

# STUDENT STUDY PROJECT WORK

## "CAFFEINE IN TEA AND COFFEE A COMPARATIVE STUDY"

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## Procedure:

### Part 1: Dissolution of Caffeine in Water

1. Obtain a 500 to 1000ml beaker.
2. Weigh about 15g of tea bags and place them in the beaker. Record actual weight: 14.98 g
3. Add 300ml of distilled water to the beaker.
4. Boil the water containing the tea bags on a boiling water bath for 15-20 minutes while stirring occasionally.
5. After the boiling period is over, remove the beaker from the heat and allow to cool 15 minutes or on ice until cooled.
6. After the solution has cooled, squeeze the tea bags to remove all the liquid. Dispose of the bags.
7. Using vacuum filtration, filter the solution through regular filter paper to remove any solid particles.

### Part 2: Transfer of Caffeine from Water to Chloroform

***\*\*Caution: Use Chloroform under hood with proper ventilation. Do Not Breath Fumes.\*\****

1. Transfer the solution obtained from step 7 above to a 500ml separatory funnel. Add 100ml of chloroform. Instructor will demonstrate proper use of the separatory funnel.
2. Allow the chloroform to settle to the bottom. Carefully drain the chloroform layer into a flask or beaker. Dispose of the aqueous top layer.

3. Filter the chloroform/caffeine solution through reverse-phase filter paper using vacuum filtration. This will allow the chloroform to filter through but will trap any water and residue. Transfer the solution to a 125ml flask.

### Part: 3 Crystallization of Caffeine

1. Using a hot water bath in the fume hood, place the chloroform solution over the boiling water. The boiling point of chloroform is 61 to 62OC.
2. Evaporate the solution down to about 20ml and then remove from the heat.
3. Weigh a clean watch glass and record its weight here: 15.26 g
4. Place the watch glass over the boiling water bath, fill it with a portion of the concentrated caffeine solution, and evaporate it. Repeat this process until all the concentrated solution is gone.
5. Remove the watch glass from the water bath and let it cool. Wipe the moisture from the bottom of the watch glass.
6. Reweigh the watch glass. The weight of the caffeine: 0.0799 g.

Similarly quantity of caffeine yielded from 15gms of coffee powder was found and that is 4.5gms.

### Result:

The percentage yield of caffeine in tea is

$$(\text{Weight of caffeine/weight tea}) \times 100 = 5.33 \%$$

The percentage yield of Caffeine from coffee is

$$(\text{Weight of caffeine/Weight of coffee}) \times 100 = 30\%$$

## SUMMARY

Extractions of certain solids can be performed by utilizing the different chemical properties of various solvents. The solubility of caffeine in chloroform is quite high at room temperature. The chloroform - caffeine mixture can be separated by utilizing the different densities of chloroform and water. Caffeine will be extracted from tea leaves and coffee seeds using polar-non polar solvent extraction techniques. The percentage yield of caffeine from tea was found to be 5% where as that from coffee was found to be 30%. In view of the many disadvantages and side effects of caffeine Tea is preferred to Coffee(since tea has less percentage of caffeine than that of coffee).

## STUDENT STUDY PROJECT WORK

"TO ESTIMATE ORGANIC MATTER IN THE SOIL SAMPLES"

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Objective :- To estimate organic matter in the soil samples.

Reagents :- The reagents needed are:

1. 1N solution of potassium dichromate ( $K_2Cr_2O_7$ )
2. concentrated sulphuric acid ( $H_2SO_4$ )
3. orthophosphoric acid ( $H_3PO_4$ )
4. diphenyl amine and
5. ferrous ammonium sulphate.

Apparatus :- Burette, conical flask.

Theory :- The oxidation of the soil organic matters may be carried out by the dichromate-sulphuric acid mixture and the intensity of green colour of the chromium sulphate formed gives directly the amount of carbon oxidised.

procedure :- One gram each of the soil samples were weighed and transferred to three marked conical flasks. Ten millilitres of potassium dichromate was added. Then 20ml of concentrated sulphuric acid was added. The conical flask was shaken and left undisturbed for half an hour. Similarly in a conical flask a "blank" was made i.e.

$K_2Cr_2O_7$  + conc  $H_2SO_4$ . The blank was titrated with 1N solution of ferrous ammonium sulphate and the volume used was noted (B ml).

