Thermodynamics Fundamentals

Thermodynamics · Answer Key · 12 Questions

1. Which of the following processes involves the transfer of heat energy through electromagnetic waves, requiring no medium for propagation?

A) Conduction in a metal rod
B) Convection in boiling water
C) Radiation from the Sun
D) Advection of warm air

2. According to the first law of thermodynamics, energy cannot be created or destroyed, only transformed. If 100 Joules of heat are added to a system, and the system does 40 Joules of work, what is the change in the internal energy of the system?

A) 60 Joules
B) 140 Joules
C) 100 Joules
D) 40 Joules

3. When a substance undergoes a phase change from a liquid to a gas at a constant temperature, the energy absorbed by the substance is known as:

A) Specific heat capacity
B) Latent heat of fusion
C) Thermal conductivity
D) Latent heat of vaporisation

4. A measure of the average kinetic energy of the particles within a substance is called:

A) Heat
B) Entropy
C) Temperature
D) Internal energy

5. Which state of matter has the most ordered arrangement of its particles and the lowest kinetic energy among its constituent particles at a given pressure?

A) Gas
B) Plasma
C) Liquid
D) Solid

6. The second law of thermodynamics states that in any spontaneous process, the total entropy of an isolated system tends to increase. Which real-world observation best illustrates this principle?

A) Ice melting in a warm room
B) A refrigerator cooling its contents
C) Water freezing at 0°C
D) A pendulum swinging indefinitely

7. What is the primary mechanism of heat transfer when you hold a hot metal spoon, and your hand starts to feel warm?

A) Convection
B) Radiation
C) Conduction
D) Evaporation

8. If you have a sealed container of gas that is heated, what is the most likely immediate effect on the gas particles?

A) They will move slower and closer together.
B) They will gain kinetic energy and move faster.
C) They will lose mass and shrink.
D) They will become more ordered and form a lattice.

9. Which of the following statements about specific heat capacity is correct?

A) It is the amount of heat required to raise the temperature of 1 gram of a substance by 1 degree Celsius.
B) It is the total energy stored within a substance.
C) It is the rate at which heat flows through a material.
D) It is the maximum amount of work a system can perform.

10. A black object absorbs more radiant energy than a white object when exposed to the same light source. This relates to the property of:

A) Thermal conductivity
B) Specific heat capacity
C) Emissivity
D) Absorptivity

11. When water boils, it changes from a liquid to a gas. During this phase transition at its boiling point, the temperature of the water remains constant because the added energy is used to:

A) Increase the kinetic energy of the water molecules

B) Break the intermolecular bonds between water molecules

C) Decrease the density of the water

D) Convert the water into ice

12. In an ideal refrigerator, which of the following statements is true according to the laws of thermodynamics?

A) It creates energy to cool the interior.

B) It can achieve 100% efficiency in transferring heat.

C) It moves heat from a colder region to a hotter region by expending work.

D) Its operation leads to a net decrease in the entropy of the universe.