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20/04/20

M.N. 8750910927

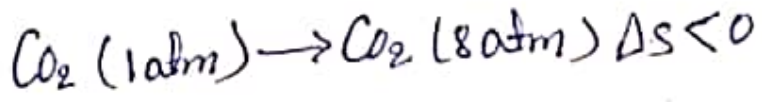
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Condition for gas: —

- $n \uparrow \quad \Delta S > 0$
- $T \uparrow \quad \Delta S > 0 \quad Fe(300K) \rightarrow Fe(400K)$
- $V \uparrow \quad \Delta S > 0 \quad CO_2(10atm) \rightarrow CO_2(1atm)$
- $P \uparrow \quad \Delta S < 0$



Example! —

1.  $\Delta S_{graphite} > \Delta S_{diamond}$   
(Free  $\ominus$  more)

during boiling of egg  $\Delta S > 0$   
due to denaturation of proteins

stretching of rubber  $\Delta S < 0$

Coiled (disordered)  $\xrightarrow{\Delta S < 0}$  uncoiled (ordered)

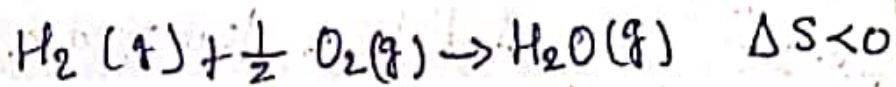
Mixture formation

- gas + gas
- gas + liq
- liq + liq
- liq + solid
- solid + solid

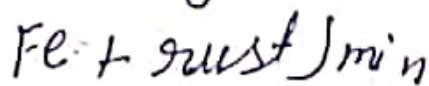
randomness  $\Delta S \uparrow$

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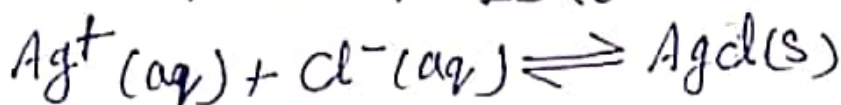
gas + solid absorb  $\Delta S \downarrow$



eg :- Rusting of Iron  $\Delta S > 0$



Precipitation :-  $\Delta S < 0$

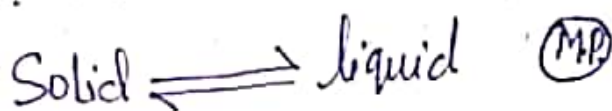


Crystallisation  $\Delta S < 0$

Polymerisation  $\Delta S < 0$

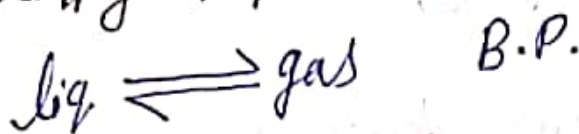
Entropy change in Physical reacn:-

1. Heat of fusion / Enthalpy of fusion ( $\Delta H_{\text{fusion}}$ )  
when 1 mole of liquid is converted into liquid  
at its M.P. then heat change is c/a  $\Delta H_{\text{fusion}}$ .



$\Delta S = \frac{\Delta H_{\text{fusion}}}{T} \quad JK^{-1} mol^{-1}$

2. Heat / Enthalpy vapourisation ( $\Delta H_{\text{vap}}$ )



$\Delta S = \frac{\Delta H_{\text{vap}}}{T}$

### 3. Heat / Enthalpy Sublimations



$$\Delta S_{\text{sub}} = \frac{\Delta H_{\text{sub}}}{T}$$

Ques: For a sample of perfect gas when its pressure is changed isothermally from  $P_i$  to  $P_f$  then entropy change is given by -

①  $\Delta S = nRT \ln \frac{P_i}{P_f}$       ②  $\Delta S = nRT \ln \frac{P_f}{P_i}$

