1. What is convection?

a) The transfer of heat through direct contact between materials
b) The transfer of heat through electromagnetic waves
c) The transfer of heat through the movement of fluids
d) The transfer of heat through radiation

Answer: c) The transfer of heat through the movement of fluids

Explanation: Convection involves the transfer of heat through the movement of fluids such as liquids or gases.

2. Which of the following statements about free convection is true?

a) It occurs only in the absence of gravity
b) It involves the use of external forces to induce fluid motion
c) It occurs due to density differences within a fluid
d) It is not influenced by temperature differences

Answer: c) It occurs due to density differences within a fluid

Explanation: Free convection arises due to density variations caused by temperature differences within a fluid, leading to natural fluid motion.

3. Forced convection differs from free convection in that:

a) Forced convection requires external forces to induce fluid motion
b) Free convection occurs only in closed systems

c) Forced convection does not involve heat transfer
d) Free convection occurs at higher velocities

Answer: a) Forced convection requires external forces to induce fluid motion

Explanation: Forced convection involves the use of external forces such as pumps or fans to induce fluid motion and enhance heat transfer.

4. The principle of dimensional analysis is based on the:

a) Conservation of energy
b) Conservation of momentum
c) Conservation of mass
d) Conservation of entropy

Answer: b) Conservation of momentum

Explanation: Dimensional analysis relies on the conservation of momentum principle to analyze the relationships between different physical quantities.

5. Which theorem is used in dimensional analysis to determine the relationship between variables?

a) Newton’s theorem
b) Buckingham ‘pie’ theorem
c) Euler’s theorem
d) Bernoulli’s theorem

Answer: b) Buckingham ‘pie’ theorem

Explanation: The Buckingham ‘pie’ theorem is utilized in dimensional analysis to determine the relationships between variables in a problem.

6. What is the application of dimensional analysis in convection?

a) To calculate convective heat transfer coefficient
b) To analyze the effects of temperature on fluid properties
c) To determine the velocity profile of fluid flow
d) To study the behavior of fluids in microgravity

Answer: a) To calculate convective heat transfer coefficient

Explanation: Dimensional analysis can be applied to convection to derive empirical correlations and equations for calculating convective heat transfer coefficients.

7. Which of the following is NOT an empirical correlation for laminar flow over a flat plate?

a) Nusselt number correlation
b) Reynolds number correlation
c) Prandtl number correlation
d) Grashof number correlation

Answer: b) Reynolds number correlation

Explanation: Reynolds number is a dimensionless quantity used to characterize the flow regime, but it is not typically used as an empirical correlation for laminar flow over a flat

plate.

8. Turbulent flow over tubular geometry is characterized by:

a) Smooth and predictable fluid motion
b) High Reynolds numbers
c) Low frictional losses
d) Linear velocity profiles

Answer: b) High Reynolds numbers

Explanation: Turbulent flow over tubular geometry is characterized by high Reynolds numbers, indicating chaotic and unpredictable fluid motion.

9. In forced convection, increasing the flow velocity typically leads to:

a) Decreased convective heat transfer
b) Increased convective heat transfer
c) No change in convective heat transfer
d) A transition from laminar to turbulent flow

Answer: b) Increased convective heat transfer

Explanation: Increasing the flow velocity in forced convection generally enhances convective heat transfer by promoting greater fluid mixing and increasing the rate of heat exchange.

10. How is the convective heat transfer coefficient calculated using a data book?

a) By directly measuring the temperature difference
b) By using empirical correlations and equations
c) By estimating fluid properties from tables
d) By conducting numerical simulations

Answer: b) By using empirical correlations and equations

Explanation: Data books provide empirical correlations and equations that can be used to calculate convective heat transfer coefficients based on relevant parameters such as fluid properties and flow conditions.

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