1. Which type of heat exchanger configuration offers the highest temperature difference between the hot and cold fluids?

a) Parallel flow
b) Counter flow
c) Cross flow
d) Double pipe

Answer: b) Counter flow
Explanation: In counter flow heat exchangers, the hot and cold fluids flow in opposite directions, maximizing the temperature gradient along the length of the exchanger, resulting in higher overall heat transfer.

2. What is the purpose of an evaporator in a refrigeration system?

a) To transfer heat from the surroundings to the refrigerant
b) To remove moisture from the air
c) To convert liquid refrigerant into vapor
d) To increase the pressure of the refrigerant

Answer: c) To convert liquid refrigerant into vapor
Explanation: The evaporator absorbs heat from the surroundings to vaporize the liquid refrigerant, cooling the surroundings in the process.

3. Which factor affects the overall heat transfer coefficient of a heat exchanger?

a) Fouling factors
b) Length of the exchanger

c) Diameter of the tubes
d) Material of construction

Answer: a) Fouling factors
Explanation: Fouling factors account for the decrease in heat transfer efficiency due to the accumulation of deposits on the heat transfer surface.

4. What does LMTD stand for in the context of heat exchangers?

a) Longitudinal Mean Temperature Difference
b) Linear Mean Thermal Dispersion
c) Logarithmic Mean Temperature Difference
d) Localized Mean Thermal Distribution

Answer: c) Logarithmic Mean Temperature Difference
Explanation: LMTD is a logarithmic average of the temperature differences between the hot and cold fluids at the inlet and outlet of a heat exchanger.

5. Which method is commonly used for the analysis of heat exchangers?

a) Finite Element Method
b) Boundary Element Method
c) NTU Method
d) CFD Analysis

Answer: c) NTU Method
Explanation: NTU (Number of Transfer Units) method is widely used for analyzing the performance of heat exchangers.

6. What parameter is used to evaluate the effectiveness of a heat exchanger?

a) Thermal conductivity
b) Fouling resistance
c) Overall heat transfer coefficient
d) Effectiveness

Answer: d) Effectiveness
Explanation: Effectiveness measures the actual heat transfer achieved by a heat exchanger compared to the maximum possible heat transfer.

7. Which law governs the rate of diffusion in mass transfer?

a) Newton’s Law of Cooling
b) Ohm’s Law
c) Fick’s Law
d) Boyle’s Law

Answer: c) Fick’s Law
Explanation: Fick’s Law describes the diffusion of one substance through another and states that the rate of diffusion is proportional to the concentration gradient.

8. What is equimolar diffusion?

a) Diffusion of gases with equal molar masses
b) Diffusion of gases with equal partial pressures
c) Diffusion of gases with equal concentrations
d) Diffusion of gases with equal diffusion coefficients

Answer: a) Diffusion of gases with equal molar masses
Explanation: Equimolar diffusion occurs when gases with equal molar masses diffuse through each other at equal rates.

9. What does the diffusion coefficient represent in mass transfer?

a) The rate of diffusion of a substance through a medium
b) The concentration gradient of a substance
c) The temperature gradient of a substance
d) The pressure difference of a substance

Answer: a) The rate of diffusion of a substance through a medium
Explanation: The diffusion coefficient quantifies how quickly a substance diffuses through a medium under a given set of conditions.

10. How is mass transfer analogous to heat transfer?

a) Both involve the movement of energy from a high concentration to a low concentration
b) Both follow the laws of thermodynamics
c) Both depend on the specific heat capacity of the substances involved
d) Both are driven by a gradient (concentration or temperature)

Answer: d) Both are driven by a gradient (concentration or temperature)
Explanation: Both mass transfer and heat transfer involve the movement of a substance from regions of high concentration or temperature to regions of low concentration or temperature.

11. In which scenario does diffusion of vapor in a stationary medium occur?

a) Boiling of water

b) Condensation of steam

c) Diffusion of perfume in air

d) Absorption of gas into a liquid

Answer: c) Diffusion of perfume in air

Explanation: Diffusion of vapor in a stationary medium occurs when vapor molecules spread out evenly through the medium, such as the diffusion of perfume in air.

12. What does NTU stand for in the context of heat exchanger analysis?

a) Number of Thermal Units

b) Number of Transfer Units

c) Non-Thermal Utilization

d) Network Transfer Understanding

Answer: b) Number of Transfer Units

Explanation: NTU is a dimensionless parameter used in heat exchanger analysis to quantify the size of the heat exchanger relative to the heat capacity rate of the fluid streams.

13. Which type of flow configuration in a heat exchanger results in the lowest LMTD?

a) Parallel flow

b) Counter flow

c) Cross flow

d) Double pipe

Answer: a) Parallel flow

Explanation: In parallel flow heat exchangers, the temperature difference between the two fluids decreases continuously along the length of the exchanger, resulting in the lowest LMTD.

14. What is the primary function of a condenser in a refrigeration cycle?

a) To compress the refrigerant
b) To convert vapor refrigerant into liquid
c) To remove heat from the refrigerant
d) To regulate the pressure of the refrigerant

Answer: b) To convert vapor refrigerant into liquid
Explanation: The condenser removes heat from the vapor refrigerant, causing it to condense into liquid form.

15. How does fouling affect the performance of a heat exchanger?

a) It increases the overall heat transfer coefficient
b) It decreases the overall heat transfer coefficient
c) It has no effect on the overall heat transfer coefficient
d) It increases the efficiency of the heat exchanger

Answer: b) It decreases the overall heat transfer coefficient
Explanation: Fouling reduces the heat transfer efficiency of a heat exchanger by insulating the heat transfer surfaces and increasing the thermal resistance.

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