SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

Affiliated To The Tamil Nadu Dr. MGR Medical University, Chennai
Approved by Pharmacy Council of India, New Delhi.
Coimbatore -641035

COURSE NAME : PHARMACEUTICAL ENGINEERING

(BP404 T)

III SEM / II YEAR

UNIT 2

SUB TOPIC: heat transfer

Heat Transfer and Evaporation Concepts

Heat Transfer Mechanisms

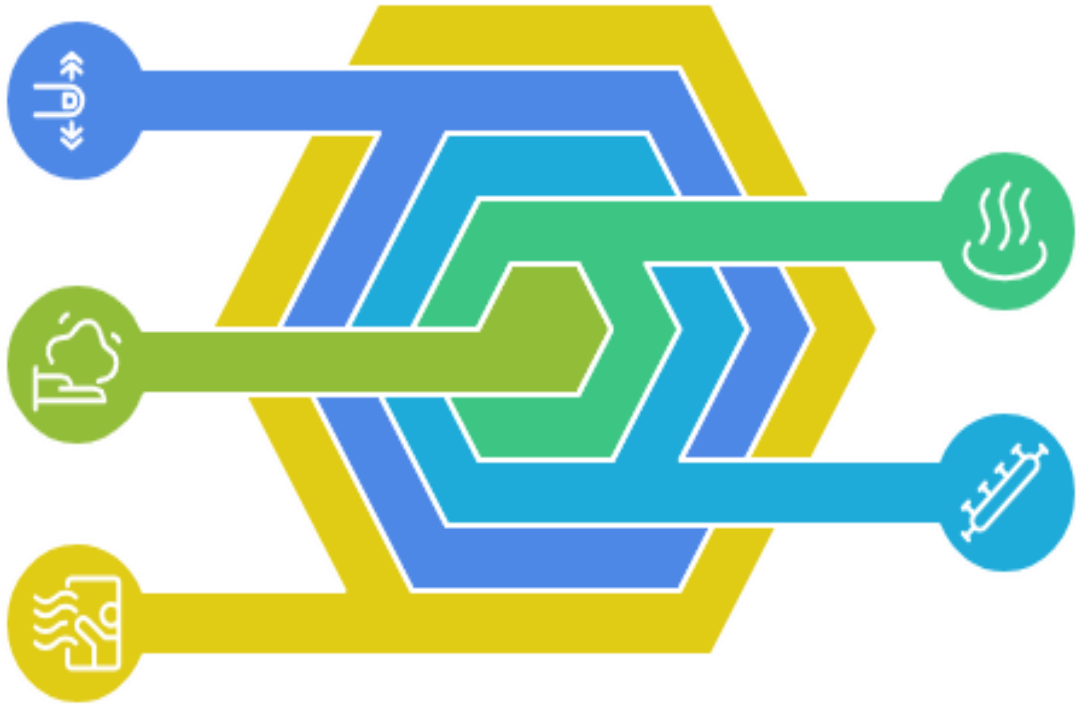
Specific ways heat moves

Evaporation

Process of liquid turning into gas

Heat Transfer Principles

Fundamental laws governing heat flow



