Colligative properties of electrolyte solutions

- The study of colligative properties of electrolyte is slightly different from the non-electrolyte?!
- Because electrolyte dissociate into ions in solutions.

Remember

- The total number of solute particles are determines the colligative properties of a solution.

Van't Hoff factor

$$i = \frac{\text{actual no.of particles in soln.after dissociation}}{\text{number of formula units initially dissolved in soln.}}$$

The value of (i)

1) i should be 1 for all non-electrolyte

2) i should be 2 for strong electrolyte such as "NaCl , KNO_3"

3) i should be 3 for strong electrolyte such as "Na_2SO_4 and $CaCl_2$"

Equation of colligative properties

$\Delta T_b = iK_b\ m \quad \Delta T_f = iK_f\ m \quad \pi = iMRT$

Ion pairs → is made up of one or more cations and one or more anions held together by electrostatic force.

- The presence of ion pair reduces the no. of particle in soln. causing a reduction in the colligative properties.
- Electrolyte containing multicharged ions such as Mg^{+2} .Al^{+3} , $SO4^{-2}$ and $PO4^{-3}$ have a greater tendency to form ion pairs than electrolytes such as NaCl ,KNO_3.

Example

The osmotic pressure of a 0.010 M potassium° iodide (KI) solution at 25°C is 0.465 atm. calculate the van't Hoff factor of KI at this concentration.

Solution

KI is → electrolyte solution

$$\pi = iMRT$$

$$i=\frac{\pi}{MRT} = \frac{0.465}{0.010*(25+273)*0.0821} = 1.9$$

Choose

1) ..... dissociated into ions in solutions.

A) non electrolyte
B) electrolyte
C) concentrated soln.
D) diluted soln.

2) Colligative properties are determined by.....

A) nature of solvent
B) number of solute
C) nature of solute
D) number of solvent

3) The value of Van't Hoff is.....for all non-electrolytes.

A) 2
B) 4
C) 3
D) 1

4) The value of Van't Hoff is……..for NaCl.

A) 3
C) 2
B) 6
D) 1

5) The value of Van't Hoff is 1 for……..

A) non electrolyte
C) NaCl
B) electrolyte
D) Na_2CO_3

6) The value of Van't Hoff is 2 for……..

A) $CaCl_2$
C) H_2SO_4
B) Na_2SO_4
D) KNO_3

7) KNO_3 and NaCl is……. Electrolyte.

A) Strong
B) Weak

8) The value of Van't Hoff is ……..for KNO_3

A) 1
C) 2
B) 4
D) 3

9) The value of Van't Hoff is ……..for Na_2SO_4.

A) 6
C) 2
B) 1
D) 3

10) The value of Van't Hoff is……..for $CaCl_2$.

A) 8
C) 3
B) 2
D) 5

11)…….is made up by one or more cation held together by electro-static force.

A) ion pair
C) electron pair
B) anion pair
D) free radical

12) Is made up by one or more anions held together by electro static force

A) cation pair
C) free radical
B) electron pair
D) ion pair

13) The presence of ion pair in solution …… the colligative properties.

A) decrease
B) increase

14) The presence of ion pair in solution……. The no. of particle in soln.

A) increase
B) decrease

15) ……is multi-charged ion .

A) Cl^-
C) Na^+
B) K^+
D) $SO4^{-2}$

16) Electrolyte containing multi-charged ions have greater tendency to form…….

A) cation pair
C) ion pair
B) anion pair
D) electron pair