Question Bank (Desi Style)

Chapter 1: History of Thermodynamics

"Samajhne me Aasaan, Exam me Pass!"

Bhai ki Advice:
Questions english me hi hain (kyunki exam me wahi aayega), lekin Solutions puri **Desi Language** me hain taaki concept seedha dimaag me ghuse. Ratna mana hai, samjhna zaruri hai!

Quick Timeline (Kahani Ab Tak)

- **1600s: Galileo** ne banaya Thermoscope (Paani wala thermometer).
- **1770s: Joseph Black** ne bola "Bhai Heat aur Temperature alag hain."
- **Caloric Theory:** Log sochte the Heat ek 'fluid' hai jo behta hai.
- **1798: Rumford** ne Top (Cannon) me ched karte waqt Caloric theory ko galat prove kiya.
- **1850s: Clausius** aur **Kelvin** ne milke Laws banaye.

1 Short Answer Type Questions (2–3 Marks)

Q: Describe Galileo's Thermoscope and its primary limitation. [2–3 Marks]

Desi Solution:

- **Jugaad:** 1600 ke aas-paas Galileo bhai ne ek ande (egg) size ka glass bulb liya aur usme ek lambi tube lagayi. Bulb ko haath se garam kiya aur tube ko ulta karke paani me daal diya. Jaise bulb thanda hua, paani tube me upar chadh gaya.
- **Problem kya thi?** Ye instrument perfect nahi tha. Kyunki ye Temperature ke saath-saath **Atmospheric Pressure** change hone se bhi hilta tha. Isliye isko sirf thodi der ke liye hi use kar sakte the.

Q: Differentiate between the physiological sensation of heat and the concept of thermal equilibrium. [2–3 Marks]

Desi Solution:

- **Sensation (Feeling):** Apni body ka touch sensor bharosemand nahi hai. Example ke liye, sardi me Loha (Metal) Lakdi (Wood) se zyada thanda lagta hai, jabki dono ka temperature same hota hai.
- **Equilibrium:** Iska matlab hai "Sababar". Agar cheezen ek hi environment me rakhi hain, to eventually sabka thandapan (temperature) same ho jayega, chahe hume touch karne pe kaisa bhi feel ho.

Q: Who was Joseph Black, and what was his major contribution to Thermodynamics? [2–3 Marks]

Desi Solution: Joseph Black (1770 wala banda) Thermodynamics ka asli hero tha:

1. Usne sabse pehle clear kiya ki **Temperature** aur **Heat** (Influence) do alag cheezein hain. Mix mat karo.
2. Usne dhoonda ki Ice jab paani banti hai to temperature change nahi hota. Isko usne **Latent Heat** bola (Chupi hui heat).

Q: Define the "Caloric Theory" and list two of its postulates. [2–3 Marks]

Desi Solution: Caloric Theory purane zamaane ka concept tha jisme maante the ki Heat ek 'Fluid' (Liquid type) hai jiska naam "Caloric" hai. **Iske Rules (Postulates):**

- Caloric ke particles ek dusre ko dhakka maarte hain (Repel karte hain).
- Caloric kabhi destroy nahi ho sakta (Amar hai).
- Iska wazan (weight) hota hai.

Q: What is a Thermodynamic Cycle and why is it important in engineering? [2–3 Marks]

Desi Solution:

- **Cycle kya hai?** Sadi Carnot ne bataya. Cycle wo process hai jisme system ghum-phir ke wapas apni purani haalat (Initial State) me aa jata hai.
- **Zaruri kyu hai?** Engine banane ke liye! Agar cycle nahi hogi to engine ek baar chal ke ruk jayega. Cycle ki wajah se hi engine baar-baar, lagatar chal sakta hai.

Q: What was the "gap in the armor" of the Caloric Theory? [2–3 Marks]

Desi Solution: Is theory ki sabse badi kami thi **Friction**. Caloric theory wale ye nahi samjha paaye ki ragadne (friction) se heat kyu paida hoti hai. Wo sochte the heat limited hai, par friction se to unlimited heat nikalti thi. Bas yahi ye theory fail ho gayi.

Q: State Caratheodory's version of the Second Law of Thermodynamics. [2–3 Marks]

Desi Solution: Ye banda Maths ka ustad tha. 1909 me isne bola: *"Kisi bhi state ke aas-paas aisi states hoti hain jahan tum Adiabatic tareeke se (bina heat exchange kiye) nahi pahunch sakte."* Simple shabdon me: Kuch raaste band hain bhai!

