Imbibition:

We have seen before that colloidal system invariability take up a large amount of water from their surrounding medium (their charged particles taking an aquatic confer called **Bound water)** and as a result swell up considerably. Many other substances such as proteins, gums, starch, cellulose, agar, gelatin, etc., show such **Hydrophilic properties** when placed in contact with water or lose water and shrink when devoid of water and consequent swelling of colloidal particles (because they have tiny canals on their particle's surface which accumulate the water molecules according to diffusion or capillary phenomena lows) and other substances is commonly called Imbibition.

Imbibition pressure or metric pressure:

The maximum pressure resulting inside the imbibing (materials which is imbibing) when it is soaked in pure water.

e.g.

A few dry seeds with seed coats permeable to water are soaked in:

1. Distal water.
2. Saline solution (low concentration).
3. Saline solution (high concentration).

Result/ the imbibition rate

1>2>3

Reason: In 1 the resulting imbibition pressure enters seeds higher than other 2 and 3.

Concentration gradient between the α imbibition pressure imbibing and imbibing solution.

Importance of imbibition in plants:

1. It is a very important pre-germination event that initiates the biochemical processes leading to germination of seed.
2. Which plays an important role in ascent of sap through the xylem vessels?

Conditions of taking place the imbibition process:

1. Diffusional pressure gradient occurs that mean differences in concentrations

   Occur between imbibing substances and imbibing solutions (concentration gradient α rate of imbibition).

2.Occurrence of some specific forces of attraction between the molecules of imbibing and the water (or the liquid) it may be imbibing.

e.g. Seeds imbibing in water while the rubber in ether.

Factors affecting the rate of imbibition:

1. Temperature α rate of imbibition.
   The temperature effect on the velocity of the process but not on the amount of imbibing solution.

5 gm	dry seed
10°C	Temperature
20 ml	imbibing water
5 minutes	time of imb.

↓ Increasing Temp

5 gm	dry seed
20°C	Temperature
20 ml	imbibing water
2 minutes	time of imb.

2. Surface area of the imbibing particles α rate of Imb.
   More surface area ⟶ more canals on the particle surface ⟶ more
   water molecules accumulation ⟶ more imbibing water.

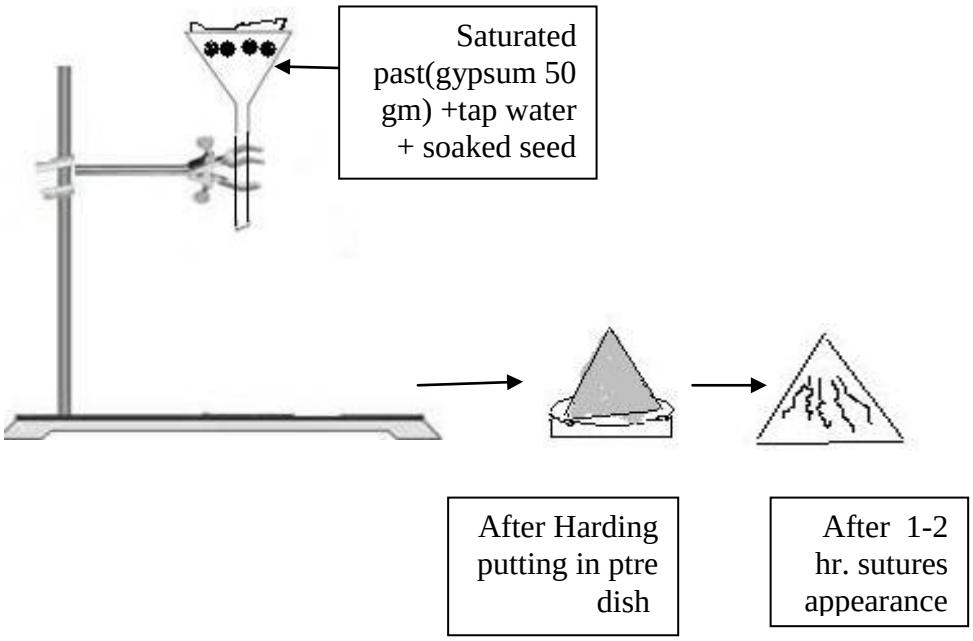
3. Osmotic pressure to the imbibing solution α 1 / rate of Imb.

Imbibing solution Osmotic pressure increasing ⟶ solute cone. Increasing⟶ cone. Gradient between imbibing and imbibing solution decreasing ⟶ diffusional pressure gradient decreasing ⟶ imbibition pressure enter the imbibing decreasing ⟶ rate of imbibition decreasing.