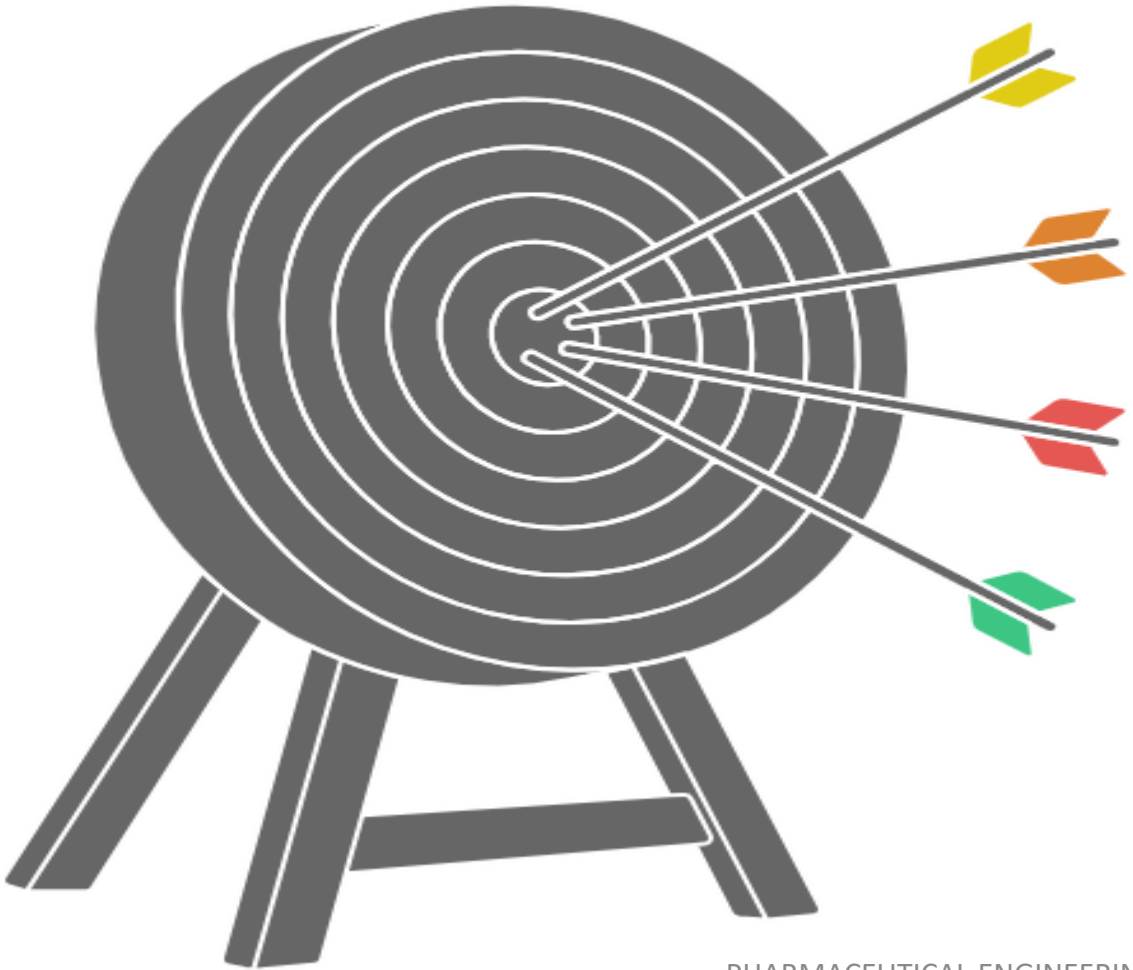
Heat Processes

General methods of heat exchange

Heat Exchangers

Devices facilitating heat transfer

Heat Transfer Process



Heat Transfer

Core process of energy movement

Temperature Difference

Driving force behind heat transfer

Thermal Equilibrium

Goal of heat transfer process

Engineering Applications

Practical uses of heat transfer knowledge

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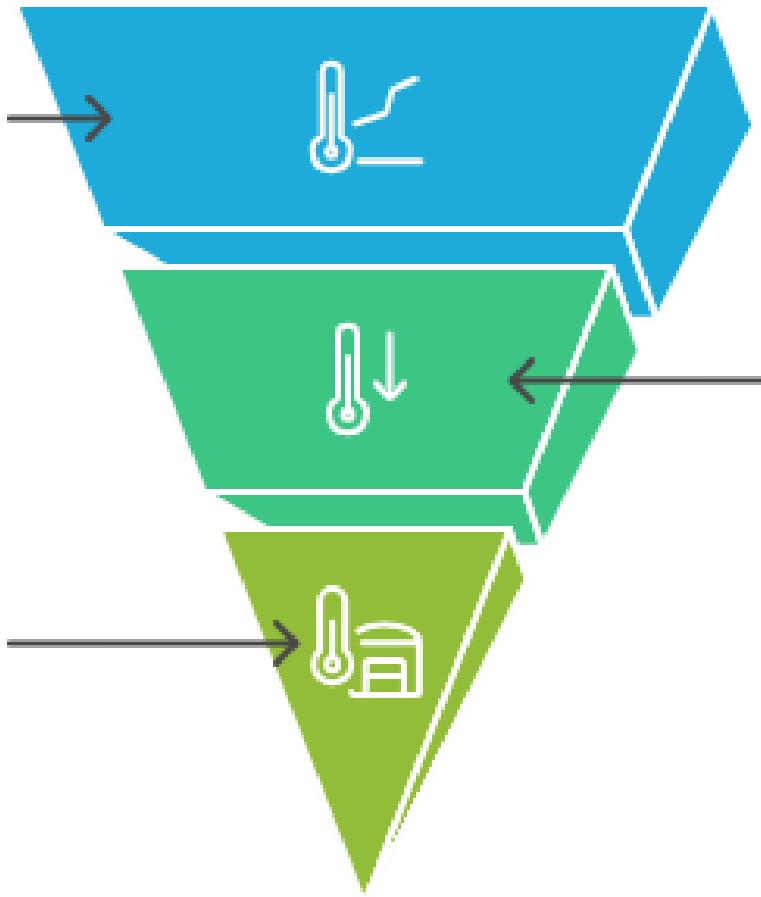
Heat Transfer System Design Process

