YAKEEN NEET 2.0

2026

Thermodynamics & Thermochemistry

Physical Chemistry | **Lecture -1**

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Topics to be covered

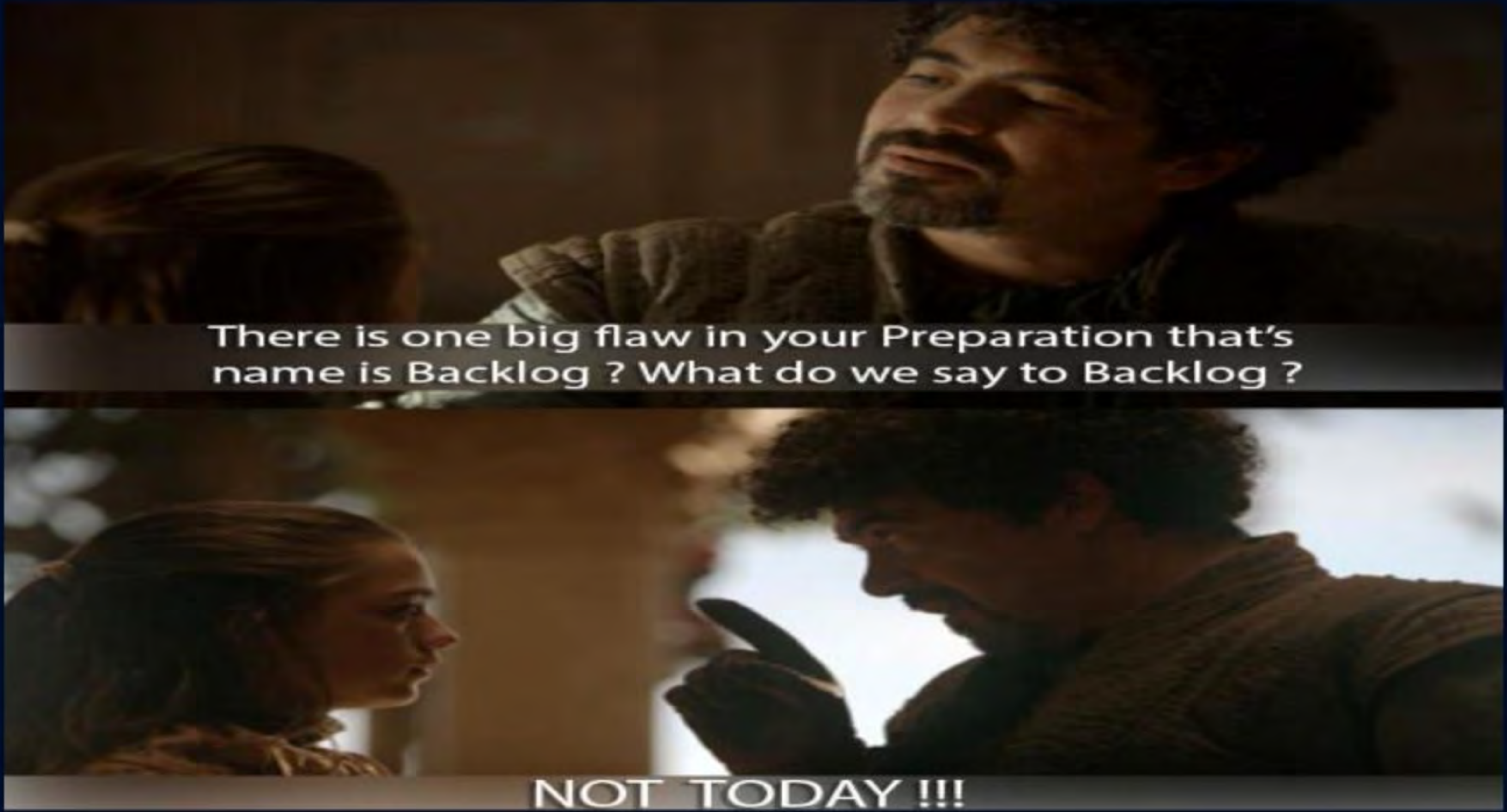
1. Medics Test n0 11, Thermodynamics
2. System & Surroundings
3. State of a System & different Process

Rules to Attend Class

1. Always sit in a peaceful environment with headphone and be ready with your copy and pen.
2. Never ever attend a class from in between or don't join a live class in the middle of the chapter.
3. Make sure to revise the last class before attending the next class & always complete your Magarmach Practice Questions.
4. Never ever engage in chat whether live or recorded on the topic which is not being discussed in current class as by doing so u can be blocked by the admin team or your subscription can be cancelled.

