

Short answer questions.

Q1. What are the Extensive and Intensive properties of a system?

Answer: i) Extensive properties: The properties which depend on the amount of the substance present in the system are called extensive properties. Thus, an extensive property depends upon the size of the system. e.g., Mass, volume, energy, heat capacity, area etc.

ii) Intensive properties: The properties which are independent of the amount of the substance present in the system are called intensive properties. This property depends upon the nature of the substance and not on the size of the system. e.g., Density, viscosity, surface tension, pressure, concentration etc.

Q2. Explain the terms - the systems and the surroundings and give the types of system.

Answer: System & Surroundings: In thermodynamics, a system is the specific part of the universe under study, while the surroundings are everything else that interacts with it, and the boundary separates them.

Types of Systems:

i] Open System-Exchanges both matter and energy with the surroundings.

ii] Closed System-Exchanges energy (heat and work) but not matter with the surroundings.

iii] Isolated System- Exchanges neither matter nor energy with the surroundings.

Q3. Explain in short Reversible and Irreversible processes from thermodynamics point of view.

A] Reversible process: A process that can be reversed without leaving any net change in the system or its surroundings. Occurs infinitely slowly, allowing the system to remain in equilibrium at all times. Involves infinitesimal changes in conditions. Is an idealized concept, not achievable in reality. The work done is maximum in a reversible process.

B] Irreversible Process: A process that cannot be reversed to return both the system and its surroundings to their original states. Occurs with finite changes in conditions, leading to a departure from equilibrium. Involves dissipative forces like friction, leading to a loss of energy. All natural processes are irreversible. The work done is less than the maximum possible in a reversible process

Q4. Explain Second law and Third law of thermodynamics in short.

A] Second law of thermodynamics: Cold Hot Second law of thermodynamics states that the entropy in an isolated system always increases. Any isolated system spontaneously evolves towards thermal equilibrium the state of maximum entropy of the system. The entropy of the universe only increases and never decreases. Many individuals take this statement lightly and for granted, but it has an extensive impact and consequence.

B) Third law of thermodynamics: $S=0$, 0K Third law of thermodynamics states that the entropy of a system approaches a constant value as the temperature approaches absolute zero. The entropy of a pure crystalline substance (perfect order) at absolute zero temperature is zero. This statement holds true if the perfect crystal has only one state with minimum energy.

Q5. Explain zeroth law and first law of thermodynamics in short.

Answer: 1] Zeroth law of thermodynamics: The Zeroth law of thermodynamics states that if two bodies are individually in equilibrium with a separate third body, then the first two bodies are also in thermal equilibrium with each other. This means that if system A is in thermal equilibrium with system C and system B is also in equilibrium with system C, then system A and B are also in thermal equilibrium.

2] First law of thermodynamics: $q=\Delta E+W$ First law of thermodynamics, also known as the law of conservation of energy, states that energy can neither be created nor destroyed, but it can be changed from one form to another. Plants convert the radiant energy of sunlight to chemical energy through photosynthesis. We eat plants and convert the chemical energy into kinetic energy while we swim, walk, breathe, and scroll through this page. Switching on light may seem to produce energy, but it is electrical energy that is converted.

Answer in one sentence.

1. What is thermodynamics?

Ans: Thermodynamics is the branch of physics that deals with the relationships between heat, work, and energy.

2. Define a system.

Ans: A system is a specific portion of matter or space that is being studied, separated from its surroundings by boundaries.

3. Enlist any two types of a system.

Ans: Two types of a system are open system and closed system.

4. What is a closed system?

Ans: A closed system is one where energy can be exchanged with the surroundings, but matter cannot.

5. Give any two extensive properties of a system.

Ans: Two extensive properties of a system are volume and mass.

6. What is a state function?

Ans: A state function is a property whose value depends only on the current state of the system, not on how it reached that state.

7. Define a reversible reaction.

Ans: A reversible reaction is a chemical reaction that can proceed in both forward and reverse directions under suitable conditions.

8. Define internal energy of a system.

Ans: Internal energy of a system is the total energy contained within the system, including both kinetic and potential energies of the particles.

9. Define enthalpy of a system.

Ans: Enthalpy of a system is the total heat content, defined as the internal energy plus the product of pressure and volume.

10. Give any two intensive properties of the system.

Ans: Two intensive properties of a system are temperature and pressure.