Determine Heat Transfer Rate

Quantify heat flow per unit time



Analyze Temperature Distribution

Understand temperature variations within system

Design Equipment

Create efficient heat transfer devices

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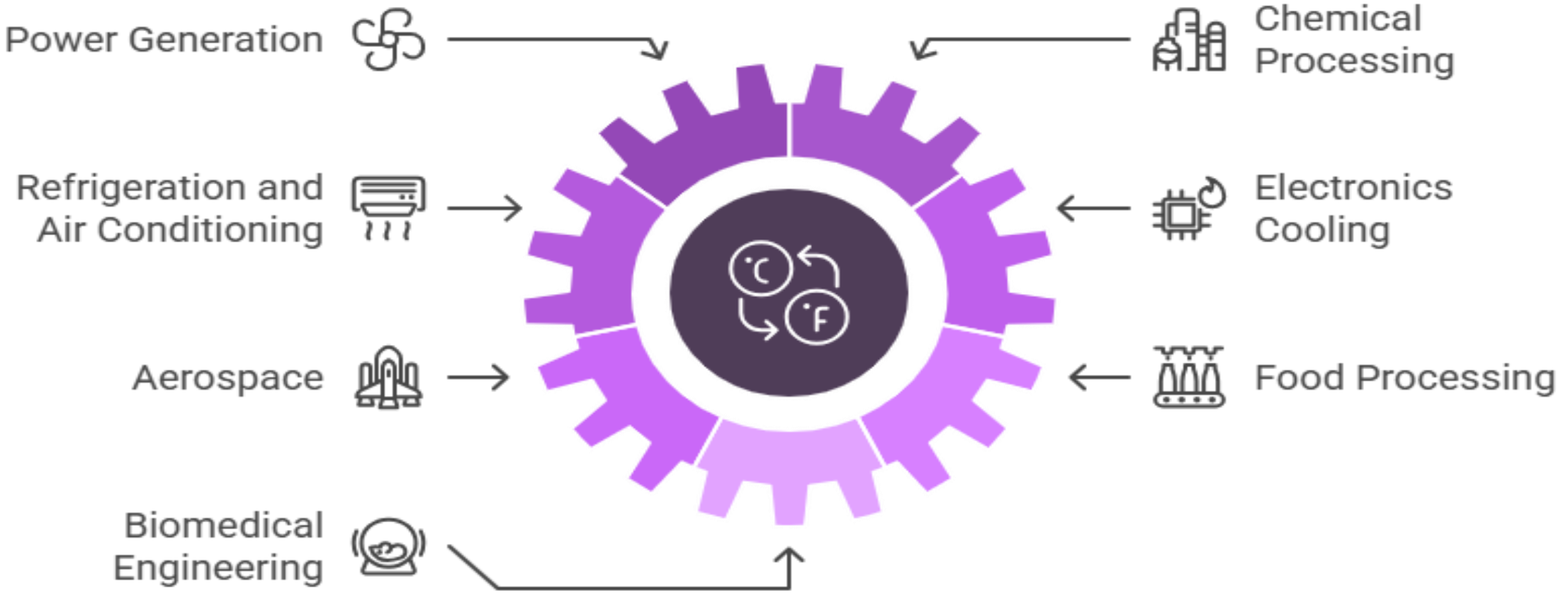
Diverse Applications of Heat Transfer



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Heat Transfer by Conduction

Temperature Gradient

Uneven heat distribution

Molecular Interaction

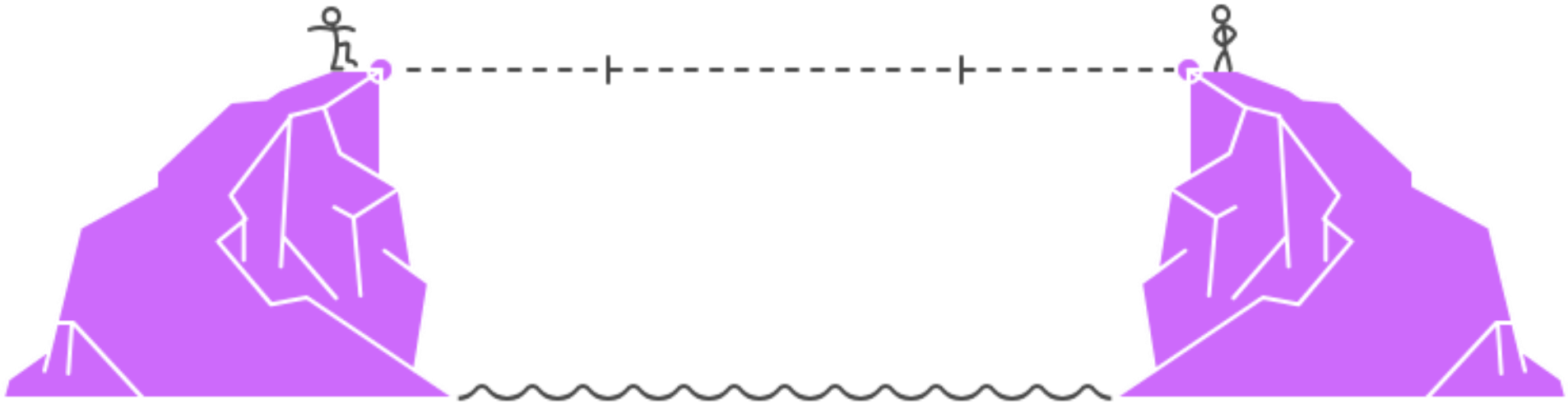
Direct energy transfer between molecules

Fourier's Law

Rate of heat transfer is governed

Heat Equilibrium

Even heat distribution



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How does location influence our lives?

Geographical Location

Shapes experiences and decisions based on climate, resources, and opportunities.

Emotional Location

Defines personal identity and emotional connections to places.

Social Location

Affects relationships and interactions within communities.