Rules to Attend Class

5. Try to make maximum notes during the class if something is left then u can use the notes pdf after the class to complete the remaining class.
6. Always ask your doubts in doubt section to get answer from faculty. Before asking any doubt please check whether same doubt has been asked by someone or not.


There is one big flaw in your Preparation that's
name is Backlog ? What do we say to Backlog ?
NOT TODAY !!!

MEDICS

Mastery
Checks your grasp over NEET-level concepts

Evaluation
Judging both knowledge and test-smartness

Decision Making
Testing your speed + accuracy under pressure

Intuition
Some answers need gut + logic – can you spot the trick?

Concepts
It's all about strong basics – no shortcuts here

Strategy

The **MEDICS** test – built for those who heal, hustle, and hope.

QUESTION

A complex of Cr is represented as $CrCl_3 \cdot xNH_3$ (x is an integer) with coordination number of six. 0.1 molal aqueous solution shows depression in freezing point as shown by 0.3 molal urea solution. ($K = 1.86°$ molal^{-1}). If complex is 100% ionised, then complex is

$m = 0.1m \longrightarrow \Delta T_f = \Delta T_f'$ $\quad m' = 0.3\,m$. Urea $i' = 1$

$i\,\cancel{K_f}\,m = i'\,\cancel{K_f}\,m'$

$i \times 0.1 = 1 \times 0.3$

$i = 3 = n$

$[Cr(NH_3)_5Cl]Cl_2 + H_2O \rightleftharpoons 1[Cr(NH_3)_5Cl]^{2+} + 2Cl^-$

$n = 3$

(A) $[Cr(NH_3)_6]Cl_3$

(B) $[Cr(NH_3)_5Cl]Cl_2$

(C) $[Cr(NH_3)_4Cl_2]Cl$

(D) $[Cr(NH_3)_3Cl_3]$

QUESTION

On addition of a solute, the vapour pressure of a liquid reduces to $(9/10)^{th}$ of the original value. If 2 g of the solute (molar mass 100 g mol^{-1}) is added to 100 g of the liquid to attain the reduction, then molar mass of the liquid is:

(A) 200 g mol^{-1}

(B) 100 g mol^{-1}

(C) 500 g mol^{-1} ✓

(D) 400 g mol^{-1}

Let $P^\circ = 100$ mm of Hg

$P_S = \frac{9}{10} \times 100 = 90$ mm of Hg.

$w_B = 2g$

$M_B = 100g$

$w_A = 100g$.

$M_A = ?$

$$\frac{P^\circ - P_S}{P_S} = \frac{w_B \times M_A}{M_B \times w_A}$$

$$\frac{100 - 90}{90} = \frac{2 \times M_A}{100 \times 100}$$

$$\frac{1 \times 100 \times \cancel{100}^{50}}{9 \times \cancel{2}} = M_A$$

$$\boxed{\frac{P^\circ - P_S}{P^\circ} = \frac{w_B \times M_A}{M_B \times w_A}}$$

$$\frac{100 - 90}{100} = \frac{2 \times M_A}{100 \times 100}$$

$$\frac{\cancel{10}^{5} \times 100 \times \cancel{100}}{\cancel{100} \times \cancel{2}} = M_A$$

QUESTION

For a non-electrolyte aqueous solution of molality m, $\left(\frac{\partial \Delta T_f}{\partial m}\right) =$

$$\Delta T_f = K_f m$$

(A) m

(B) K_f

(C) mK_f

(D) zero

$$\frac{d\Delta T_b}{dm} = K_f$$

QUESTION

Blood plasma has following composition:

$Na^+ = 0.01$ milli-equivalent L^{-1}

$Mg^{2+} = 0.01$ milli-equivalent L^{-1}

$PO_4^{3-} = 0.01$ milli-equivalent L^{-1}

Thus, osmotic pressure set up due to these ions at 300 K is

(A) 0.246 atm

(B) 0.739 atm

(C) 2.460 atm

(D) 4.510×10^{-4} atm

$\pi = CRT$

$\pi = \frac{n_T}{V} RT$

eq = moles × n_f

$n_f = 2$

Na^+ milli eq = 0.01

$n_f = 1$ Na^+ eq = $\frac{0.01}{1000}$

Na^+ moles $= \frac{0.01}{1000} = 10^{-5}$

Mg^{2+} eq. $= 10^{-5}$

Mg^{2+} moles $= \frac{10^{-5}}{2}$

PO_4^{3-} moles $= \frac{10^{-5}}{3}$

$$\pi = \frac{\left(10^{-5} + \frac{10^{-5}}{2} + \frac{10^{-5}}{3}\right) \times \frac{1}{\cancel{10}} \times \cancel{300}^{25}}{1}$$

$$\pi = 10^{-5}\underbrace{\left(1 + \frac{1}{2} + \frac{1}{3}\right)}_{\frac{6+3+2}{6}} \times 25$$

$$= 10^{-5} \times 25 \times \frac{11}{6}$$

$$\simeq 45 \times 10^{-5}$$

$$\simeq 4.5 \times 10^{-4} \text{ atm}$$

QUESTION

$NH_2-CO-NH_2$

On evaporation of 1L urea solution of density 1.12 g L^{-1}, 120 g of residue is formed. Thus, molality of solution is:

(A) 1.0

(B) 2.0

(C) 2.5

(D) 0.5

$V(L) = 1000\,ml$

$d_{sol^n} = 1.12\,g/ml$

$w_A = 1000 \times 1.12 - 120$

$= 1120 - 120$

$= 1000g$

Urea + water

$\underset{n.v.s}{\underline{\text{Urea}}}$

$w_B = 120g$; $M_B = 60g$

$n_B = \frac{120}{60} = 2$

$m = \frac{n_B \times 1000}{w_A(g)}$

$m = \frac{2 \times 1000}{1000} = 2m$

QUESTION

$\frac{3}{6}$

Boiling point of heavy water (D_2O) as well as its molal elevation constant are 10% higher than that of pure water. If boiling point of pure water is T (K), then ratio of latent heat of D_2O to that of H_2O (taken per gram) is

(A) 1.10

(B) $(1.10)^2$

(C) 1.1

(D) $\left(\frac{1}{1.1}\right)^2$

$T^0_{H_2O} = T\,K.$

$T^0_{D_2O} = 1.1\,T\,K.$

$\frac{l_{D_2O}}{l_{H_2O}}$

$K_b(H_2O) = x$

$K_b(D_2O) = 1.1x$

$$\frac{K_b(H_2O)}{K_b(D_2O)} = \frac{\cancel{R}\,{T^0_{H_2O}}^2 \times \cancel{1000}\, l_{D_2O}}{\cancel{1000}\, l_{H_2O} \times \cancel{R}\,{T^0_{D_2O}}^2}$$

$$\frac{\cancel{x}}{\cancel{1.1}\cancel{x}} = \frac{(\cancel{T})^2 \times l_{D_2O}}{(1.1\cancel{T})^2 \times l_{H_2O}} = 1.1$$

MEDICS Test Syllabus → Some basic Concepts of Chemistry

↓

Wednesday

↓

Level → Moderate + Tough

easy paper → 12 Q easy + 4 Q moderate

Hard/Tough → 16 Q

4 easy

6 Moderate

6 hard

Thermodynamics

(1) deal with ideal gas $PV = nRT$

(2) energy changes taking place in chemical r^n.

$2H_2 + 1O_2 \rightarrow 2H_2O$ + Heat

& does not tell us speed of r^n.

QUESTION – (NCERT Exemplar)

Thermodynamics is not concerned about______.

A) energy changes involved in a chemical reaction.

B) the extent to which a chemical reaction proceeds.

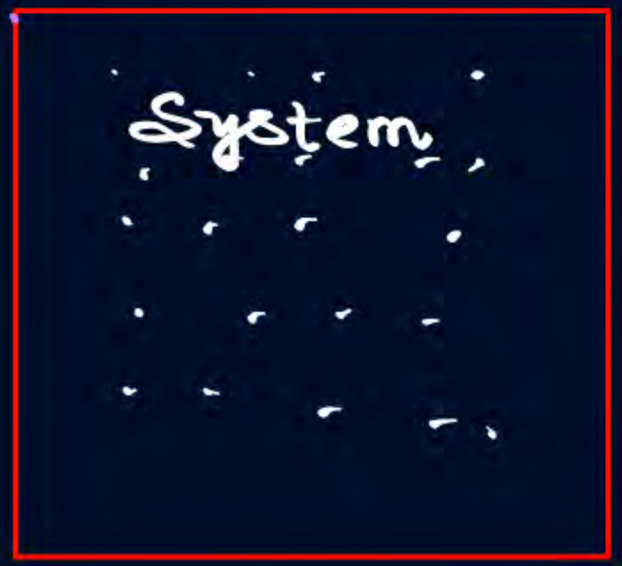
C) the rate at which a reaction proceeds.

D) the feasibility of a chemical reaction.

