INDIAN SCHOOL AL WADI AL KABIR

Class: XI	Department: SCIENCE 2023-2024 -PHYSICS	Date: 15/01/2024
Worksheet No: 12	CHAPTER: THERMODYNAMICS	Note: A4 FILE FORMAT
Name of the student:	Class & Sec:	Roll No:

MULTIPLE CHOICE QUESTIONS

1. An ideal gas undergoes four different process from the same initial state. (Fig.). Four process is adiabatic, isothermal, isobaric & isochoric. Out of 1, 2, 3 & 4 which one is adiabatic
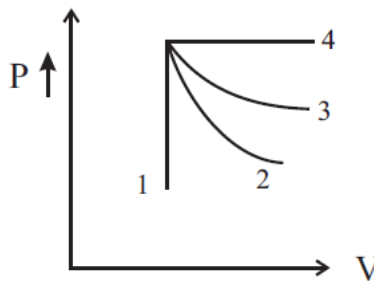
(a) 4   (b) 3   (c) 2   (d) 1

Ans; - In curve 1, V is constant: It represents isochoric process. In curve 4, P is constant. It represents isobaric process. Out of curves 2 & 3, one is isothermal and other is adiabatic process. As slope of curve 2 is more than the slope of 3, therefore. Curve 2 represents adiabatic process.

2. In an open system, for maximum work, the process must be entirely
(a) irreversible   (b) reversible   (c) adiabatic   (d) isothermal
Ans: - (d) isothermal

3. A quantity of heat required to change the unit mass of a solid to liquid state, while the temperature remains constant, is known as
(a) Latent heat of vaporisation   (b) Sublimation
(c) Condensation   (d) latent heat of fusion
Ans: - (d) latent heat of fusion

4. At a common temperature, a block of wood and a block of metal feel equally cold or hot. The temperature of block and wood are
(a) Equal to the temperature of the body   (b) Less than the temperature of the body
(c) Greater than temperature of the body   (d) Either b or c
Ans: - (a) Equal to the temperature of the body

5. An ideal gas undergoes isothermal process. Choose the correct alternative
(a) $dU = 0$ (b) $d\theta = 0$ (c) $d\theta = dU$ (d) $dQ = dw$
Ans: - (d) dQ = dw

CASE STUDY BASED QUESTIONS

Q1. Heat can be transferred from one place to another by three different methods.
These are conduction, convection and radiation. Solids are usually heated
by the process of conduction. Liquid and gases are heated by the process

of convection. The process of radiation requires no medium. Conduction
and convection are slow process while radiation is a very fast process.

Answer the following questions

(i) Which of the following processes depends on gravity?

(a) conduction   (b) convection   (c) radiation   (d) none of these

(ii) Woolen cloths keep the body warm, because wool

(a) is a bad conductor   (b) increases the temperature

(c) decreases the temperature   (d) generates heat energy

(iii) On a cold morning, a metal surface will feel colder to touch than a wooden surface because

(a) metal has high specific heat   (b) metal has high thermal conductivity

(c) metal has low specific heat   (d) metal has low thermal conducting

(iv) Earth receive heat from the sun by method of

(a) conduction   (b) convection   (c) radiation   (d) all of these

ASSERTION - REASON BASED QUESTIONS

Direction: - In the following questions, a statement of assertion is followed by a statement of reason. Mark the correct choice as:

(a) If both assertion and reason are true and reason is the correct explanation of assertion.

(b) If both assertion and reason are true but reason is not correct explanation of assertion.

(c) If assertion is true, but reason is false.

(d) If both assertion and reason are false.

1. Assertion: We cannot change the temperature of a body without giving (or taking) heat to (or from) it.

Reason: According to principle of conservation of energy the total energy of the system should remain conserved.

    (a) A   (b) B   (c) C   (d) D

2. Assertion: In isothermal process whole of the heat energy is converted in to internal energy.

Reason: According to first law of thermal dynamics, DQ = DU – PDV

    (a) A   (b) B   (c) C   (d) D

3. Assertion: Work and heat are two equivalent form of energy.

Reason: Work is the transfer of mechanical energy irrespective of the temperature difference, whereas heat is the transfer of thermal energy because of temperature difference only.