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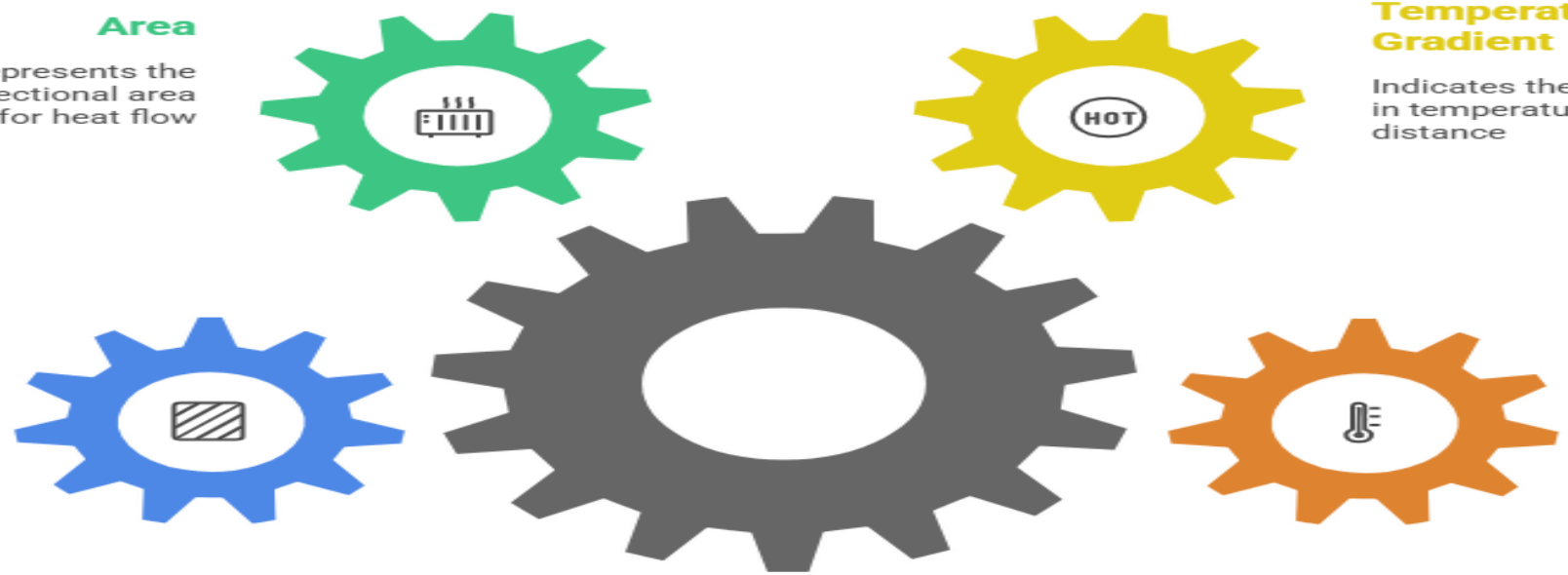
Factors Affecting Heat Conduction

Area

Represents the cross-sectional area for heat flow

Temperature Gradient

Indicates the change in temperature over distance



Material Properties

Includes density, specific heat, and structure

Thermal Conductivity

Measures a material's ability to conduct heat

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Choose the appropriate convection method for heat transfer.

Natural Convection

Driven by buoyancy forces

VS

Forced Convection

Induced by external means

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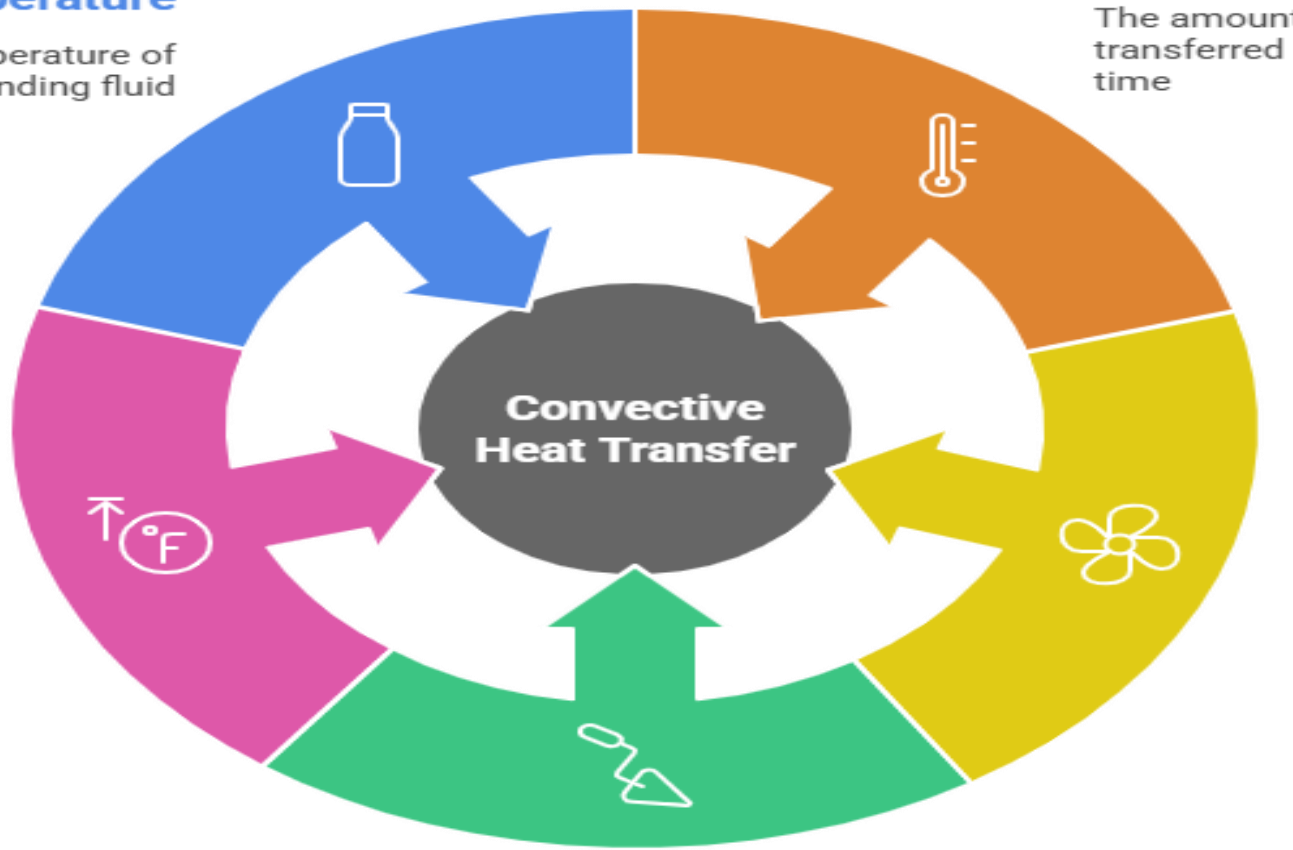
Factors Influencing Convective Heat Transfer



