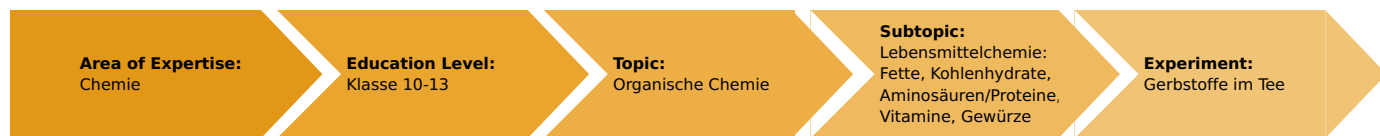


# Tanning matter in tea (Item No.: P7186300)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



20 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

food chemistry, tanning matter

## Task and equipment

## Information for teachers

## Additional Information

The formulation of the question is given by reading the recipe on a package of tea. Infusion time 2-3 minutes = stimulating, 5-8 minutes = soothing. The colour of tea infusions is lightened when lemon juice is added.

## Notes on content and learning objectives

- Black tea contains tanning matter, which goes into solution on longer infusion times and taste astringent.
- Infusions of tea contain caffeine.
- Tanning matter changes colour according to the pH. It forms flocculent precipitates with proteins and metal ions, and is therefore used as a clarifying agent.

## Notes on the method

To determine the differences in taste of tea which has been allowed to infuse for various times, the same tea sort should be poured into cups after 2, 4, 6 and 8 minutes for the students to taste.

The detection of a further ingredient of tea, caffeine, is described in the experiment "Caffeine in foods".

## Fundamentals and remarks

Tanning matter consists of substances with an astringent taste which are widely distributed in the plant kingdom. It is composed mainly of polyphenols and phenolcarboxylic acids.

An important group of tanning matter is the tannins, which are preferentially won from gallnuts.

Tanning matter contains phenolic hydroxyl groups and reacts acidic. It is therefore also called gallic acid. The change in colour with pH is connected with the chemical behaviour of the phenolic hydroxyl groups (see the technical literature on the mesomeric effect on functional groups of aromatic systems).

Red wine and tea are particularly rich in tanning matter (4-25 %).

## Hints on going deeper

- Caffeine is an alkaloid, i.e. a drug in the farthest sense. Caffeine is added to many beverages. The question of stimulant or drug should be subject to a classroom discussion.

## Notes on the set-up and procedure

## Preparation:

Various types of black tea can be used in this experiment.

## Notes on the students experiment:

Other heavy metal solutions can be used in place of Fehling's solution I (copper(II) sulphate solution).



## Hazard and Precautionary statements

Fehling's solution I (copper(II)-sulphate in water):

H410: Very toxic to aquatic life with long lasting effects.

P273: Avoid release to the environment.

Caustic soda solution (Sodium hydroxide in water):

H314: Causes severe skin burns and eye damage.

H290: May be corrosive to metals.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

P301 + P330 + P331: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P309 + P310: IF exposed or you feel unwell: Call a POISON CENTER or doctor/physician.

P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do

- continue rinsing.

## Hazards

- Sodium hydroxide solution is caustic.
- Avoid any bodily contact with the chemicals.

## Waste disposal

Pour the solutions in test tubes 1 and 3 to drain. Leave test tube 4 for waste disposal.

# Tanning matter in tea (Item No.: P7186300)

## Task and equipment

### Task

### Why does tea sometimes have an astringent taste?

Detect tanning matter in tea.



### Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Boss head	02043-00	1
4	Universal clamp	37715-00	1
5	Ring with boss head, i. d. = 10 cm	37701-01	1
6	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
7	Glass beaker DURAN®, short, 250 ml	36013-00	1
8	Beaker, 250 ml, low form, stackable, plastic	36082-00	1
9	Graduated cylinder 100 ml, PP transparent	36629-01	1
10	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
11	Test tube, 180x18 mm,100pcs	37658-10	(4)
12	Test tube holder, up to d 22mm	38823-00	1
13	Test tube brush w. wool tip,d25mm	38762-00	1
14	Filter funnel, d = 75 mm, PP	46895-00	1
15	Crucible tongs,200mm,stainl.steel	33600-00	1
16	Pipette with rubber bulb	64701-00	4
17	Spoon, special steel	33398-00	1
18	Labor pencil, waterproof	38711-00	1
19	Protecting glasses, clear glass	39316-00	1
20	Rubber gloves, size S (7)	39325-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Fehling's solution I 1000 ml	30079-70	1
	Gelatin powder 250 g	30083-25	1
	Caustic soda sol. 32% 1000 ml	30266-70	1
	Water, distilled 5 l	31246-81	1
	Boiling beads, 200 g	36937-20	1
	folded filter,qual.,150 mm,100pcs	47580-04	1
Additional material			
	Tea (black tea)		

## Set-up and procedure

### Set-up

### Hazards

- Sodium hydroxide solution is caustic.
- Avoid any bodily contact with the chemicals.



