



# **Fundamental Physics for Food Technology and Innovation (4011106)**

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# **Ideal Gases and Heat in Food Technology**

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# Overview of topics to be covered:

- A. Ideal Gas Law
- B. Thermodynamics
- C. Food Processing

# Introduction to Ideal Gases

- Definition of Ideal Gas
- Characteristics of Ideal Gases
- Key Assumptions of the Ideal Gas Model

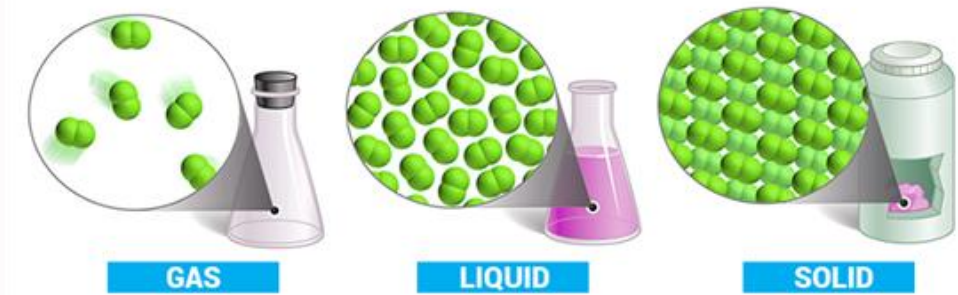


Figure 1: Molecular representation of gas particles in motion

# Ideal Gas Law ( $PV = nRT$ )

- Detailed breakdown of the equation

- $P$ : Pressure
- $V$ : Volume
- $n$ : Number of moles
- $R$ : Universal Gas Constant
- $T$ : Absolute Temperature

- Practical significance in food technology

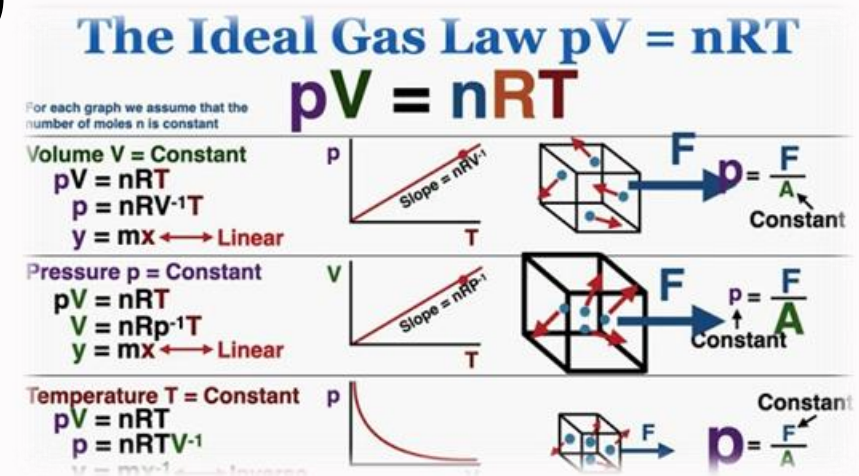


Figure 2: Graphical representation of gas law variables

# Temperature and Its Measurement

- Temperature scales (Kelvin, Celsius, Fahrenheit)
- Conversion formulas
- Importance in food processing