In the mean time in other three soil samples, 5ml of orthophosphoric acid and 1ml of diphenylamine were added. These mixtures were then titrated with ammonium ferrous sulphate solution. The end point was bottle green. Let the volume used be V ml.

Observations:- The volume  $FeSO_4(NH_4)_2SO_4 \cdot 7H_2O$  used for various samples is given in tables.

Table 6.6 volume of  $FeSO_4(NH_4)_2SO_4 \cdot 7H_2O$

S.No	initial volume in ml	final volume in ml	volume used in ml
1	0	29.7	29.7
2	0	29.6	29.6
3	0	29.6	29.6

mean of three concordant readings = 29.6 ml.

Table 8.7 volume of  $FeSO_4(NH_4)_2SO_4 \cdot 7H_2O$  used for Soil A

S.No	initial volume in ml	final volume in ml	volume used in ml
1	0	27.8	27.8
2	0	27.7	27.7
3	0	27.6	27.6

mean of three concordant readings = 27.7 ml.

Table 6.8 volume of  $FeSO_4(NH_4)_2SO_4 \cdot 7H_2O$  used for Soil B.

S.No	initial volume in ml	final volume in ml	volume used in ml
1	0	21.2	21.2
2	0	21.2	21.2
3	0	21.2	21.2

Table 8.9 volume of  $\text{FeCl}_3(\text{NH}_4)_2 \cdot 10 \cdot 7\text{H}_2\text{O}$  used for soil C

S.No	initial volume in ml	Final volume in ml	volume used in ml
1	0	19.3	19.3
2	0	19.3	19.3
3	0	19.3	19.3

mean of the concordant readings = 19.3 ml

calculations :- The percentage of organic compounds presents in various soil samples may be calculated as follows:

$$\text{organic carbon (OC)\%} = \frac{10(\text{B}-\text{T}) \times 0.003 \times 100\%}{\text{weight of soil}}$$

$$\text{Soil A : OC \%} = \frac{10 \times 29.6 - 27.7}{29.6} \times 0.003 \times 100\% = 0.218\%$$

$$\text{Soil B : OC \%} = \frac{10 \times 29.6 - 21.2}{29.6} \times 0.003 \times 100\% = 0.414\%$$

$$\text{Soil C : OC \%} = \frac{10 \times 29.6 - 19.3}{29.6} \times 0.003 \times 100\% = 0.646\%$$

Result :- Among the three soil samples soil C contained the maximum quantity of organic matter followed by B and then A.

$$\text{Soil C} = 0.646\%$$

$$\text{Soil B} = 0.414\%$$

$$\text{Soil A} = 0.218\%$$



## STUDENT STUDY PROJECT WORK

"TO DETECT THE PRESENCE OF INSECTICIDES AND  
PESTICIDES IN FRUITS AND VEGETABLES"

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Project:- To detect the presence of Insecticides and pesticides in fruits and vegetables.

Aim:- To detect the presence of Insecticides or pesticides (Nitrogen Containing) in various fruits and vegetables.

Materials required:- Samples of various fruits and vegetables, Alcohol, Sodium metal, Ferric chloride ferrous sulphate crystals; distilled water and dilute sulphuric acid.

Procedure:- Take different types of fruits and vegetables and cut them into small pieces and crush them separately. Take them into separate beakers and add 100ml of alcohol to each of these stir well and filter collect the filtrate in separate China dishes. Evaporate the alcohol by heating the China dishes one by one over a water bath and let the residue dry in the oven. Heat small piece of Sodium in fusion tube till it melts. Then add one of the above residues from China dish to this fusion tube and heat it till red hot. Now drop this tube in China dish containing 10ml of distilled water. Break the tube and boil the contents of the China dish for 5mts cool and filter the solution. Collect the filtrate. To the filtrate add 1ml of freshly prepared ferrous sulphate solution and warm the contents. Then add 2, 3 drops of ferric chloride solution and acidify with dilute Hcl. If a blue or green, precipitate or colouration is obtained. It indicates the presence of nitrogen containing insecticide. Repeat this test for other fruits and vegetables.

S. No	Name of the fruit or Vegetable	Test for the presence of nitrogen	Presence of Insecticide or pesticide residue
1.	Apple	Nil	Nil
2.	Grape	Nil	Nil
3.	Brinjal	Nil	Nil
4.	Tomato	Nil	Nil

Conclusion:- By the Experimental results it is found that there are no traces Nitrogen element or pesticides in the above fruits and vegetable.