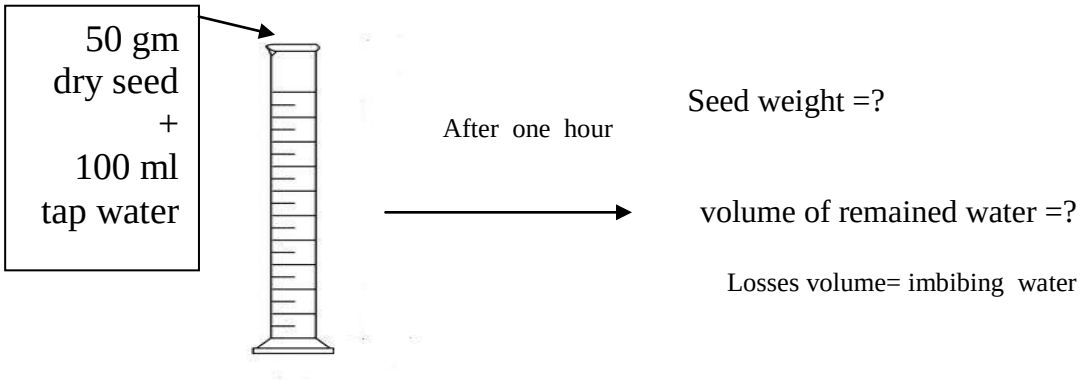
Duty question
Q /What's the differ / similar between osmosis and imbibition?

Practice part:

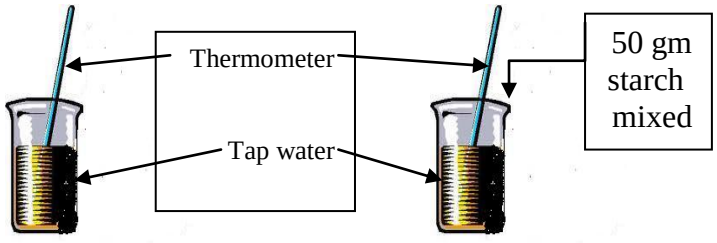
Exp1:power of the pressure releasing during the imbibition .



Exp2:the changes of weight &size during the imbibition.



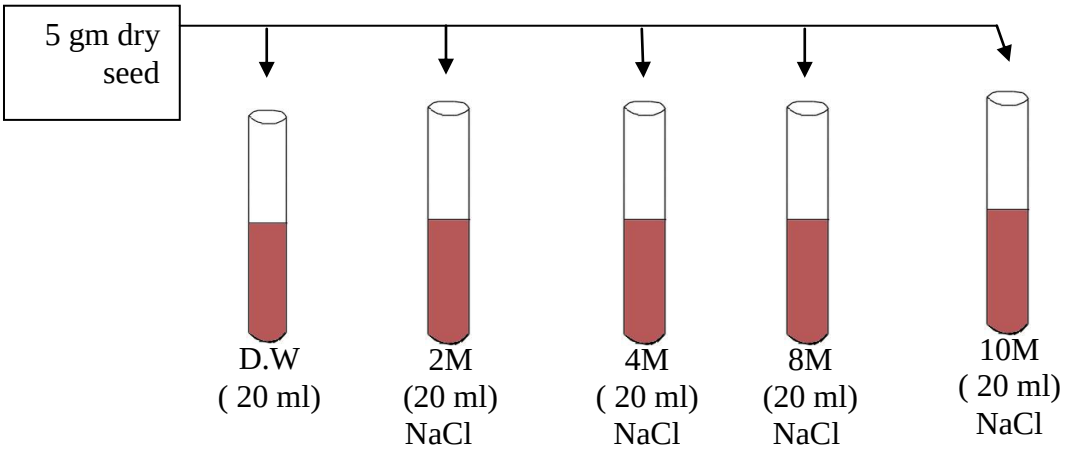
Exp3: releasing of heat during the imbibition.



Temp.1 Temp.2

T2-T1= hydration tempreture

Exp4: effect of osmotic pressure of imbibing solutions during the imbibition.



The test tubes left to next day.at the laboratory temp. then record the results at this table:

sample number	Osmotic pressure(o.p)	Initial wt. Of seed(gm)	Wt. of seed after imbi.(gm.)	Wt. Of imbibing water(gm.)	Rate of imbibition
1		5			
2		5			
3		5			
4		5			
5		5			

Wt. of imbibing water(gm) = Wt.of seed after imbibition _ Wt.of seed befor imbibition

O.P= 22.4*M*n*T/273

Rate of imbibition = Wt. of imbibing water(gm)/ Wt.of seed after imbibition(gm)

Q/which sample gave the maximum/minimum rate of imbibition ,why?