

Chapter 9: Theory of dilute solution

Sl. No.	Question	Obj/ Spec./ Diff. Level						
1.	Mention any two different between ideal and non-ideal solutions.	U Distinguish Average						
	<table border="0" style="width: 100%;"> <tr> <td style="text-align: center;">Ideal solution</td> <td style="text-align: center;">Non ideal solution</td> </tr> <tr> <td>1. Obeys Raoult's law</td> <td>1. Does not obey Raoult's law</td> </tr> <tr> <td>2. $\Delta V = 0$</td> <td>2. $\delta V \neq 0$</td> </tr> </table>	Ideal solution	Non ideal solution	1. Obeys Raoult's law	1. Does not obey Raoult's law	2. $\Delta V = 0$	2. $\delta V \neq 0$	
Ideal solution	Non ideal solution							
1. Obeys Raoult's law	1. Does not obey Raoult's law							
2. $\Delta V = 0$	2. $\delta V \neq 0$							
	Or any other two differences.							
2.	18.2g of urea is dissolved in 100g of H ₂ O at 50°C. The lowering of vapour pressure produced is 660 pa. The vapour pressure of pure H ₂ O at 50°C is 12,260 p.a. Calculate the molecular mass of urea.	A Problems Average						
	Formula given Substitute the value and Result							
3.	Write van't Hoff's solution equation and expand the symbols involved in it.	K Recognize Average						
	Equation (1 mark) Expand the symbols (1 mark)							
4.	In a Ostwald-Walker's experiment, 16.0 g of urea was dissolved in 90g of water. Dry air was passed into it and then later into pure water. Loss in mass of solution bulbs was found to be 2.5g and that of solvent bulbs was 0.142g. Calculate the molecular mass of urea.	A Problem Average						
	Formula (1 mark) Substitution (1 mark) Calculation and result (1 mark)							
5.	How is relative lowering of vapour pressure determined by Ostwald- Walker's dynamic method?	A Describe Average						
	Figure (1 mark) Procedure (1 mark) Calculation (1 mark)							

6. Give reason : Sea water freezes below 271 C.
- A
Analyse
Average
- Due to the presence of salt in sea water.
7. What happens to the boiling point of pure H₂O when NaCl is dissolved in it?
- U
Interpret
Average
- Boiling point increases
8. Define the term relative lowering of vapour pressure.
- K
Recall
Easy
- Ratio of lowering of vapour pressure to the vapour pressure of the pure solvent at the same temperature.
9. What happens to the relative lowering of vapour pressure when the number of moles of non-volatile solute is increased?
- A
Interpret
Average
- Increases
10. Define the term osmosis.
- K
Recall
Easy
- The movement of solvent molecule into solution through semi permeable membrane or any related definition.
11. State Raoult's law of relative lowering of vapour pressure.
- K
Recall
Easy
- The relative lowering of vapour pressure is equal to the mole fraction of the solute present in the solution.
12. Give an example for synthetic semipermeable membrane.
- K
Cite an
example
Easy
- Copper ferrocyanide

13. Define the term osmotic pressure.

The external pressure just applied to prevent the flow of solvent molecules into the solution through a semipermeable membrane.

14. What is a semipermeable membrane?

K
Recall
Easy

Which allows only solvent molecules to pass through it but not the solute particles.

15. State van't Hoff-Boyle's law

K
Recall
Easy

Osmotic pressure of a dilute solution is directly proportional to the molar concentration of the solution at constant pressure.

16. State Raoult's law for liquid mixtures.

K
Recall
Average

Vapour pressure of any component in a solution is equal to the product of redefraction of the component and its vapour pressure in the pure state at that temperature.

17. Give an example for a non-ideal solution with positive deviation.

K
Recall
Average

Methanol + water OR Ethanol + water

18. What is a colligative property?

K
Recall
Easy

The property which depends on the number of solute particles and not on the nature of the solute particles.

19. Give an example for ideal solution.

K
Cite example
Easy

Hexane and Heptane OR any suitable example. Ethyl bromide and ethyl iode.

20. Give an example for colligative properties.
- K
Recall
Easy
- Relative lowering vapour pressure
21. Give an example for a non-ideal solution with negative deviation.
- U
Cite example
Average
- HCl + water OR chloroform + acetone OR suitable example
22. Elevation in boiling point is a colligative property. Why ?
- U
Interpret
Average
- It depends upon the number of moles of the solute particles.

Chapter 10 : Chemical Thermodynamics

Sl. No.	Question	Obj/ Spec./ Diff. Level
1.	What is the SI unit of entropy?	K Recall Easy
	JK ⁻¹	
2.	What is the change in entropy when a liquid is converted into vapour?	A Solve Easy
	ΔS is positive	
3.	How does standard free energy change is related to equilibrium constant K_p for a reaction?	K Recall Average
	Correct equation $\rightarrow \Delta G^\circ = - 2.303 RT \log K_p$ (1 mark)	
4.	State Second Law of Thermodynamics.	K State Average

All spontaneous processes are irreversible and tend to attain equilibrium or any other form.

