d.) Methane

**Correct Answer-** (c.) Carbon dioxide

**Q2. What is the name of the gas used in high-speed photography?**

a.) Nitrous Oxide
b.) Krypton
c.) Xenon
d.) Radon

**Correct Answer-** (b.) Krypton

**Q3. Which of the following gases is used in the production of chloroform?**

a.) Methane
b.) Propane
c.) Butane
d.) Acetylene

**Correct Answer-** (a.) Methane

**Q4. What is the name of the gas that is abundant on Earth in both combined and free form with other elements?**

a.) Oxygen
b.) Nitrogen
c.) Hydrogen
d.) Sulphur

**Correct Answer-** (a.) Oxygen

**Q5. Which of the following gases is used in the production of vanaspati ghee, alcohol, and ammonia?**

a.) Hydrogen

b.) Ozone
c.) Propane
d.) Butane

**Correct Answer.** (a.) Hydrogen

**Q6. State True or False.**
The confining gas exerts uniform pressure on the container's walls in all directions.

**Answer.** True. The confining gas exerts uniform pressure on the container's walls in all directions.

**Q7. What's the connection between a gas particle's mass and the rate at which it diffuses through another gas?**

**Answer.** The larger the particle is, the slower it diffuses.
For a given kinetic energy or temperature, a heavy particle has a lower velocity. A large particle interacts more with its surroundings, slowing it down. As a result, heavy particles diffuse more slowly than light or small particles.

**Q8. What causes gas pressure?**

**Answer.**

- When the molecules collide with the container's walls, they exert force on the container. This force manifests as pressure on the container's walls.
- The collision of molecules will not cause pressure to build upon the container's walls.
- The random motion of gas molecules will not generate pressure.
- Hence, the collision of gas molecules against the walls of the container causes gas pressure.

**Q9. State Avogadro's law.**

**Answer.** Avogadro's law states that if the gas is an ideal gas, the same number of molecules exists in the system. The law also states that if the volume of gases is equal, it means that the number of the molecule will be the same as the ideal gas only when it has equal volume.

**Q10. What do you understand by an Ideal gas?**

**Answer**. Ideal gases are also known as perfect gas. It establishes a relationship among the four different gas variables such as pressure (P), Volume(V), Temperature(T) and amount of gas (n). Mathematically, the ideal gas law can be stated as-
$pV = nRT$

**Q11. Discuss the postulates of the Kinetic theory of gases.**

**Answer.** Kinetic Theory of Gases Postulates:

1.) Gas molecules are small and very far apart. The majority of a gas's volume is empty space.
2.) Gas molecules are constantly moving at random. There are just as many molecules moving in one direction as there are in the other.
3.) Molecules can collide with one another and with the container's walls. Collisions with the walls determine the pressure of the gas.
4.) When molecules collide, they lose no kinetic energy; thus, the collisions are said to be perfectly elastic. Unless there is some outside interference, all the molecules' total kinetic energy remains constant.
5.) Except during the collision process, the molecules have no attractive or repulsive forces on one another. They move in straight lines between collisions.

**Q12. Give the difference between solids, liquids and gases.**

**Answer.** The primary distinction between solids, liquids, and gases is:

- Solids (substances in their solid-state) have distinct shapes and occupy fixed volumes.
- Liquids (substances that exist in the liquid state) do not have distinct shapes, but they do occupy specific volumes. They are slightly compressible and occupy the shape of their containers.
- Gases (substances that exist in a gaseous state) have no definite shapes and no fixed volumes. Gaseous substances are highly compressible and occupy the shape of their container.

**Q13. Gases cannot be liquefied unless their temperature is brought down to or below their critical temperature. Justify or rectify.**

**Answer.** This statement is correct. At or below the critical temperature, a gas can be liquefied by applying more pressure alone. $P= (RT/V-b) – (a/V^2)$ is the Van der Walls equation for one-mole gas.
At very high temperatures, the second term in comparison and $V>>b$ can be ignored, and the equation becomes equal to the ideal gas equation.
Thus, liquefaction will not occur at those temperatures. Both terms will be important below and at a certain temperature – the gas will behave non-ideally and can be liquefied. The same holds true for any other state equation. This certain temperature is known as Critical temperature, Tc

**Q14. What are greenhouse gases? What are its causes and effect on the environment?**

**Answer.** Greenhouse gases are gases that absorb infrared radiation and thus cause the greenhouse effect. Carbon dioxide, methane, and chlorofluorocarbons are examples."
The following are the primary causes of the greenhouse effect:

- Fossil fuel combustion- Carbon dioxide is released when fossil fuels are burned. The use of fossil fuels has increased as the population has grown. As a result, the amount of greenhouse gases released into the atmosphere has increased.

