ID . 13748
Name Hamza Ishaq (1)
. Thermodynamics

Q 1

PART. A

$K = °C + 273$

$K = 140 + 273$

$\boxed{K = 413}$

$°R = 1.8\,K$

$°R = 1.8\,(413)$

$\boxed{°R = 743.4}$

$°R = °F + 460$

$°F = °R - 460$

$°F = 743.4 - 460$

$\boxed{°F = 283.4}$

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Q.1

PART-B

For an ideal gas the work involved when a gas changes from State A to state B through an isothermal process is given as WA → B = nRTlnVBVA WA → B = nRT ln VB VA

For many systems, if the temperature is held constant, the internal energy of the system also is constant. It follows that Q = -W in this case.

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Q.2

Answer:-

Process (I) → Constant volume → isochoric

Process (II) → $PV^{\gamma} = k$ → adiabatic

Process (III) → Constant temperature → Isothermal

Process (IV) → Constant pressure → isobaric

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	Work (W)	Heat (Q)
Interaction	Mechanical	Thermal
Requires	Force and displacement	Temperature difference
Process	Macroscopic pushes and pull	Microscopic collisions
Positive value	W>0 when gas is compressed Energy is transferred into System	Q>0 when the environment is at higher temperature than the system energy is transffered →
Negative value	W<0 when gas is expand Energy is transferred out of system	Q < 0 when the system is at higher temperature Energy is transferred out of system
Equilibrium	A system is in mechanical equilibrium when there is not net force or torque on it	A system is in thermal equilibrium when it is at the some temperature as the environment

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Q · 3

PART · B

Change in internal energy of a System = heat put into the System - work done by the System on it Sorroundings

or

$\Delta U = \Delta Q - \Delta W$.

A System can be anything It is the most convenient if it is has well difined boundries.

ΔQ is positive if heat flows into the System, negative if it flows out of the System

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ΔW is positive if the System does not work on it surrounding and it is negative if work is done on the system.

The internal energy U is the sum of kinetic energy and potential energy of the atoms and molecule that makup the System.

For an ideal gas, for example,

$U = (3/2) NK_BT$.

The internal energy of the gas depends only on the number N

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of gas atoms present and on the temperature T of the gas. not on the way the gas has reached that temperature.

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Q. 4

Answer:-

A throttling process is defined as

Definition:-

Process in which there is no change in enthalpy from state one to state two

Explanation:-

h1 = h2. no work is done W = 0 and the process is adiabatic Q = 0

To better understand the theory

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of the ideal throttling process lets compare what we can observe with the above theoretical assumptions

An example of a throttling process is an ideal gas flowing through a valve in mid position

~~For~~ From experience we can observe that $P_{in} > P_{out}$, Vel_{in} (where P: pressure and vel = velocity).

These observations confirm the theory that $h_{in} = h_{out}$

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Remember $h = u + Pv$ (v - Specific volume).
So if pressure decrease the specific volume must increase if enthalpy remain constant (assuming u is constant)

Because mass flow is constant the change in specific volume is observed as an increasing in gas velocity. and this is verified by our observations.

The thoery also states W=0,
Our observations again confirm this is to be true as clearly

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no "work" has been done by the throttling process

Finally the theory state that an ideal throttling Process is adiabatic

This cannot clearly by proven by observation since a "real" throttling process is not ideal and will have some heat transfer

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