### Setup

Number four test tubes from 1 to 4 and stand them next to each other in the test tube rack (Fig. 1).



Fig. 1

Put two spatula tips of gelatin in test tube 1. Add distilled water to a height of 3 ml. Dissolve the gelatin by shaking gently.

Assemble the stand as shown in figures 2 to 6. Fasten the support ring to the support rod and place the wire gauze on it. Adjust the height of the support ring so that the flame of the burner just reaches the wire gauze.



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Fill 100 ml of water into a 250 ml beaker and add a few boiling stones (Fig. 7). Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!



Fig. 7

## Procedure

Drop a heaped teaspoonful of tea into the hot water and let it draw for 10 minutes (Fig. 8).



Fig. 8

Pour the hot tea through the strainer into a 250 ml lab beaker as you can see in Fig. 9.

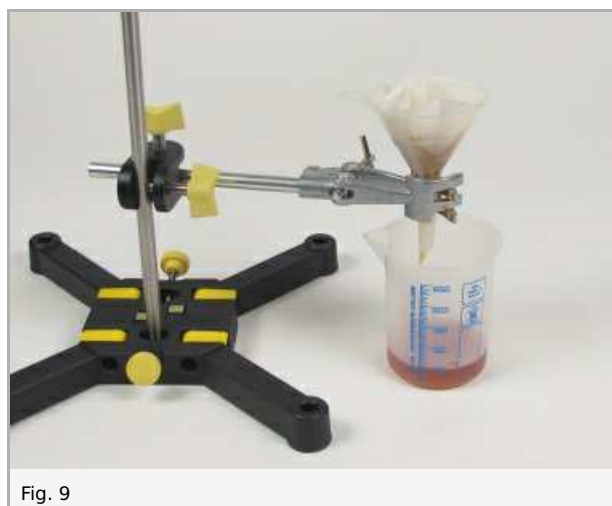


Fig. 9

Fill each of the test tubes 2, 3 and 4 to a height of 3 cm with strained tea (Fig. 10).



Pour the gelatin solution from test tube 1 into test tube 2. Add a few drops of sodium hydroxide solution to test tube 3. Add 4 drops of Fehling's solution I to the tea in test tube 4.

Move the beaker containing the strained tea aside.

## Waste disposal

Pour the solutions in test tubes 1 to 3 to drain. Leave test tube 4 for waste disposal. Filter this solution and discard the precipitate in the heavy metal waste.



## Report: Tanning matter in tea

### Result - Observations

Note your observations.

- a) Tea with gelatin solution
- b) Tea with sodium hydroxide solution
- c) Tea with Fehling's solution I
- d) Old tea

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### Evaluation - Question 1

Draw conclusions from your observations.

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### Evaluation - Question 2

Why is tea which has only drawn for 2-3 minutes stimulating, and one which has drawn for 5-6 minutes soothing? How do the tastes of the two teas differ?

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### Evaluation - Question 3

From which countries does the tea come which is available in retail stores?

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### Evaluation - Question 4

Why can tanning matters be used as clarifying agent for beverages?

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### Evaluation - Question 5

Complete the following statements:

1. Tea which has only briefly drawn tastes ..... and contains stimulating .....
2. Black tea contains ....., which require a ..... brewing in ..... water to go into solution and leaves an ..... after taste.
3. The very difficulty soluble tanning matter ..... out from tea which has been allowed to stand as .....
4. The colour of the tea changes according to the .....

### Evaluation - Question 6

Packages of tea give various preparation methods. Explain the sense behind the individual recipes.

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### Evaluation - Question 7

Prepare a list of names and countries of origin of various sorts of tea.

Country of origin	Name of tea sort
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0
0	0

### Evaluation - Question 8

Observe tea on the addition of lemon juice!

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