- Deforestation- Plants and trees absorb carbon dioxide and emit oxygen. The cutting of trees causes a significant increase in greenhouse gases, which raises the earth's temperature.
- Farming- Nitrous oxide, a component of fertilisers, contributes to the greenhouse effect in the atmosphere.
- Landfills and Industrial Waste- Industries and factories produce hazardous gases that are released into the atmosphere.
  Landfills also emit carbon dioxide and methane, which contribute to greenhouse gas emissions.

The primary consequences of increased greenhouse gas emissions are

- Climate Change
- Ozone Layer Depletion, Smog, and Air Pollution
- Water Body Acidification

**Q15. If the temperature is kept constant, how can we increase the pressure of a gas?**

**Answer.** The ideal gas equation is **pV = nRT**
There are three ways to increase the pressure of a gas-

- Increase the quantity of gas. The "n" in the equation represents this. Increasing the number of collisions between gas molecules and container walls increases the number of collisions. This adds to the pressure.
- Increase the gas's temperature. This is represented by the letter "T" in the equation. Increasing the temperature adds energy to the gas molecules, causing them to move faster and collide more.
- Reduce the size of the gas. This represents the "V" in the equation. Gases, by definition, can be compressed, so putting the same gas into a smaller container will result in higher pressure. As the gas molecules are forced closer together, collisions (force) and pressure increase.

## Practise Questions on Gases

**Q1. Greenhouse gases absorb:**

**a.) Ultraviolet radiations**
**b.) Visible light radiations**
**c.) Microwave radiations**
**d.) Infrared radiations**

**Correct Answer-** (d.) Infrared radiations.
Explanation- They trap heat rays because they have properties that are either enhanced or decreased by heat. Capturing infrared rays is one of the characteristics of greenhouse gases.

**Q2. Which of the gases is a neutral gas?**

**a.) $O_2$**
**b.) $CO_2$**
**c.) $SO_2$**
**d.) All of the above**

**Correct Answer-** (a.) $O_2$

**Q3. In the lab, an unknown gas is being examined. 1g of this gas is placed in a 27°C container. The pressure and volume of the gas are 1.54 atm and 0.5 L, respectively. What is the name of the gas? Assume that the gas behaves ideally/perfectly.**

**Answer.**
The ideal gas equation is pV = nRT
Given– P =  atm, V = 0.5 L, R = 0.08206 L. atom $mol^{-1}$ $K^{-1}$, T = 27°C = 27 + 273.15 = 300.15 K
Rearranging he ideal gas equation, and solving for n:
n = pV/RT

$$n = \frac{(1.54atm)\,(0.5L)}{(300.15)\,(0.08206L.atm.mol^{-1}K^{-1})}$$

n = 0.0312 mol
The question asks you to put one g of gas in the container. Since we know the moles, we can solve for the gas's molecular weight and deduce its identity from the molecular weight.
MW = 1g/0.0312 mol = 32g
Since this molecular weight of oxygen gas, O2, is 32g/mol, the unknown gas must be oxygen.

**Q4. A sample of argon gas has a volume of 563 mL at a pressure of 0.959 atm and a temperature of 27.5°C. What is the final volume of a gas sample if it is compressed at constant temperature until its pressure reaches 1.40 atm?**

**Answer.** The argon gas, is under constant temperature with varying volume and pressure. Therefore, Boyle's law will be used-
$P_1V_1 = P_2V_2$
$(P_1V_1)/P_2 = V_2$
$V_2 = (0.959 \times 563)/1.4$
$V_2$ = 386 mL

**Q5. Given the ideal gas law, consider the following:**

$$P = \rho\frac{R}{M}T$$

**Where D denotes density, P denotes pressure, R denotes the gas constant, M denotes molar mass, and T denotes temperature.**

**Which of the following statements about the Ideal Gas Law is correct?**

**I. Pressure and volume have an inverse relationship.**
**II. Pressure and density have an inverse relationship.**
**III. Pressure and temperature have a direct relationship.**
**IV. Temperature and density are inversely proportional**
**V, R, and M have inverse proportions.**

**Correct Answer**- I, III and IV

- Condition I is correct. Volume and pressure are inversely proportional.
- Condition II is incorrect. The equation clearly shows that pressure and density are directly proportional.
- Condition III holds true because the equation clearly shows that temperature and pressure are directly proportional.
- Density and temperature are on the same side of the equation in the numerator, so they must be inversely proportional.
- Since the ideal gas constant and molar mass can be rearranged to be on opposite sides of the equation and in the numerator, Condition V is false.