Fluid Temperature

The temperature of the surrounding fluid

Heat Transfer Rate

The amount of heat transferred per unit time

Surface Temperature

The temperature of the surface

Convective Heat Transfer Coefficient

A measure of how effectively heat is transferred between a surface and a fluid

Surface Area

The total area of the surface involved in heat transfer

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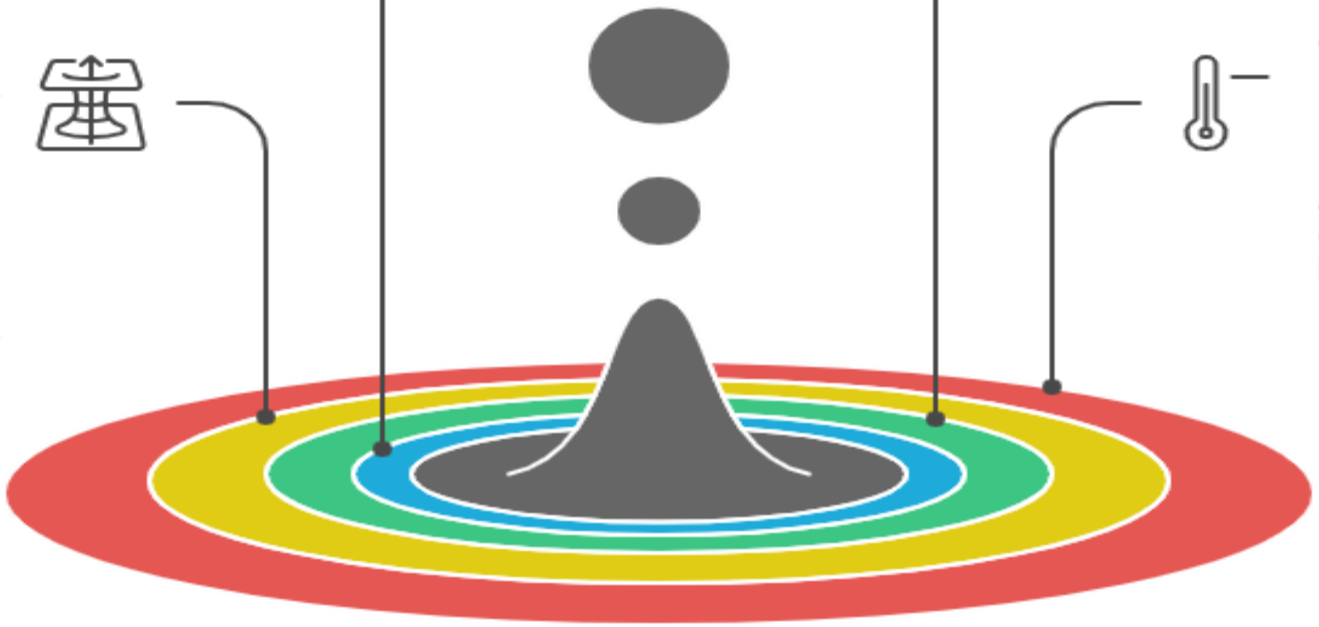
Factors Affecting Heat Transfer

Fluid Properties

Density, viscosity, thermal conductivity, and specific heat of the fluid

Surface Geometry

The shape and orientation of the surface affect the flow pattern and heat transfer