2 Long Answer Type Questions (5 Marks)

Q: Q1. Explain the "Theory of Caloric" in detail. How did it account for observed physical phenomena? [5 Marks]

Desi Solution: Purane time me (18th Century) scientists ko lagta tha Heat ek invisible paani jaisa fluid hai, jisko unhone **"Caloric"** naam diya.
Iske 5 Main Fande (Postulates):

1. **Elastic Fluid:** Iske particles ek dusre se nafrat karte hain (Repel karte hain).
2. **Attraction:** Ye matter (cheezon) se chipakna chahte hain.
3. **Conservation:** Caloric ko na paida kar sakte ho, na maar sakte ho.
4. **Types:** Ya to ye feel hota hai (Sensible) ya chup jata hai (Latent).
5. **Weight:** Unhe lagta tha heat ka wazan hota hai.

Ye Theory chali kaise? Inhone har cheez ka bahana dhoond liya tha:

- **Cheezein failti kyu hain (Expansion)?** Kyunki Caloric ke particles ek dusre ko dhakka maarte hain, to cheez fail jati hai.
- **Metal bhari kyu hota hai garam karne pe?** Unhe lagta tha Caloric add ho gaya isliye weight badh gaya (Jo ki galat tha).

Q: Q2. Discuss Count Rumford's Cannon-Boring experiments and how they disproved the Caloric Theory. [5 Marks]

Desi Solution: Kahani: Count Rumford Munich me Top (Cannon) banwa raha tha. Wahan ghode ghum rahe the aur drill se lohe me ched kiya ja raha tha.
Rumford ne kya dekha?

- **Heat ka wazan nahi hai:** Usne prove kiya ki Caloric weightless hai.
- **Chips same hain:** Jo lohe ka buraada (chips) nikla, wo solid lohe jaisa hi tha. Matlb andar se koi "Fluid" nichod ke bahar nahi aaya tha.
- **Heat khatam hi nahi ho rahi (Main Point):** Usne drill ko paani me daal ke chalaya. Paani ubalne laga. Usne dekha jab tak ghode ghum rahe hain (work ho raha hai), tab tak heat nikal rahi hai.

Conclusion: Rumford ne bola: "Bhai, agar Caloric koi fluid hota to kabhi na kabhi khatam ho jata. Par ye to **Inexhaustible** (Anant) hai. Iska matlab Heat koi fluid nahi, balki Motion (Energy) hai." Bas yahi Caloric theory ki maut ho gayi.

Q: Q3. Trace the development of the First and Second Laws of Thermodynamics from Carnot to Clausius. [5 Marks]

Desi Solution: Thermodynamics raato-raat nahi bani, isme bohot drama hua tha:
1. Sadi Carnot (1824):

- Ye banda genius tha. Isne **Cycle** aur **Reversible Engine** ka idea diya.

- Par iski galti ye thi ki ye Caloric Theory maanta tha (Ki heat kabhi khatam nahi hoti, bas upar se niche girti hai).

2. Joule aur Mayer (1840s):

- Joule ne experiment karke dikhaya ki Work hi Heat hai. (Paani me paddle ghumaoge to paani garam hoga).
- Isne prove kiya ki Heat energy hai, koi fluid nahi.

3. The Climax (Clausius - 1850):

- Lord Kelvin confuse ho gaya tha. Carnot bol raha tha Heat bachti hai, Joule bol raha tha Heat kharch hoti hai.
- **Rudolf Clausius** ne aake matter solve kiya. Usne kaha: "Carnot ka idea (Cycle/Efficiency) sahi hai, bas uska logic (Caloric) hata do."
- Clausius ne First Law (Energy Conserved hai) aur Second Law (Entropy badhti hai) ko alag-alag establish kiya.

Q: Q4. Write a note on Caratheodory's structure of Thermodynamics (1909). [5 Marks]

Desi Solution: Jab classical thermodynamics ban chuki thi, tab 1909 me **Constantin Caratheodory** aaya.
Isne kya kiya?

- Isne bola "Engine-Wengine ki baatein chodo, Pure Maths lagate hain."
- Isne **"Heat"** word use hi nahi kiya rules banane me.
- Isne **Adiabatic Wall** (aisi diwaar jisse heat na aa sake) ka concept use kiya.
- **Logic:** Isne First Law ko Energy ke terms me aur Second Law ko mathematical terms me likha. Iska tarika bohot strict aur logical tha, jisse purani sari confusion dur ho gayi.

Final Baat: Bhai chapter ka saar yahi hai - Heat koi Fluid nahi hai, Energy hai. Isko samjhaane me scient