    (a) A   (b) B   (c) C   (d) D

4. Assertion: A room can be cooled by opening the door of a refrigerator in closed room.

Reason: Heat flows from lower temperature (refrigerator) to higher temperature (room).

    (a) A   (b) B   (c) C   (d) D

5. Assertion: It is not possible for a system, unaided by an external agency to transfer heat from a body at lower temperature to another body at higher temperature.

Reason: According to Clausius statement, no process is possible whose sole result is the transfer of heat for a cooled object to a hotter object.

    (a) A   (b) B   (c) C   (d) D

VERY SHORT ANSWER QUESTIONS.

1. State first law of thermodynamics

2. State second law of thermodynamics.

3. What is isothermal process? Also give essential conditions for an isothermal process to take place.

4. Why do birds swell their feathers in winter?

 (Ans. To maintain a column of air, which acts an insulator and hence to avoid   loss of heat from the body to the surroundings.)

5. If a drop of water falls on a hot plate, it takes longer time to evaporate. Why?

(Ans. The vapour formed at the instant of landing of the drop acts as an insulator and prevents the heat being passed on to the water above.)

6. Explain how, cooking is faster in a pressure cooker than an ordinary vessel.

*(Ans. Food is **cooked** more quickly in a **pressure cooker** because at the higher **pressure** the boiling point of water rises from 100 °C (212 °F) to 121 °C (250 °F). The hotter steam is able to transmit its thermal energy to the food and hence the food gets cooked faster)*

7. Why burns from steam more serious than those from boiling water?

(Ans. Steam at 100 °C has 22.6 x 10^5 J of heat energy more than water at 100 °C)

LONG ANSWER TYPE QUESTIONS - ADVANCED LEVEL QUESTIONS

1. A gas is contained in a cylinder with a moveable piston on which a heavy block is placed. Suppose the region outside the chamber is evacuated and the total mass of the block and the movable piston is 102 kg. When 2140 J of heat flows into the gas, the internal energy of the gas increases by 1580 J. What is the distance s through which the piston rises?

(Ans. Total heat supplied =Work done + Change in internal energy

So work done=2140-1580=560 J

Let s be the distance moved then, the work done is given by =Fs

Fs=560,   s=560/F,   =560/102x10   s=.54 m)

2. In changing the state of a gas adiabatically from an equilibrium state A to another equilibrium state B, an amount of work equal to 22.3 J is done on the system. If the gas is taken from state A to B via a process in which the net heat absorbed by the system is 9.35 cal, how much is the net work done by the system in the latter case? (Take 1 cal = 4.19 J)

Here, when the change is adiabatic, $\Delta Q = 0$, $\Delta W = -22.3$ J

If ΔU is change in internal energy of the system, then

as $\Delta Q = \Delta U + \Delta W$

$0 = \Delta U - 22.3$ or $\Delta U = 22.3$ J

In the second case, $\Delta Q = 9.35$ cal $= 9.35 \times 4.2$J $= 39.3$ J

$\Delta W = ?$

As $\Delta U + \Delta W = \Delta Q$

∴ $\Delta W = \Delta Q - \Delta U = 39.3 - 22.3 = 17.0$ J.

3. Contains a gas at standard temperature and pressure. B is completely evacuated. The entire system is thermally insulated. The stopcock is suddenly opened. Answer the following:

(a) What is the final pressure of the gas in A and B?

(b) What is the change in internal energy of the gas?

(c) What is the change in the temperature of the gas?

Answer: (a) Since the final temperature and initial temperature remain the same,

∴ $P_2 V_2 = P_1 V_1$

But $P_1 = 1$ atm, $V_1 = V$, $V_2 = 2V$ and $P_2 = ?$

∴ $P_2 = \dfrac{P_1 V_1}{V_2} = \dfrac{1 \times V}{2V} = 0.5$ atm

(b) Since the temperature of the system remains unchanged, change in internal energy is zero.

(c) The system being thermally insulated, there is no change in temperature (because of free expansion)

PREPARED BY	CHECKED BY
Mr RANDHIR K GUPTA	HoD SCIENCE