[B] **Condensation Method:** Colloidal system may be obtained by various chemical reactions-

(1) **Reduction-** Sols of metals are usually obtained by reduction of their salt solutions in water by using certain reducing agents. Eg. Goldsol is prepared by reduction of auric chloride.

$2\ AuCl_3$ + $3\ H_2O$ $\xrightarrow[\text{up to boiling}]{\text{heated}}$ Added 2or 3 ml of very weak solution of

(1% Solution) Distilled water up to boiling formalin

(3 HCHO)

↓

$2\ Au + 6HCl + 3HCOOH$

(2) **Oxidation-** Sols of non – metals are usually obtained by oxidation. A Colloidal Sulphur Sol is obtained by the oxidation of an aqueous solution of hydrogen sulphide with air or sulpher di-oxide.

$$2\ H_2S + O_2 \longrightarrow 2\ S + H_2O$$

$$2\ H_2S + SO_2 \longrightarrow 3\ S + 2H_2O$$

(3) **Hydrolysis-** Colloidal sols of heavy metals are obtained by the hydrolysis of the solution of their salts. Thus when a small amount of ferric chloride is added to boiling water , a red brown sol of ferric hydroxide is obtained .

$$FeCl_3 + 3\ H_2O \xrightarrow{\text{heat}} Fe(OH)_3 + HCl$$

(4) **Double Decomposition-** This method is generally used for the preparation of sols from insolution salts. A sol of arsenis sulphide is prepared by passing H_2S gas through a dilute solution of arsenious oxide and removing the excess H_2S by boiling .

$$As_2O_3 + 3\ H_2S \longrightarrow As_2S_3 + 3H_2O$$

(5) **Exchange of solvent-** Sols can also be obtained by exchange of solvents . For example , when a concentrated solution of sulphur in alcohol is poured in a large amount of boiling water , the alcoholevaporates leaving being sulphur particles which form nuclei that rapidaly grow into a colloidal sol.

PURIFICATION :- Three methods are generally used-

1. **Dialysis:** It has already been stated that while particles in true solution can easily diffuse through parchment and other fine membranes, the colloidal particles, being much larger , cannot do so readily. If a mixture , containing colloidal particles as well as particles in true solution , is placed in a parchment bag which is then held in a wider vessel containing pure water , the substance in true solution pass out while the colloids remain in the bag. The distilled water in the wider vessel is renewed frequently.

The process of separating substance in colloidal state from those present in true solution with the help of fine membrane is known as dialysis.

2. **Electrodialysis:** Ordinarily , the process of dialysis is quite slow but it can be quickened by applying an electric field if the substance in true solution is an electrolyte the process is then called electrodialysis.

3. **Ultrafiltration:** The separation of solutes from colloidal systems can also be carried out by the process known as ultra –filtration. Ordinarily , filter papers have pores larger then 1 micron so that the colloidal particles which can readily pass through along with the ions or molecules in solution. But the pores can be made smaller by soaking the filter paper in a solution of gelatin or colloid ion . the pores thus become very small and the colloidal particles may be retained on the treated filter paper. This process of separating colloids from solute is known as Ultra- filtration.