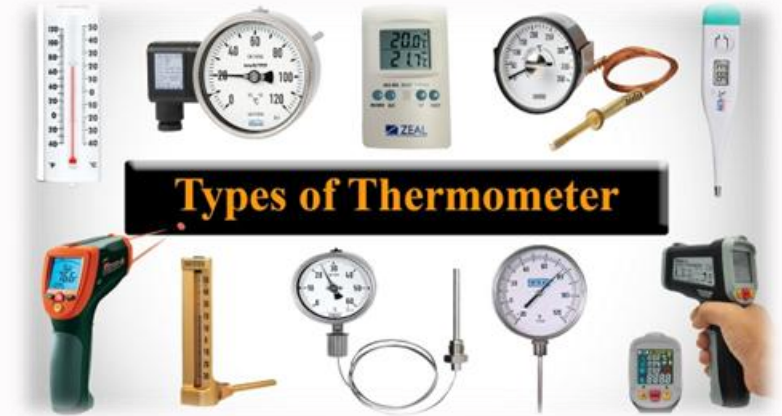


Figure 3: Thermometer types, temperature conversion chart

# Heat Transfer in Food Processing

- Conduction
- Convection
- Radiation
- Examples in food technology

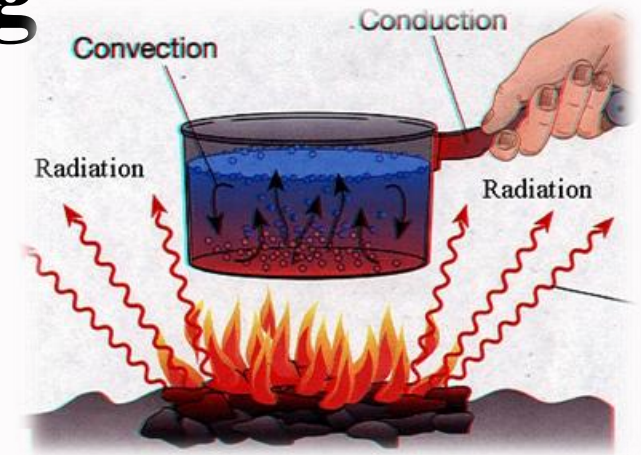


Figure 4: Heat transfer types in cooking/processing

# Thermal Properties of Food

- Specific Heat Capacity
- Thermal Conductivity
- Latent Heat
- Practical applications in food preservation

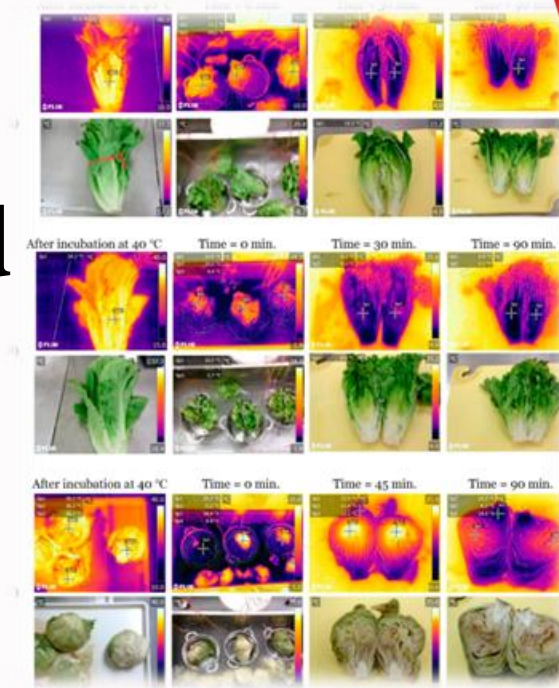


Figure 5: Thermal imaging of different food items

# Gas Behavior in Food Technology

- Pressure effects on food
- Gas expansion and contraction
- Applications in:
  - *Packaging*
  - *Fermentation*
  - *Cooking processes*

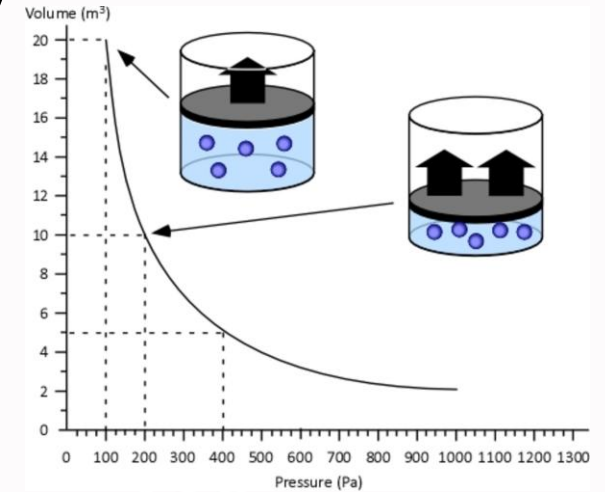


Figure 6: Diagrams of gas behavior in food-related scenarios

# Practical Applications

- Refrigeration
- Drying processes
- Sterilization
- Vacuum packaging



Figure 7: Collage of food processing technologies



# Calculations and Problem Solving

- Sample calculations using Ideal Gas Law
- Step-by-step problem-solving approach
- Real-world food technology scenarios

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# Conclusion

- Key takeaways
- Importance of understanding thermal principles
- Future innovations in food technology



Figure 8: Futuristic food processing concept



# References.

1. Specific Physics Textbook for Food Technology
2. International Journal of Food Science and Technology
3. ASHRAE Handbook of Fundamentals
4. Food Engineering Interfaces

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