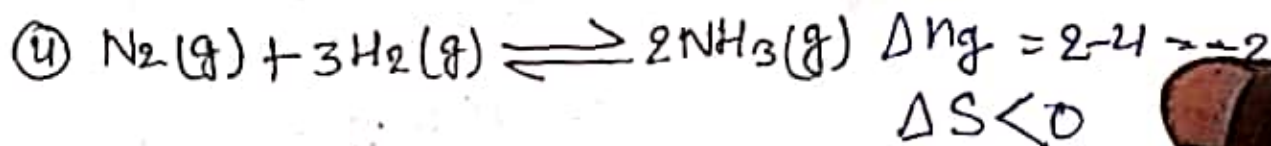
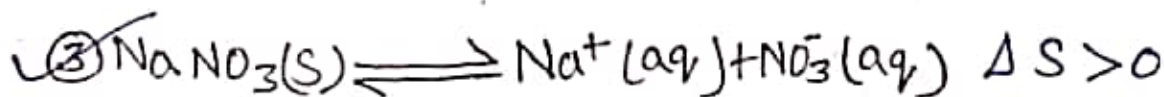
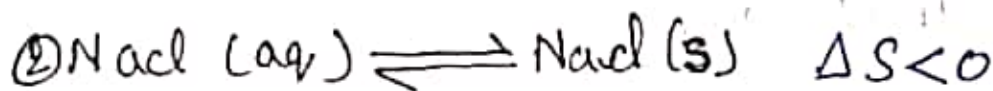
✓ ③  $\Delta S = nR \ln \frac{P_i}{P_f}$       ④  $\Delta S = nR \ln \frac{P_f}{P_i}$   
 $T \rightarrow \text{const.}$

$$\Delta S = nR \ln \frac{V_2}{V_1}$$

$$P \propto \frac{1}{V}$$

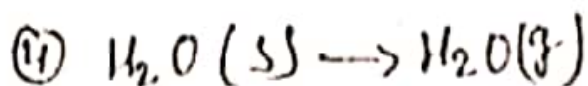
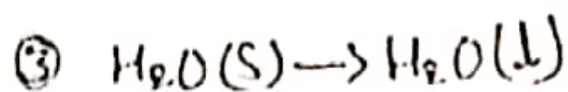
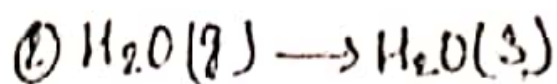
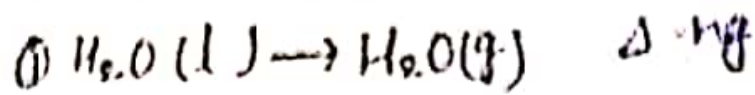
$$\Delta S = nR \ln \frac{P_i}{P_f}$$

Ques:  $\Delta S > 0$  for





Q) Quest:-  $\Delta S < 0$  जोर



Quest- The entropy change involved in isothermal & reversible expansion of 2 mol of an ideal gas from a volume of 1 cm<sup>3</sup> to 10 cm<sup>3</sup> at 27°C in  $J K^{-1} mol^{-1}$

$$\Delta S = 2 \cdot 303 n R \log_{10} \frac{V_2}{V_1}$$

$$= 2 \cdot 303 \times 2 \times 8.3 \log_{10} \frac{10}{1}$$

$$= 2 \cdot 3 \times 2 \times 8.3 \log_{10} 10^1$$

$$= 4.6 \times 8.3$$

$$\begin{array}{r} 8.3 \\ 4.6 \\ \hline 498 \\ 332 \times \\ \hline 3818 \end{array}$$

$$\Delta S = 38.18 \text{ J K}^{-1} \text{ mol}^{-1}$$

Quest- The enthalpy of vap. for water is 185 kJ mol<sup>-1</sup>. Then calculate entropy change.

$$\Delta S = \frac{\Delta H_{\text{vap}}}{T}$$

$$= \frac{185 \times 10^3}{373} = \frac{18500}{373}$$

$$= 495.9 \text{ J mol}^{-1} \text{ K}^{-1}$$