System

- Part of universe which is under consideration

Surroundings : except system rest of the universe

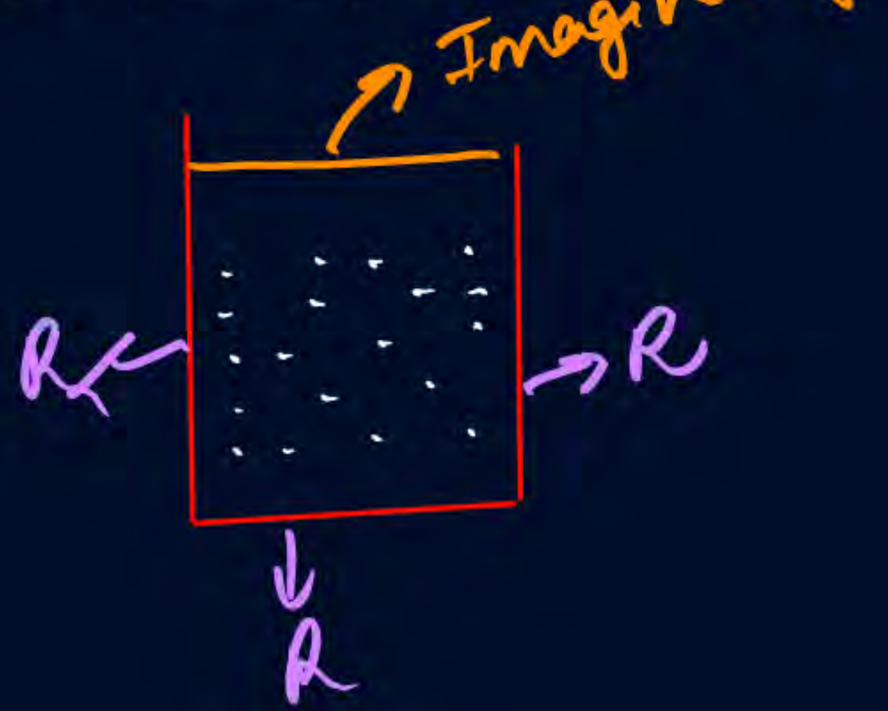


System & Surroundings are differentiated by boundaries.

Boundary 2 Types

① Real :-

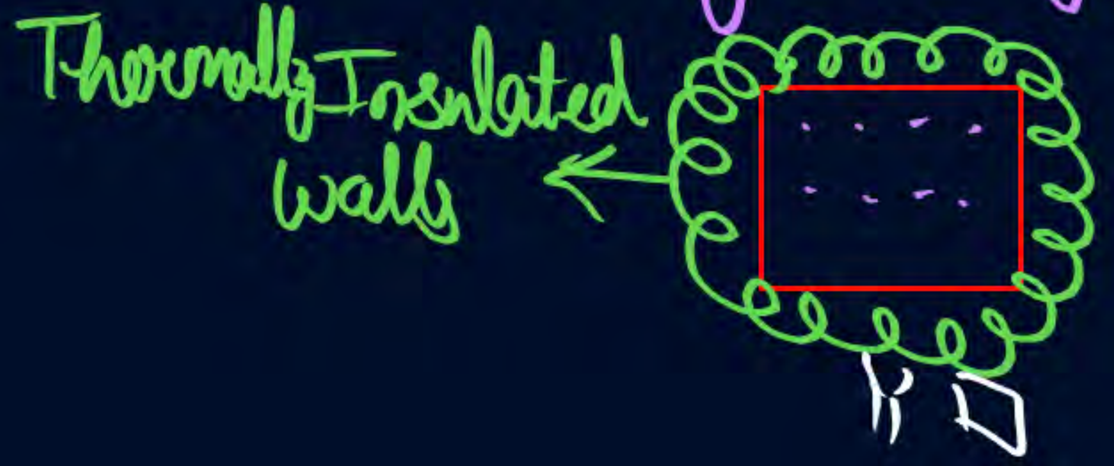
② Imaginary :- Imaginary.



