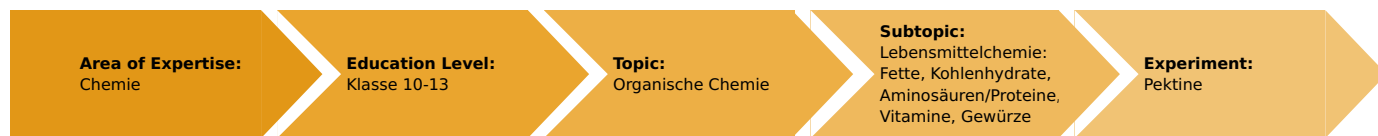


# Pectins (Item No.: P7187600)

## Curricular Relevance



### Difficulty



Intermediate

### Preparation Time



10 Minutes

### Execution Time



20 Minutes

### Recommended Group Size



2 Students

### Additional Requirements:

### Experiment Variations:

### Keywords:

carbohydrates, pectins

## Task and equipment

### Information for teachers

### Additional Information

Jams are made from fruit by adding sugar and citric acid. Pectin is also added to improve their consistency. Preserving sugar is a ready-made product for making jams.

### Notes on content and learning objectives

- Fruit juices contain pectic substances, which can be isolated by precipitation with ethanol.
- Pectins are polysaccharides, which form stable gels with sugar and citric acid.

### Notes on the method

This experiment can be carried out in groups, each with different fruit juices and fruit components. The various gels formed should be compared with each other.

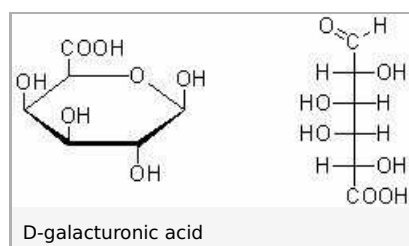
Working with formulas should be avoided, as the connections exceed requirements.

### Fundamentals and remarks

Pectins are found in the tissues of many higher plants, particularly in the parenchymatous tissue of fruits and roots. Industrially, pectins are isolated from the peel of citrus fruits, apple rests and leached-out sugar beet.

Pectins consist of polygalacturonic acid chains, which are present in plants as calcium or magnesium salts, or partly as methanol esters.

The parent substance D-galacturonic (see figure) acid is  $\alpha$ -1,4 glycosidic linked to threadlike molecules.



The carboxyl groups are partly esterified with methanol. The degree of esterification influences the gel formation.

## Hints on going deeper

- Preparation of a fruit jam.

## Notes on the set-up and procedure

### Preparation:

Pure fruit juice, and not fruit juice drinks, should be used to isolate pectin.

Pectin can also be won from pieces of apple and chopped up citrus fruit peel by leaching it out with hot water and subsequently precipitating it with alcohol.

### Notes on the students experiment:

Take care that there are no open flames burning when the alcoholic solutions are heated.

Should a centrifuge be available, the alcoholic solution can be centrifuged to separate off the pectin.



## Hazard and Precautionary statements

Ethanol:

H225: Highly flammable liquid and vapour.

P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking.

## Hazards

- Ethanol is highly inflammable. Extinguish all open flames! Close and remove all bottles as soon as no longer needed.
- Wear protective gloves and protective glasses.
- Carry out the experiment in a fume cupboard whenever possible.

## Waste disposal

Pour the filtrate in the container for halogen-free organic solvents.

Dispose of solid material in the normal waste.

# Pectins (Item No.: P7187600)

## Task and equipment

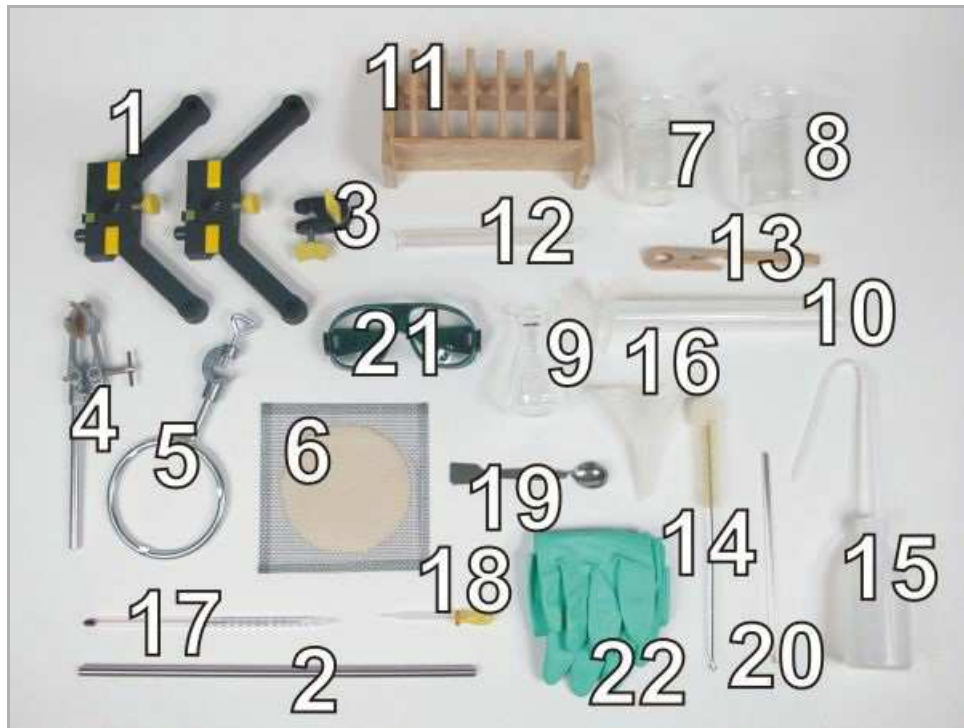
### Task

#### How can pectins be extracted from fruit juice?

Detect pectic substance in orange juice.