Flow Velocity

Higher velocities generally lead to higher heat transfer rates

Temperature Difference

A larger temperature difference drives higher heat transfer rates

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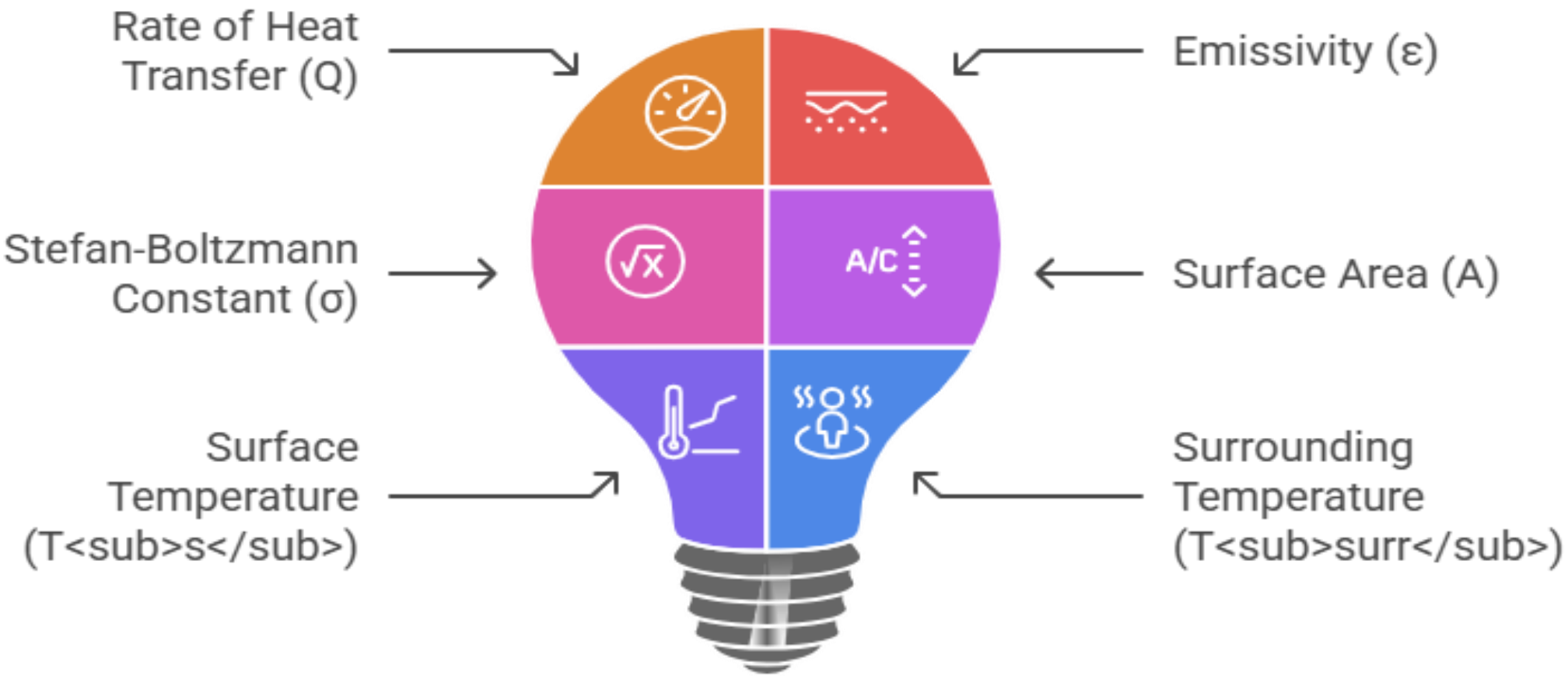
Understanding Radiation Heat Transfer

Understanding Radiation Heat Transfer



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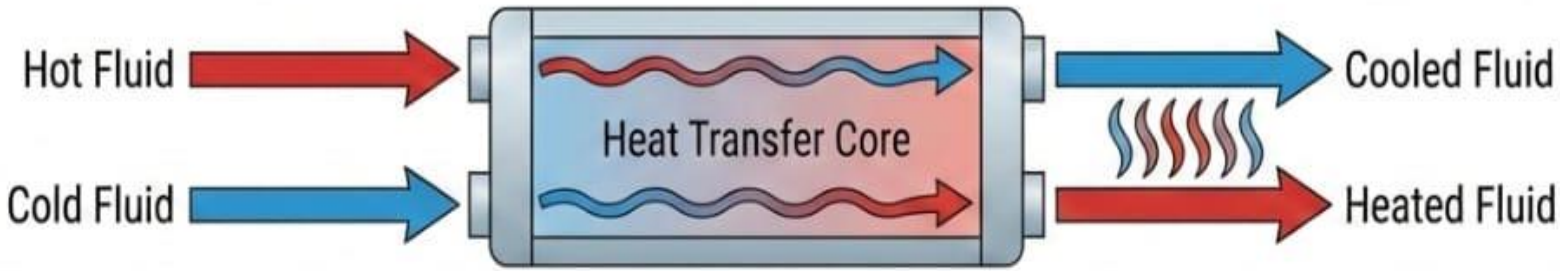
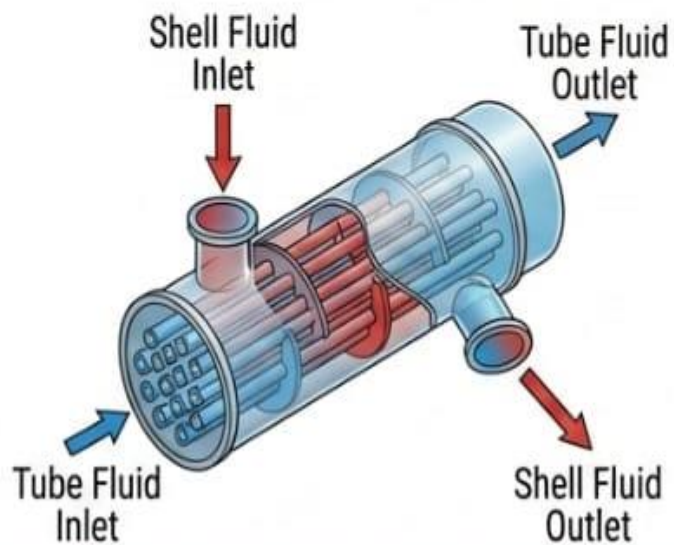
HEAT INTERCHANGERS & HEAT EXCHANGERS