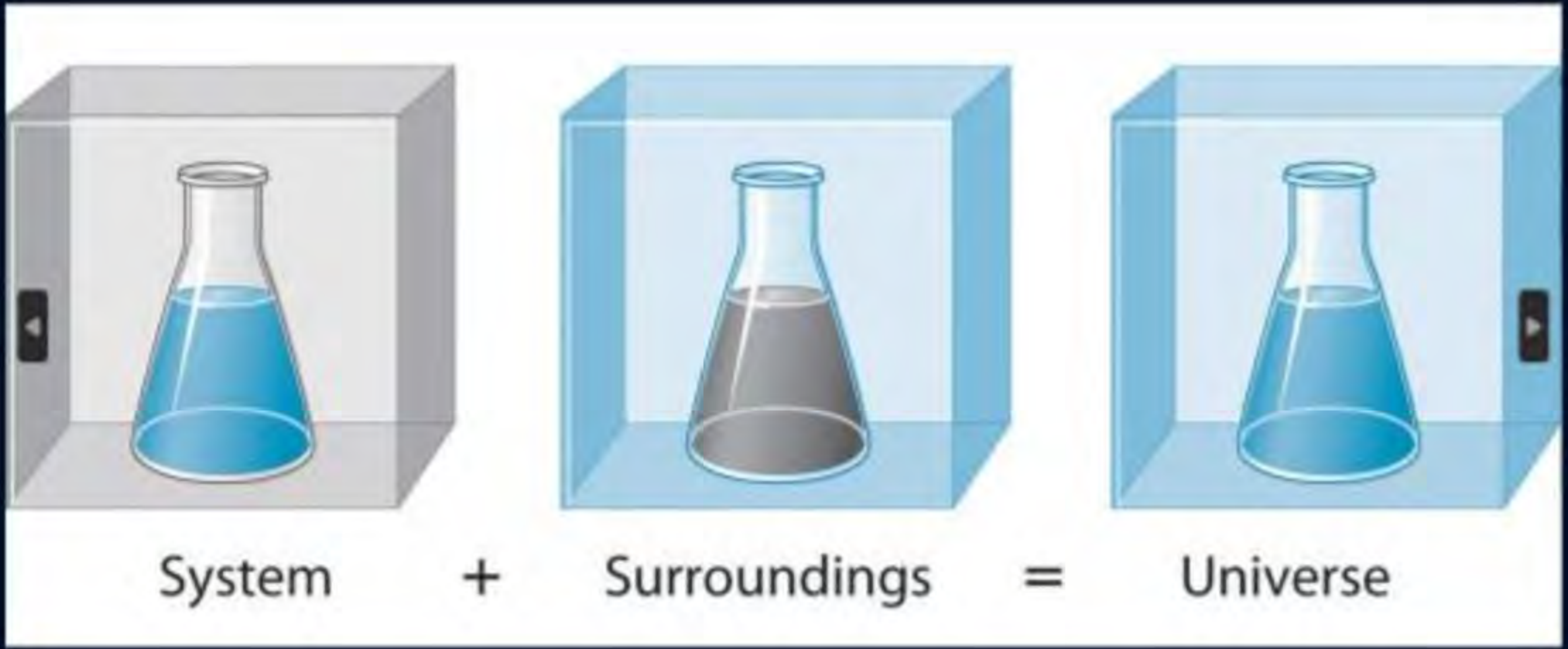
Walls → 2 Types.

(1) Diathermic walls :-
exchange energy b/w System & Surroundings.

(2) Thermally insulated walls :-
No exchange energy b/w System & Surroundings.



