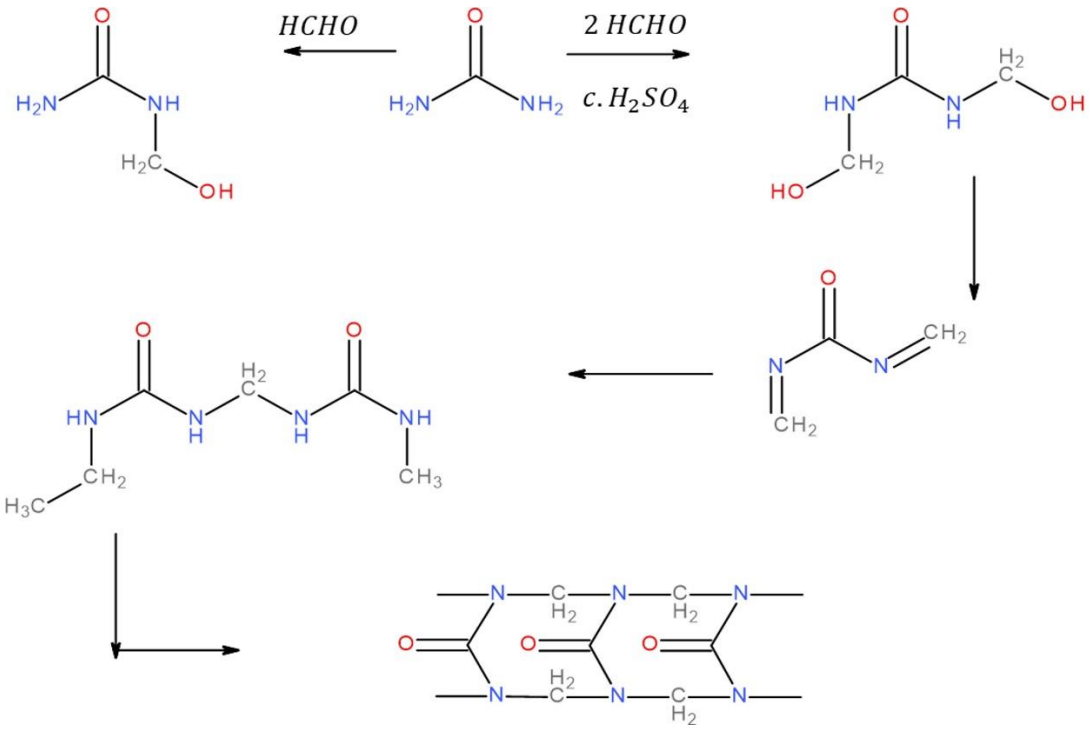
EXPERIMENT 1:

Objective: Synthesis of urea formaldehyde resin.

Principle: Amino resins are obtained by condensation reaction of urea with formaldehyde. Such resins find uses in packaging, water tumblers, unbreakable dishes, buttons etc. They are also used in paper industry to improve the strength of paper.

Urea formaldehyde resin is formed by a condensation reaction. Urea and formaldehyde are mixed to form the precursor molecule and concentrated H_2SO_4 is added to remove water and grow a three-dimensional network structure. The reaction is as follows:



Reagents: Formaldehyde (40%), Urea, conc. H_2SO_4, distilled water.

Apparatus: 100 ml beaker, measuring cylinder, glass rod, watch glass, funnel, filter paper

Procedure:

1. Take 2 gm of urea in a 100 ml beaker and add 5 ml of 40% formaldehyde solution init with constant stirring.

2. Add 2/3 drops of conc. H_2SO_4 to the reaction mixture with constant stirring.
3. White voluminous mass appears in the beaker.
4. When the reaction is complete, wash the residue with distilled water, and filter it.
5. Dry the product in between folds of filter paper and put in a hot air oven.
6. Calculate the yield of the resin formed.

Observations:

- Weight of empty watch glass = W_1 =_____g
- Weight of watch glass with product = W_2 =_____g
- Weight of the product = $(W_2 - W_1)$ =_____g

EXPERIMENT 2:

Objective: To determine specific gravity and density of solid polymer in accordance with ASTM D792.

Principle:

Specific gravity and density determinations are performed by "Archimedes principle". This principle states that every solid body when immersed in a fluid apparently loses weight by an amount equal to the fluid it displaces.

A specimen of solid polymer is weighed in air. It is then immersed in a liquid of known density and its loss in weight upon immersed is determined. And its specific gravity is calculated.

Multiply the specific gravity of the sample to the density of the liquid used, to give density of the sample being tested.

The specific gravity or density of polymer is a property that can be measures conveniently to identify a material, to follow physical changes in a sample, to indicate degree of uniformity among different sampling units or to indicate the average density of a large item.

Apparatus:

1. Analytical balance: A balance with a precision within 0.1 mg and equipped with a stationary support for the immersion vessel above the balance pan.

2. Holder/sinker: Two numbers of holders for both floating and nonfloating solids. This shall be corrosion resistant.

3. Immersion vessel: a glass beaker may be used for holding water.

4. Thermometer: A thermometer with an accuracy of ± 1^0C is required.

Procedure:

1. Switch on the Analytical (electronics) balance and do all the settings.

2. Weigh the polymer specimen in air and note down the reading as ' W_1'.

3. Mount the immersion vessel on the support.

4. Take air-free distilled or demineralized water in a beaker and keep it on the support.

5. Immerse the polymer specimen in water using a holder.

6. Record the weight in water of the polymer specimen as 'W_2'.

7. Repeat the procedure for two more times.

Observations and calculations:

Sl. No.	Material	Temp. of water(g/cc)	Weight ofsample in air (g)	Weight ofsample in water (g)
1				
2				
3				

1. Specific gravity = $\frac{W_1}{(W_1 - W_2)}$

2. Density (g/cc) = Specific gravity X Q_0

Where,

W_1 – weight of the solid in air; g

W_2- weight of the solid in water, g

Q_0 – density of water at the given temperature, g/cc

Result:

The Specific gravity and density of given polymer specimen is _____.