TYPES OF HEAT EXCHANGERS

SHELL-AND-TUBE HEAT EXCHANGER



SHELL-AND-TUBE HEAT EXCHANGER
Bundle of tubes in a shell; one fluid in tubes, one around them.

PLATE HEAT EXCHANGER

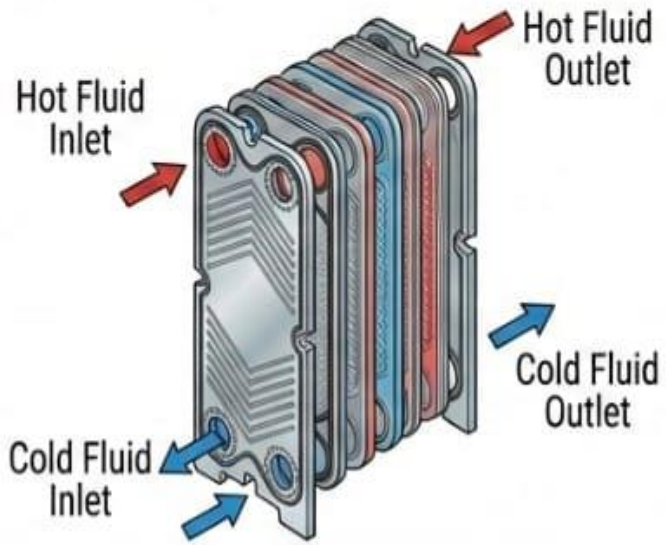
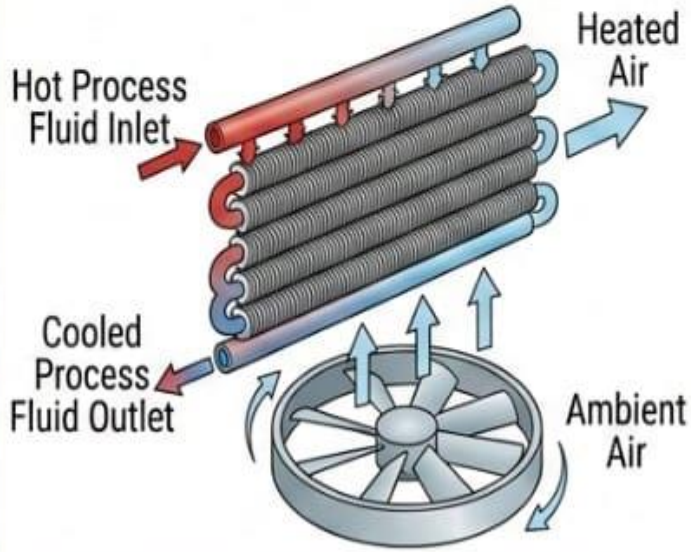


PLATE HEAT EXCHANGER
Series of thin, corrugated plates; fluids flow in alternate channels.