Surroundings

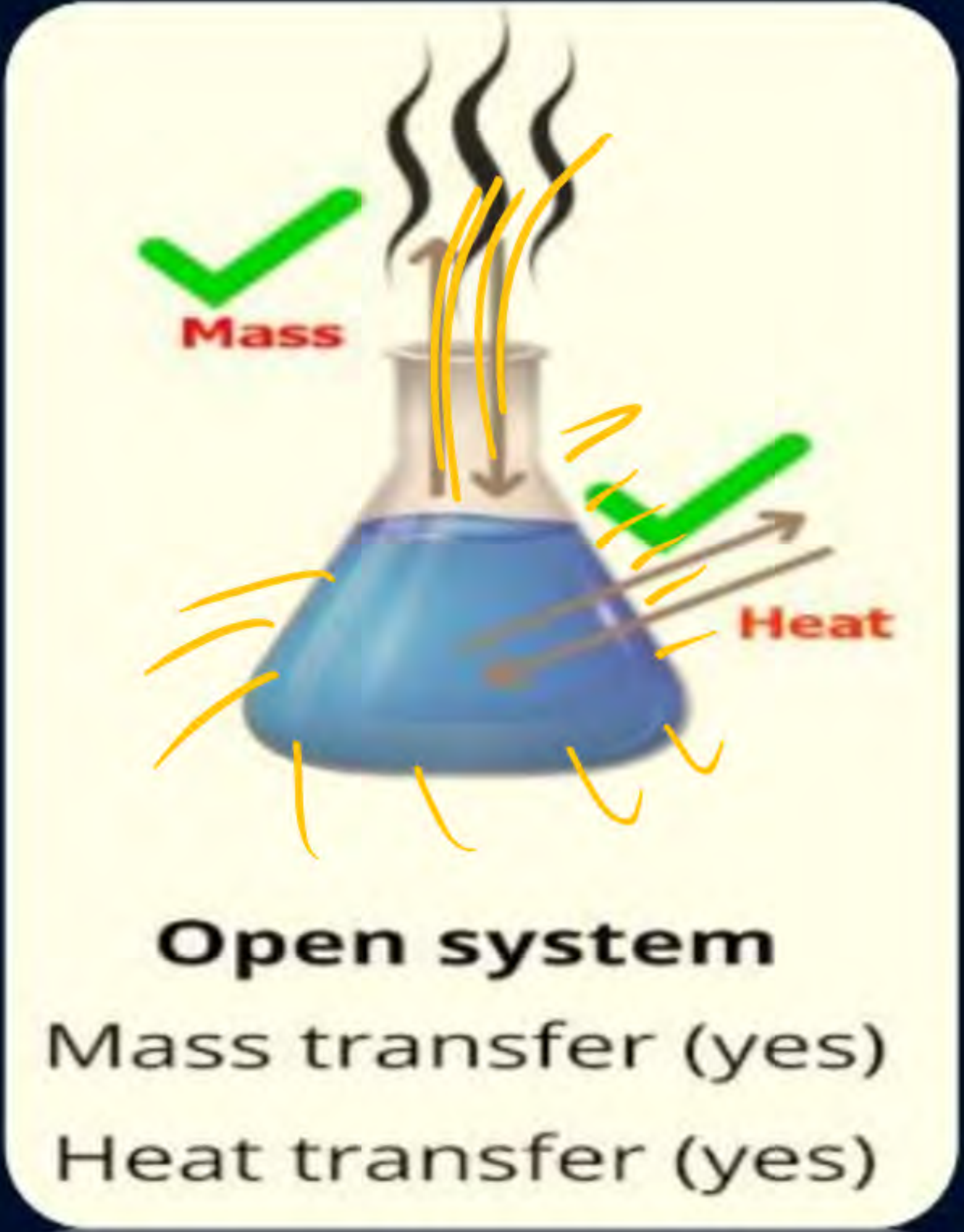


Type of System

- **Open System:**

  System which can exchange both matter and energy with surrounding

  For Example: Tea placed in an open flask.