### 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	Glass beaker DURAN®, short, 400 ml	36014-00	1
9	Erlenmeyer flask, narrow n., 100 ml	36118-00	1
10	Graduated cylinder 100 ml, PP transparent	36629-01	1
11	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
12	Test tube, 180x18 mm, 100 pcs	37658-10	(1)
13	Test tube holder, up to d 22mm	38823-00	1
14	Test tube brush w. wool tip, d25mm	38762-00	1
15	Wash bottle, 250 ml, plastic	33930-00	1
16	Filter funnel, d = 75 mm, PP	46895-00	1
17	Students thermometer, -10...+110°C, l = 180 mm	38005-02	1
18	Pipette with rubber bulb	64701-00	1
19	Spoon, special steel	33398-00	1
20	Glass rod, boro 3.3, l=200mm, d=6mm	40485-04	1
21	Protecting glasses, clear glass	39316-00	1
22	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
	Ethanol extra pure ab.95% 1000 ml	30008-70	1
	Citric acid 250 g	30063-25	1
	D (+)-Sucrose 250 g	30210-25	1
	Water, distilled 5 l	31246-81	1
	Boiling beads, 200 g	36937-20	1
	folded filter, qual., 150 mm, 100 pcs	47580-04	1
Additional material			
	Fruit juice (e.g. apple juice)		

## Set-up and procedure

### Set-up

### Hazards

- Ethanol is highly inflammable. Extinguish all open flames! Close and remove all bottles as soon as no longer needed.
- Wear protective gloves and protective glasses.
- Carry out the experiment in a fume cupboard whenever possible.



### Setup

Assemble the stand as shown in figures 1 to 5. 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. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5

Half-fill a 400 ml beaker with water and add a few boiling stones (Fig. 6). Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!

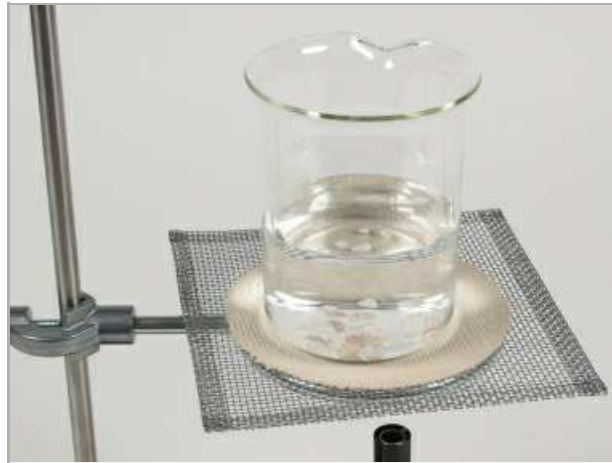


Fig. 6

Then remove the wire gauze and the support ring and instead attach the universal clamp with the help of the boss head to the support rod (Fig. 7-8).



Fig. 7



Fig. 8

## Procedure

Pour 10 ml of orange juice in an Erlenmeyer flask. Add 30 ml of ethanol (Fig. 9).



Fig. 9

Fix the Erlenmeyer flask according to figure 10 with the universal clamp, so that the Erlenmeyer flask is dunked in the prepared hot water bath. Warm the Erlenmeyer flask for about 10 minutes in the prepared hot water bath. Filter the liquid through a folded filter in a 250 ml lab beaker (Fig. 11). Pour the filtrate in the container for combustible organic solvents.



Fig. 10

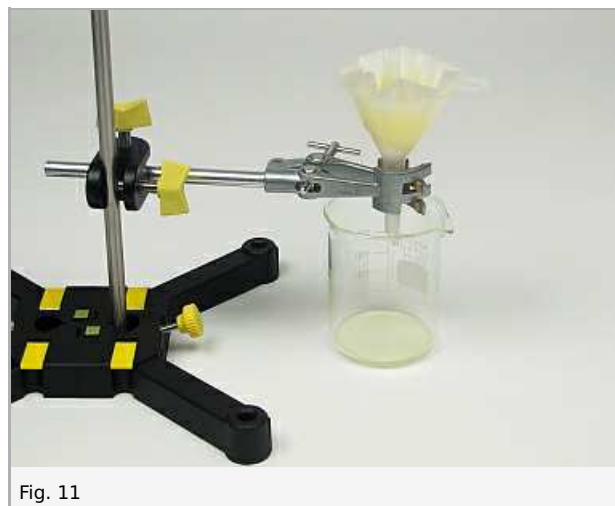


Fig. 11

Add to a test tube two heaped spatula tips of the precipitate on the filter. Further add two heaped spatula tips of sucrose and a few crystals of citric acid. Push the substances to the bottom of the test tube with a glass rod. Rinse the substances down from the inner walls of the test tube with distilled water, until the tube is filled to a height of 4 cm.

Place the test tube in the prepared hot water bath. Heat the beaker until the solution in the test tube boils (Fig. 12). Allow the mixture to cool, in a refrigerator if possible. Test the consistency of the cooled solution.





## Waste disposal

Pour the filtrate in the container for halogen-free organic solvents.  
Dispose of solid material in the normal waste.

## Report: Pectins

### Result - Observations

note your observations in the following succession.

- a) Fruit juice with alcohol
- b) Precipitate with sugar and citric acid

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### Evaluation - Question 1

Draw conclusions from your observations.

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### Evaluation - Question 2

To which foods are pectins added during their production?

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### Evaluation - Question 3

Complete the following statements:

1. Orange juice contains ....., which can be isolated with alcohol.
2. Pectins are ....., which form stable ..... with sugar and citric acid.