AIR-COOLED HEAT EXCHANGER

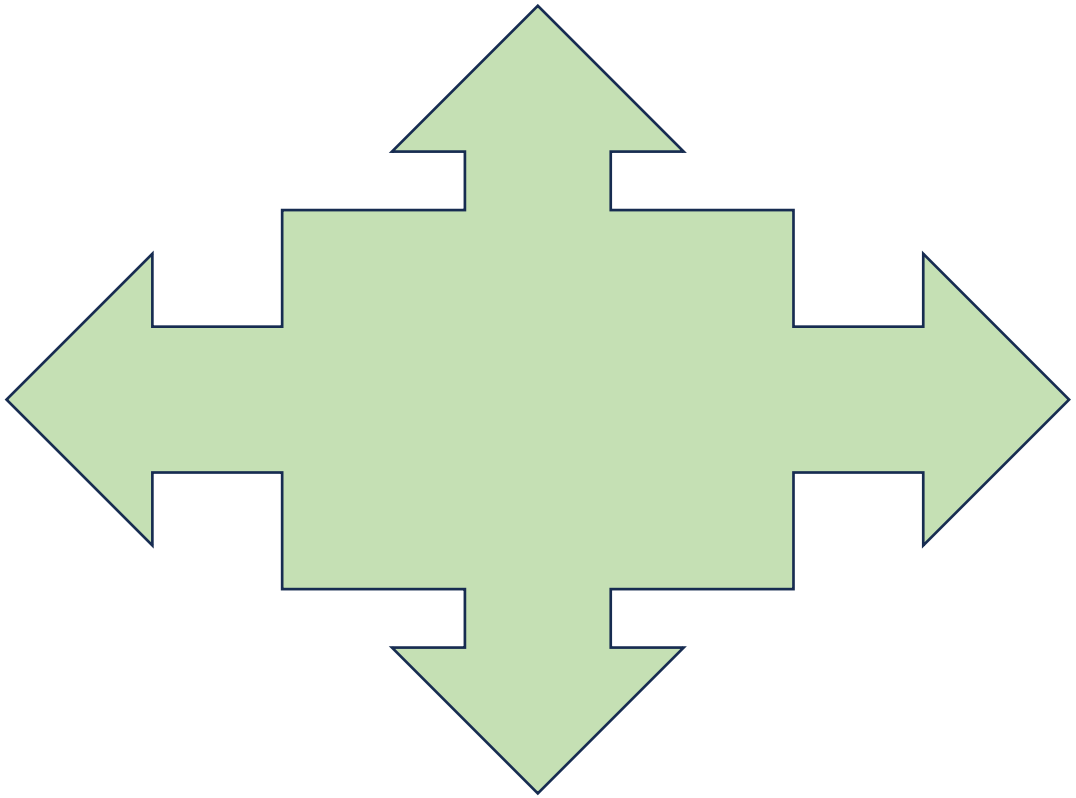


AIR-COOLED HEAT EXCHANGER
Uses ambient air as cooling fluid; finned tubes enhance heat transfer

ASSESMENT

The three mechanisms of heat transfer are:

a) Conduction, convection, and evaporation



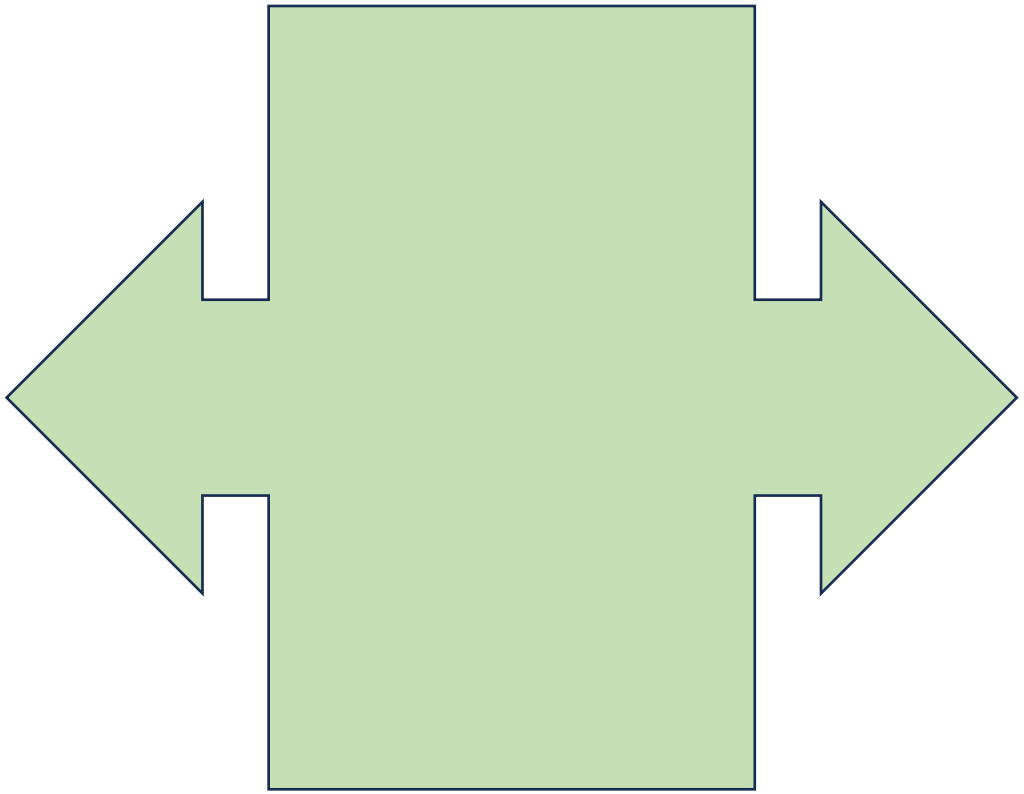
d) Convection, radiation, and filtration

b) Conduction, convection, and radiation

c) Conduction, radiation, and distillation

Heat transfer in liquids and gases primarily takes place by

C) All three equally



d) Convection

b) Radiation

A)conduction


Thank you