5. How are free energy, entropy and enthalpy related?

K
Recall
Easy

$$G = H - TS$$

6. Give an example for a spontaneous process.

U
Cite example
Easy

Reaction of Zn with dil. H_2SO_4 with the evolution of hydrogen OR
Flow of heat from a body at a higher temperature to a lower temperature

OR

Any other example

7. In a reaction $A \rightarrow B$, 50% of the reactant is converted into products. What is the ΔG° value for the reaction?

A
Analyse
Average

Zero (0)

8. Define Entropy.

K
Definition
Easy

It is a measure of disorder or randomness in a system.

9. What happens to the entropy during the melting of ice?

U
What
Easy

Increases

10. Define free energy.

K
Define
Average

Maximum amount of energy available for doing useful work at constant temperature and pressure

OR

It is the difference between total enthalpy of the system and the product of absolute temperature and entropy.

11. Write Gibb's equation.
- K
Recall
Average
- $$\Delta G = \Delta H - T \Delta S$$
12. What is the sign of ΔG° for a spontaneous process?
- U
Identify
Average
- Negative
13. What is spontaneous process?
- K
Definition
Easy
- A process which takes place on its own accord, without any external aid once it is properly initiated.
14. If $\Delta G^\circ = 0$ for a reaction, what is the value of equilibrium constant?
- S
Judge
Easy
- One
15. If ΔH is -ve and ΔS is +ve under what condition the reaction would be spontaneous?
- S
Judge
Average
- At all temperatures
16. Define standard free energy change.
- K
Define
- Correct definition
17. Apply Gibb's equation to show that exothermic reaction with + (positive) ΔS is feasible.
- A
Apply
- $$\Delta G = \Delta H - T \Delta S \quad (\frac{1}{2} \text{ mark})$$
- $$\Delta H = - \quad \Delta S = + \quad (\frac{1}{2} \text{ mark})$$
- $$\Delta G = - \quad (\frac{1}{2} \text{ mark})$$
- \therefore process is spontaneous ($\frac{1}{2}$ mark)

18. Apply Gibb's equation to show that Endothermic reaction with + (positive) ΔS is feasible.
- A
Apply
Difficult
- $\Delta G = \Delta H - T \Delta S$
 $\Delta H = + \quad \Delta S = +$
 $\Delta G = -$ (At high temperature only)
19. How does ΔG for a r \times n helps in knowing whether a r \times n is spontaneous or not?
- A
Predict
Easy
- $\Delta G = -ve$ spontaneous (1 mark)
 $\Delta G = +ve$ non-spontaneous (1 mark)
20. What is non-spontaneous process? Give an example.
- U
Cite example
Easy
- Definition (1 mark)
 Example (1 mark)
21. What is spontaneous process? Give an example.
- U
Cite example
Easy
- Definition (1 mark)
 Example (1 mark)
22. The equilibrium constant K_p for the reaction $C_2 + H_2 + H_2 \rightleftharpoons C_2H_4$ is 1.85 at 298 K. Calculate the standard free energy change for the reaction at the same temperature.
- A
Calculate.
Average
- Correct formula ($\frac{1}{2}$ mark)
 Substitution ($\frac{1}{2}$ mark)
 Answer with unit (1 mark)
23. Equilibrium constant K_p for a reaction is found to be 1×10^4 at 298 K. Calculate ΔG° .
- A
Calculate
Average
- Correct formula and substitution (1 mark)
 Correct answer with unit (1 mark)

24. Standard free energy change for $r \times n$ is -115 kJ at 298K . Calculate the equilibrium constant.
- A
Calculate
Average
- Correct formula and substitution (1 mark)
Correct answer with unit (1 mark)
25. The value of K_p for a reaction is 0.005 . Calculate its standard free energy change at 320 K .
- A
Calculate
Average
- Correct formula and substitution (1 mark)
Answer with unit (1 mark)
26. Based on Gibb's equation predict the condition for spontaneity of an endothermic reaction.
- A
Analyse
Average
- $$\left. \begin{array}{l} \Delta G = \Delta H + T \Delta S \\ \Delta H = +ve \\ \Delta S = +ve \end{array} \right\} (1 \frac{1}{2} \text{ mark})$$
- Spontaneous at high temperature ($\frac{1}{2}$ mark)
27. "Tendency to attain state of Minimum Energy" is one of the criteria. Explain.
- U
Explain
Average
- Example (1 mark)
Explanation (2 marks)
28. "Tendency to attain stae of maximum randomness" is one of the criteria. Explain.
- U
Explain
Average
- Example (1 mark)
Explanation (2 marks)