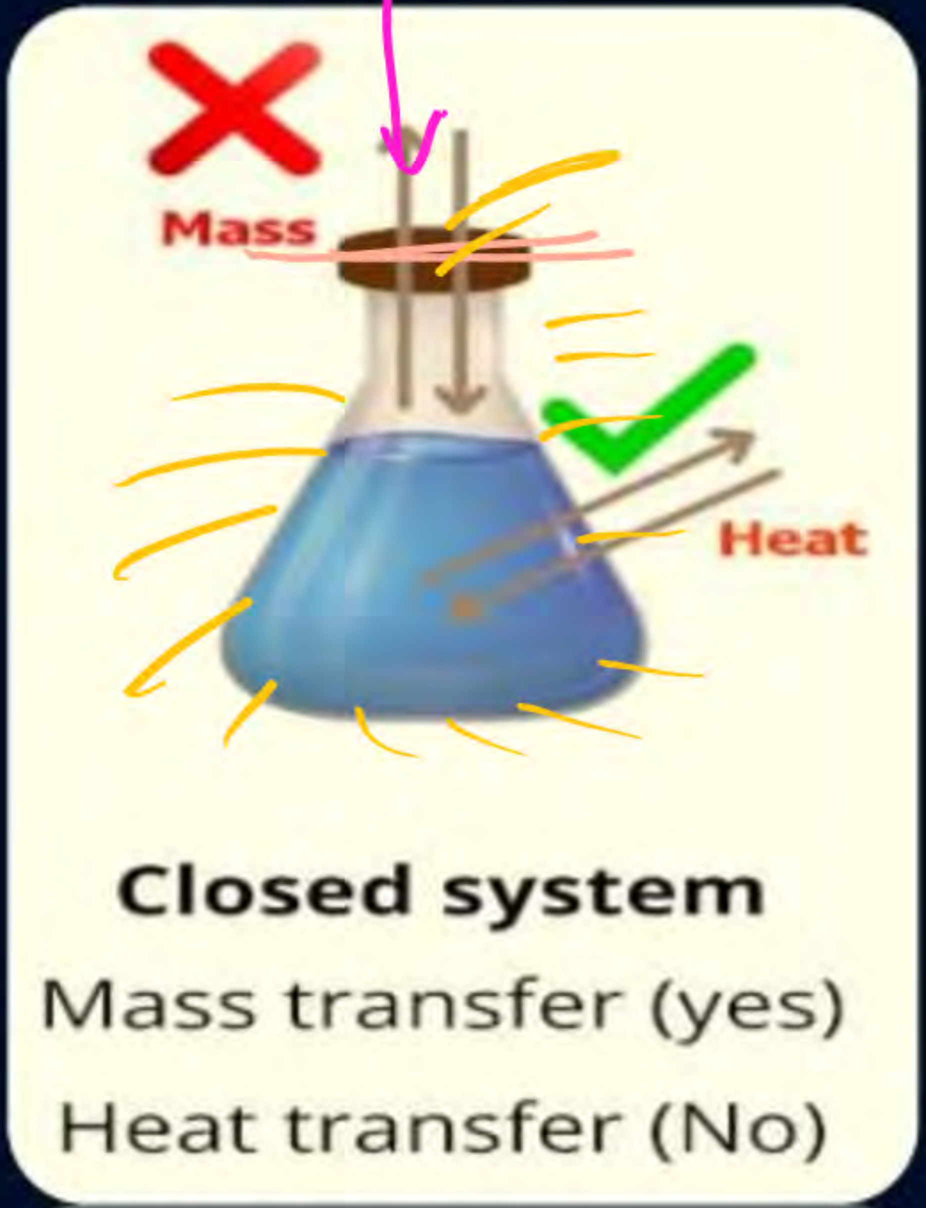


- **Closed System:**

  System which can not exchange matter but can exchange energy with surroundings.

  For example: Tea placed in a flask covered with lid.

3rd bench.



- **Isolated System:**

  System which neither exchange energy nor matter with surroundings.

  For example: Tea placed in thermos flask.

  100% Isolated System not possible.

QUESTION

A well stopped thermos flask contains some ice cubes. This is an example of a:

(A) Closed system

(B) Open system

(C) Isolated system

(D) Non-thermodynamics system

Body

Open Closed Isolated

QUESTION – (NCERT Exemplar)

Which of the following statements is correct?

(A) The presence of reacting species in a covered beaker is an example of open system.

(B) There is an exchange of energy as well as matter between the system and the surroundings in a closed system.

(C) The presence of reactants in a closed vessel made up of copper is an example of a closed system.

(D) The presence of reactants in a thermos flask or any other closed insulated vessel is an example of a closed system.

QUESTION

If in a container neither mass and nor heat exchange occurs then it constitutes a:

(A) Closed system

(B) Open system

(C) Isolated system

(D) Imaginary system

State of a System

State Variables

P, V, n, T

From 4 stt. Variables, 3 are enough to get the 4^{th} one by using $PV = nRT$

ABC

PW → watch hours

↳ DPP, MPQ

Test

QUESTION – (NCERT Exemplar)

The state of a gas can be described by quoting the relationship between_______.

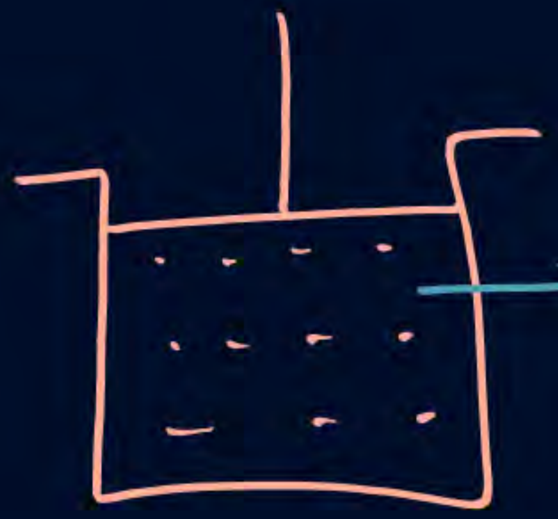
(A) pressure, volume, temperature

(B) temperature, amount, pressure

(C) amount, volume, temperature

(D) pressure, volume, temperature, amount

Work can be done if boundary is movable.

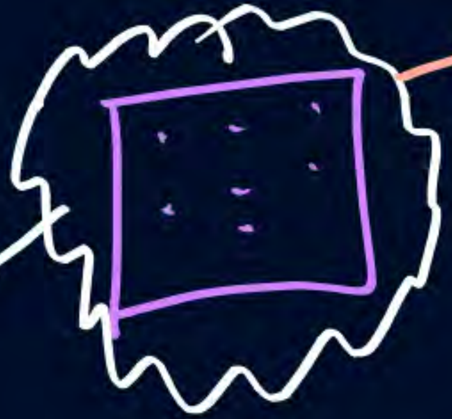


→ Heat & Work → Both can be done.

→ only work can be done

Thermal insulation

→ only Heat can be exchanged



→ Neither Heat nor work can be done.

