### OUTLINE

1. Description of gas pressure in terms of molecular collisions.
2. Relationship of gas pressure to the number of gas molecules.
3. Experimental evidence of the relationship between gas pressure and the number of molecules.
4. Theoretical explanation of the relationship between gas pressure and the number of molecules.

### SUMMARY

The relationship between gas pressure and molecular collisions is explored. The effects of molecular collisions and their implications on the behavior of gases are discussed. The experimental evidence supporting these relationships is presented, along with theoretical explanations for observed phenomena.

### EXPERIMENTAL EVIDENCE

#### 1. Description of Gas Pressure

- **Objective**: To relate the macroscopic properties of gases to the microscopic behavior of molecules using dynamic models and experimental observations.

#### 2. Relationship of Gas Pressure to the Number of Gas Molecules

- **Objective**: To investigate the direct proportional relationship between gas pressure and the number of gas molecules, keeping all other variables constant.

#### 3. Experimental Evidence of the Relationship Between Gas Pressure and the Number of Molecules

- **Methodology**: Conducted by observing changes in gas pressure under varying conditions of temperature and volume, while keeping other factors constant.

#### 4. Theoretical Explanation of the Relationship Between Gas Pressure and the Number of Molecules

- **Concept**: The theoretical framework that explains the relationship between gas pressure and the number of gas molecules, based on kinetic theory.

---

### RELATIVE RATES OF EFFUSION

| Gas     | Mole Mass | Velocity (cm/s) | Relative Rate of Effusion
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>H₂</td>
<td>2.016</td>
<td>171</td>
<td>100%</td>
</tr>
<tr>
<td>O₂</td>
<td>32</td>
<td>180</td>
<td>100%</td>
</tr>
<tr>
<td>CO₂</td>
<td>44.01</td>
<td>100</td>
<td>100%</td>
</tr>
<tr>
<td>SF₆</td>
<td>187.5</td>
<td>50</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Answer:** The gases of H₂, CO₂, and SF₆ escape at the same rate of diffusion, which is 100% of the diffusion rate of H₂.

---

### VELOCITY OF DIFFUSION

- **Relation**: The velocity of diffusion is given by the equation: \[ v = \sqrt{\frac{8RT}{\pi M}} \]

### VELOCITY OF A GAS MOLECULE AT 25°C

- **Equation**: \[ v = \sqrt{\frac{8RT}{\pi M}} \]

### VELOCITY OF CO₂ AT 25°C

- **Equation**: \[ v = \sqrt{\frac{8RT}{\pi M}} \]

### VELOCITY OF O₂ AT 25°C

- **Equation**: \[ v = \sqrt{\frac{8RT}{\pi M}} \]

---

**If you wish to calculate absolute zero:**

- **Equation**: \[ T = \frac{273}{λ} \]

**Temperature (°C)**

- **300 K**
- **298 K**
- **296 K**
- **293 K**
- **290 K**

**Pressure (atm)**

- **100 torr**
- **760 torr**

**Boiling point**

- **Water**: 100°C
- **Dry ice**: -78°C
- **Liquid nitrogen**: -196°C

---

**If you wish to calculate the actual molecular mass:**

- **Equation**: \[ M = \frac{m}{v^2} \]

### RELATIVE VELOCITIES OF A GAS MOLECULE AT 25°C

- **H₂**: 2.02 cm/s
- **O₂**: 32 cm/s
- **CO₂**: 44 cm/s
- **SF₆**: 187.5 cm/s

**Comparison at 25°C**

- **H₂**: 2.02 cm/s
- **O₂**: 32 cm/s
- **CO₂**: 44 cm/s
- **SF₆**: 187.5 cm/s

---

**If you wish to calculate the actual molecular mass:**

- **Equation**: \[ M = \frac{m}{v^2} \]