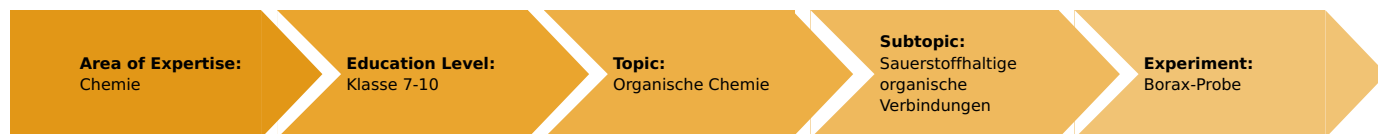


# The borax test (Item No.: P7171900)

## Curricular Relevance



### Difficulty



Easy

### Preparation Time



10 Minutes

### Execution Time



10 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

organic compounds, Borax test

## Task and equipment

### Information for teachers

### Learning objectives

- Methanol can be distinguished from ethanol by the formation of the methyl ester.
- This ester burns with a green flame, while ethanol burns with a pale-blue flame.

### Notes on setup and procedure

#### Preparation:

Boric acid cannot be used, as it also forms an ester with ethanol.

#### Remarks on the students experiments:

Since methanol is poisonous only use small amounts. The amounts given must not be exactly adhered to.



### Hazard and precautionary statements

Ethanol:

H225:

Highly flammable liquid and vapour.

P210:

Keep away from heat/sparks/open flames/hot surfaces – No smoking.

## Methanol:

H225:	Highly flammable liquid and vapour.
H331:	Toxic if swallowed.
H311:	Toxic in contact with skin.
H301:	Toxic if inhaled.
H370:	Causes damage to organs.
P210:	Keep away from heat/sparks/open flames/hot surfaces – No smoking.
P233:	Keep container tightly closed.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P302 + P352:	IF ON SKIN: Wash with soap and water.
P309 + P310:	IF exposed or you feel unwell: Immediately call a POISON CENTER or doctor/physician.

Sodium  
tetraborate:

H360:	May damage fertility or the unborn child.
P201:	Obtain special instructions before use.
P308 + P313:	IF exposed or concerned: Get medical advice/attention.

## Hazards

- Ethanol and methanol are highly inflammable. Extinguish all open flames while handling them!
- Wear protective glasses!
- Methanol is poisonous. Carry out the experiment in the fume hood if possible and air the room well! Wash splashes on the skin off with copious water!

## Notes

Borax (sodium tetraborate,  $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10 \text{H}_2\text{O}$ ) hydrolyzes easily. The boric acid which is so formed reacts easily with methanol to form boric trimethyl ester, which is volatile and burns with a green flame. Boric triethylester is only produced in this way when the reaction is proton catalyzed or if pure boric acid is used.

## Remarks on the method

Advanced courses: This experiment can be regarded as a simple esterification reaction and can be discussed when esterifications or nucleophilic substitutions are discussed in general. The boric triester can be compared to the triesters of glycerol.

## Waste disposal

Put the residues in the container for solid organic waste.

## The borax test (Item No.: P7171900)

### Task and equipment

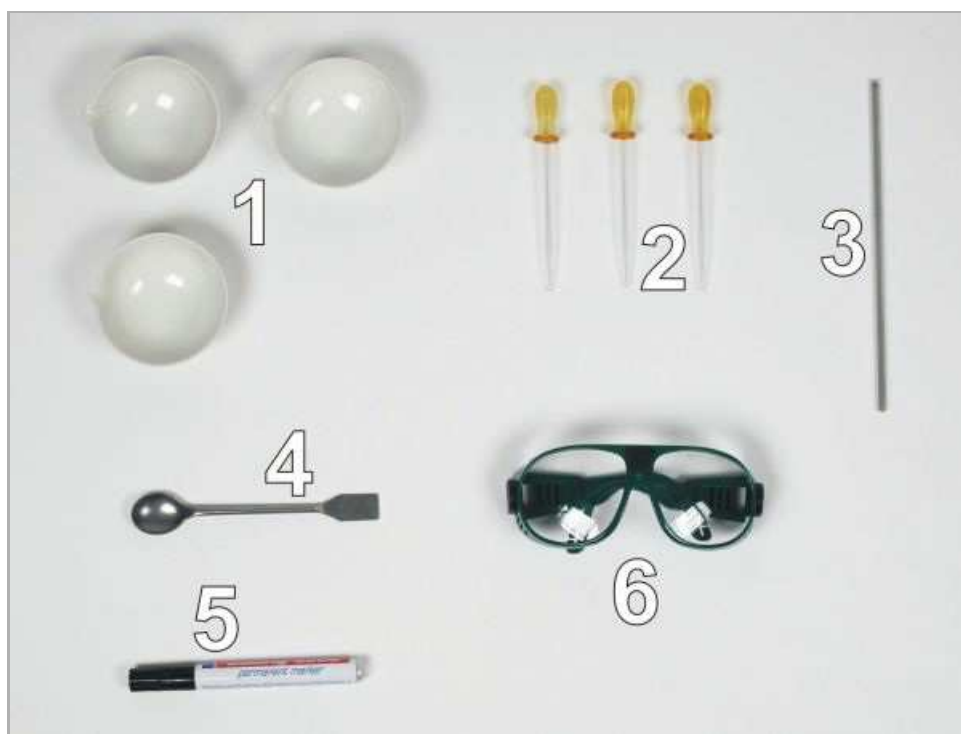
#### Task

#### How can methanol be distinguished from ethanol? (1)

Carry out the borax test with methanol and ethanol.



## Equipment



Position No.	Material	Order No.	Quantity
1	Porcelain dish, 75ml, d = 80 mm	32516-00	4
2	Pipette with rubber bulb	64701-00	3
3	Glass rod, boro 3.3, l=200mm, d=6mm	40485-04	1
4	Spoon, special steel	33398-00	1
5	Labor pencil, waterproof	38711-00	1
6	Protecting glasses, clear glass	39316-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Ethanol extra pure ab.95% 1000 ml	30008-70	1
	Methanol, tech.gr. 1000 ml	30142-70	1
	Sodium tetraborate,tech.gr.,250 g	31615-25	1
	Wood splints, package of 100	39126-10	1

## Set-up and procedure

### Set-up

### Hazards

- Ethanol and methanol are highly inflammable. Extinguish all open flames while handling them!
- Wear protective glasses!
- Methanol is poisonous. Carry out the experiment in the fume hood if possible and air the room well! Wash splashes on the skin off with copious water!



### Procedure

Number the porcelain dishes from 1 to 3 (Fig. 1).



Fig. 1

Using the pipette put about 10 drops of methanol in the first porcelain dish (Fig. 2), 20 drops of methanol in the second one and 20 drops of ethanol in the third one (change the pipette).



Fig. 2

Add a spatula tip of borax to porcelain dish 2 and 3 and mix it with the liquid. Use a different glass rod to stir the two mixtures (Fig. 3+4).



Fig. 3



Fig. 4

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Ignite all three liquids with a burning wood splint.

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## Waste disposal

- Put the residues in the container for solid organic waste.

## Report: The borax test

### Result - Observations

Note the observations you make.

- a) Porcelain dish with methanol (without borax).
- b) Porcelain dish with methanol (with borax).
- c) Porcelain dish with ethanol.

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### Evaluation - Question 1

Draw conclusions from your observations.

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## Evaluation - Question 2

In which context was the borax test used earlier?

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