SOLVENT EXTRACTION
&
PARTITION COEFFICIENT

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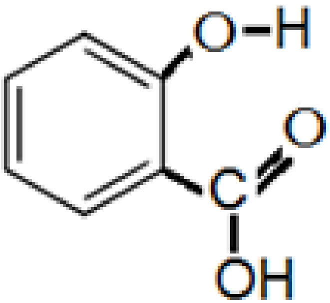
Name of Experiment: **PARTITION COEFFICIENT**.

Aim of Experiment: Calculation of the partition coefficient of **SALICYLIC ACID** .



Salicylic acid

Salicylic acid,

S.A. , it is colorless to white odorless crystals,

molecular formula $C_7H_6O_3$

molar mass **138.12** ***g.mol^{-1}*** ,

it has a water solubility of 2.48 *g.L^{-1}* at 25 ºC.

& it's Chloroform solubility of 22.2 *g.L^{-1}* at 25 ºC .

Procedure:

1- Put an unknown weight of S.A. in a separatory funnel; & then add 25 ml of chloroform & 25 ml of D.W.

2- Shake gently for 15 -20 minutes until no further pressure is released from the funnel stem.

3- Leave the funnel on an iron ring for about 5 - 10 min.s for complete separation of the 2 layers. The stopper must be removed.

4- Separate the lower chloroform layer slowly through the Funnel stem until the aqueous layer is about to enter the hole of the stopcock.

5- Pour the upper aqueous layer through the neck of the separatory funnel.

6- Take 10 ml from the organic layer by a bulb pipette, pour into a conical flask, and add two drops of ph.ph. indicator.

7- Titrate against 0.1 N NaOH solution until the end point, which is the appearance of pink colour.

8- Repeat step 6 and 7 for the aqueous layer.

Calculations:

NaOH *Salicylic acid*

$$N * V = \frac{\text{Mass}}{\text{Eq. mass}} * 1000$$

The aqueous layer:

$$0.1 \text{ x } V = \frac{\text{wt.}}{138} \text{ x } 1000$$

wt. in 10 ml x 2.5 (enlarging factor) = ***x*** gram wt. of S.A. in 25 ml .

The organic layer:

$$0.1 \text{ x } V^{-} = \frac{\text{wt.}}{138} \text{ x } 1000$$

wt. in 10 ml x 2.5 (enlarging factor) = ***y*** gram wt. of S.A. in 25 ml.

x + ***y*** = ---- weight of S.A. in the sample (unknown)

$$K = \frac{\text{wt.}_{org.} / \text{v}_{org.} \; 25 \text{ ml}}{\text{wt.}_{w} / \text{v}_{w} \; 25 \text{ ml}}$$

QUESTIONS & EXAMPLES :

Q1- If 100 ml of benzene dissolve 5.5 g of caffeine & 100 ml of water dissolve 2.2 g of caffeine. Calculate the amount of caffeine that can be extracted from 500ml of water in which 5 g of caffeine are dissolved, show calculations & give the % of caffeine extracted

a) By a single extraction with 200 ml of benzene.

b) By 2 successive extractions with 100 ml of benzene in each.

c) By 3 successive extractions with 66.6 ml of benzene in each.

Q2- Calculate the partition coefficient, K, of cpd. A, when 0.24 g of the compound dissolve in 100 ml of water & 2.7 g of it dissolve in 100 ml of ether.

Q3- An unknown sample contains **20 g** of certain compound, when extracted with **100 ml** water & **35 ml** ether, it was found that the partition coefficient of the compound was **4** ;
Calculate the weight of the compound extracted by the aqueous layer and by the organic layer?

Q4- Explain extraction by pH adjustment method & illustrate in which situation we use it?

Notes:

*** To recognize which layer is the aqueous layer and which is the is the organic layer, mix about 3 ml of any layer with an equal volume of water in a test tube and observe the result. If there are two layers, then that layer is the organic layer; & if there is one layer, then that layer is the aqueous layer.**