

## Step 1: Solution preparation

In this step, reaction solutions and a seed solution are prepared

### Chemicals

Chemical Name	CAS#
Gold(III) chloride hydrate	[27988-77-8]
NaBH <sub>4</sub>	[16940-66-2]
Silver nitrate	[7761-88-8]
Cetrimonium bromide (CTAB)	[57-09-0]
Ascorbic acid	[50-81-7]
Ultrapure H <sub>2</sub> O > 18MΩ	

### Calculations

Chemical	mol. weight	mass (g)	mol	equivalents	actual
Gold (III) chloride	339.79	0.05454	0.000160511		1
Sodium borohydride (NaBH <sub>4</sub> )	37.83	0.0075	0.000198255	1.235151932	
Silver nitrate (AgNO <sub>3</sub> )	169.87	0.137	0.000806499	5.024575082	
Ascorbic acid	176.13	0.1385	0.000786351	4.899050296	
Cetrimonium bromide (CTAB)	364.448	11.27	0.030923479	192.6565614	

### Procedure

- 1) Make sure the collected glassware is clean. The solutions may be prepared in any order, but impurities will prevent the formation of rods
- 2) Label the glassware for your solutions: Silver nitrate, Ascorbic acid, Sodium borohydride, seed solution, gold solution, CTAB.
- 3) Transfer ~130 ml of ultrapure H<sub>2</sub>O to a flask. This will be for the CTAB solution
- 4) Weigh out 11.27g of CTAB into a weighing boat and slowly transfer to the CTAB solution flask. The CTAB will not readily dissolve in room temperature water. The dissolving process can be speeded up by placing the flask in a sonication bath or in an oven at 60°C. It may require more than 1 hour to dissolve.
- 5) Transfer ~152.5 mL of >18MΩ to a clean flask. This will be for gold solution
- 6) Weigh out 54.54 mg Au(III) chloride into a weighing boat or paper using the teflon coated spatula. Metal spatulas can oxidize the Au(III), making it less reactive, so if possible use a teflon coated or plastic spatula.



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- 7) Using a clean pipette, transfer ~5mL of water from the gold solution flask to the weighing boat holding the Au(III)Cl<sub>4</sub>. The gold will dissolve almost immediately. After all of the gold has dissolved, pour the solution back into the gold solution flask. Set aside for later
- 8) Weigh out 138.8 mg of ascorbic acid either on weighing paper or directly into a glass vial, transfer to a clean glass vial if necessary, and add 10 mL of ultra pure water. Cover and set aside
- 9) Weigh out the 13.7 mg of AgNO<sub>3</sub> either on weighing paper or directly into a glass vial, transfer to a clean glass vial if necessary, and add 10 mL of ultra pure water. Cover and set aside
- 10) Weigh out the ~7.7 mg of NaBH<sub>4</sub> either on weighing paper or directly into a glass vial, transfer to a clean glass vial if necessary, and add 10 mL of ultra pure water. Cover and place in an ice bath or in a freezer until ice cold.
- 11) Solution preparation is now complete, and when the CTAB is completely dissolved, proceed to the next step



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