Properties of a System

$$d = \frac{PM}{RT}$$

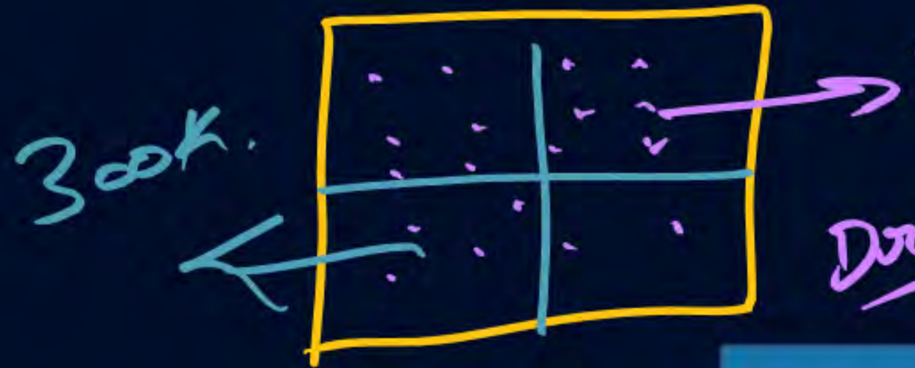
- **Extensive properties:**

  Properties of the system which depends upon matter container in the system.

  For example: Mass, Volume, all types of energy are extensive heat capacity.

  Heat Capacity, n, F, A

  U, H, S, G etc.



Dropper

Papa → Smell

Mama → Silent attack

- **Intensive properties:**

  Properties of the system which do not depends upon matter contained in system.

  For example: Temperature, refractive Index, molar mass, all conc. terms

  pH, E.M.F., P, d (M, N, m, %)

  Specific Heat Capacity,

  Molar Heat Capacity

Specific Heat Capacity → 1g substance $1°C$ (ΔT) Heat

↓ (s or C_s) s or C_s

Intensive

$1g \to 5J$

Molar Heat Capacity → 1 mole $1°C$

↓ (C_m) $1\,mol = 25J$

Intensive

$C_m \to C_{p,m}$, $C_{v,m}$

Heat Capacity → Whole System $1°C$

↓ (C)

extensive

$C \to C_p$, C_v

20 mol = 100g → 500 J

40 mol = 200g → 1000 J

60 mol = 300g → 1500 J

MIT

If x & y are two extensive prop.

$x+y$ or $x-y$ or xy is also extensive.

but $\frac{x}{y}$ or $\frac{dx}{dy}$ = intensive

$\frac{\text{ext.}}{\text{Int.}}$ = ext.

a & b are intensive

$a+b$ or $a-b$ or ab or $\frac{a}{b}$ = intensive.

ext: moles $= \dfrac{\text{mass} \rightarrow \text{ext}}{\text{G.M.M.} \rightarrow \text{Int}}$

int: $\leftarrow M = \dfrac{n_B \rightarrow \text{ext}}{V(L) \rightarrow \text{ext}}$

$I \leftarrow m = \dfrac{n_B \rightarrow e}{w_A(\text{Kg}) \rightarrow e}$

$I \leftarrow N = \dfrac{\text{g.eq.} \rightarrow e}{V(L) \rightarrow e}$

$I \leftarrow \%_B = \dfrac{n_B \rightarrow e}{n_A + n_B \rightarrow e}$

$I \leftarrow d = \dfrac{m \rightarrow e}{V \rightarrow e}$

$I \leftarrow P = \dfrac{F \rightarrow e}{A \rightarrow e}$

$F = \underline{m}a$

$pH = -\log[\underline{H^+}]$

Int.

Unit

U → Internal energy → Joule or Cal

↓

extensive

Unit or J/g

J/mol or Cal/mol

or Cal/g

↓

Intensive

QUESTION

E I I I

Out of internal energy (I), boiling point (II), pH (III) and E.M.F. of the cell (IV) intensive properties are:

(A) I, II

(B) II, III, IV

(C) I, III, IV

(D) All of these

QUESTION – (AIIMS 2018, 26 May)

$V = E$

Which of the following are extensive properties?

(A) V & E

(B) V & T

(C) V & $C_{p,m}$

(D) P and T

QUESTION

Among them intensive property is:

(A) Mass

(B) Volume

(C) Surface tension → liquid property by which it tries to reduce surface area.

(D) Enthalpy

QUESTION

If x and y are two arbitrary extensive variables, then:

(A) $(x + y)$ is an intensive variable ✗

(B) x/y is an intensive variable ✓

(C) ✗ $(x - y)$ is an intensive variable

(D) ✗ xy is an intensive variable

QUESTION – (AIIMS 2002)

Assertion: **Mass and volume are extensive properties.**

Reason: **Mass/volume is also an extensive parameter.**

(A) If both Assertion and Reason are correct and the Reason is a correct explanation of the Assertion.

(B) If both Assertion and Reason are correct but Reason is not a correct explanation of the Assertion.

(C) If the Assertion is correct but Reason is incorrect.

(D) If both the Assertion and Reason are incorrect.

(E) If the Assertion is incorrect but the Reason is correct.

QUESTION – (NCERT Exemplar)

The volume of gas is reduced to half from its original volume. The specific heat will be ____.

(A) reduce to half

(B) be doubled

(C) remain constant

(D) increase four times

THANK
YOU