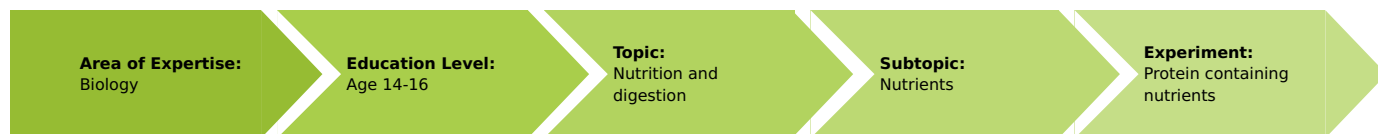


Protein containing nutrients (Item No.: P8012600)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Lean beef or pork
- Protective gloves

Experiment Variations:

Keywords:

Proteins, Peptone, Biuret-reaction

Task and equipment

Information for teachers

Additional Information

Proteins differ from carbohydrates and fats in containing nitrogen. In some there is also phosphorus or sulphur. Hence they cannot be replaced by carbohydrates or fats.

Proteins build up the body and promote its growth. For this reason children and young people in particular need foods with adequate protein content.

There is protein, at any rate in small quantities, in all foods, since the bodies of all living organisms contain protein and nearly all our food is of vegetable or animal origin.



Hazards!

- Copper-II-sulphate is harmful to health when swallowed or on skin contact!
- Don't swallow!
- Sodium hydroxide is caustic!
- Do not allow the chemicals to contact any part of the body!
- Wear protective glasses and gloves!

Disposal

Transfer the contents of the test tubes used in Experiment 2 and Experiment 3 to the container for solutions of heavy metal salts.

Pour the contents of the test tubes used in Experiment 1 to drain.

Protein containing nutrients (Item No.: P8012600)

Task and equipment

Task

Which foods contain proteins?

Learn to recognize possible tests for protein and examine various foods for protein.



Equipment



Position No.	Material	Order No.	Quantity
1	Bottle,nar.mouth,100ml,clear,p.st	41101-01	4
2	Glass beaker DURAN®, tall, 100 ml	36002-00	1
3	Beaker, 250 ml, low form, stackable, plastic	36082-00	1
4	Graduated cylinder 100 ml, PP transparent	36629-01	1
5	Watch glass, dia.60 mm	34570-00	3
6	Test tube 160x16 mm, 10 pcs	37656-03	(5)
7	Test tube rack f. 6 tubes, wood	37685-10	1
8	Test tube holder, up to d 22mm	38823-00	1
9	Mortar w. pestle, 70ml, porcelain	32603-00	1
10	Glass rod,boro 3.3,l=200mm, d=5mm	40485-03	1
11	Filter funnel, PP, d=60 mm	47318-00	1
12	Circular filter,d 90 mm,100 pcs	32977-03	1
13	Pipette with rubber bulb	64701-00	2
14	Spoon,w.spatula end,18 cm,plastic	38833-00	1
15	Knife, stainless	33476-00	1
16	Dissecting needle, pointed	64620-00	1
17	Protecting glasses, clear glass	39316-00	1
	Butane burner, Labogaz 206 type	32178-00	1
	Butane cartridge C206, without valve	47535-01	1
	Portable Balance, OHAUS JE120	48895-00	1
	Water, distilled 5 l	31246-81	1
	Copper-II sulphate,cryst. 250 g	30126-25	1
	Sodium chloride, 500 g	30155-50	1
	Sodium hydroxide, flakes, 500 g	30157-50	1
	Peptone,dry,from meat 50 g	31708-05	1
Additional material			
	Lean beef or pork		
	Protective gloves		

Set-up and procedure

Hazards!

- Copper-II-sulphate is harmful to health when swallowed or on skin contact!
- Don't swallow!
- Sodium hydroxide is caustic!
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- Wear protective glasses and gloves!



First prepare the following solutions:

- Prepare the physiological saline solution (0.09 %) by weighing 0.9 g sodium chloride in a 250 ml beaker and adding 99.1 ml (99.1 g) of distilled water.
- Prepare the protein solution by cracking a hen's egg on the edge of a mortar and allowing the white to flow into the latter (Fig. 1). After rubbing the egg white for about 5 minutes with the pestle, add approximately the same amount of physiological saline solution (0.9 %) . Strain the mixture through a circular filter into a bottle (Fig. 2). The filtrate is the required protein solution.



Fig. 1



Fig. 2

- Prepare the 1 % peptone solution by weighing 0.5 g peptone on a watch glass, giving the peptone into a bottle and adding 44.5 ml (44.5 g) of distilled water.
- Prepare the 10 % sodium hydroxide solution by weighing 2.5 g sodium hydroxide on a watch glass, giving the sodium hydroxide in a bottle and adding 22.5 ml (22.5 g) of distilled water.
- Prepare the 1 % copper-II-sulphate solution by weighing 0.25 g copper-II-sulphate on a watch glass, giving the copper-II-sulphate into a bottle and adding 24.75 ml (24.75 g) of distilled water.

Shake all solutions thoroughly until all solids have dissolved completely.

Experiment 1

Attach the butane burner to the butane cartridge as shown in Figures 3 and 4. Using matches, light up the butane burner.



Fig. 3



Fig. 4

Fill a test tube to about 2cm with protein solution and heat carefully in the flame of a butane burner (Fig. 5).



Fig. 5

Fill a second test tube with the same quantity of 1 % peptone solution and heat likewise. Peptones are polypeptides liberated in the breakdown of protein.

Note your observations in the report.

Experiment 2

Quarter fill a test tube with protein solution, add 20 drops of 10 % soda solution and 10 drops of 1 % copper(II) sulphate solution and shake thoroughly.

Repeat the experiment with 1 % peptone solution instead of the protein solution.

Note your observations in the report.

Experiment 3

Shred a lean piece of beef or pork about the size of a cherry with a knife, place the shreds in a 100 ml beaker and pour water over them filling the glass about a quarter full.



Fig. 6

After about an half an hour stir with a rod, pour the liquid into a test tube (about 4 cm), add 20 drops of 10 % soda solution and 10 drops of 1 % copper(II) sulphate solution and shake thoroughly.

Note your observations in the report.

Disposal

Transfer the contents of the test tubes used in Experiment 2 and Experiment 3 to the container for solutions of heavy metal salts.

Pour the contents of the test tubes used in Experiment 1 to drain.

Report: Protein containing nutrients

Result - Observations 1

Write down your observations on Experiment 1. What happens to the protein solution on heating? Does the same reaction occur when the peptone solution is heated?

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Result - Observations 2

Write down your observations on Experiment 2. What can you notice? How does the protein solution react? And the peptone solution? Describe accurately all changes.

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Result - Observations 3

Write down your observations on Experiment 3.

What happens to the solution in the test tube?

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Evaluation - Question 1

How can protein be detected? Consider your observations from Experiment 1 and think of the change in the white of an egg when it is boiled.

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Evaluation - Question 2

The reaction is called BIURET reaction.

Compare the results of this experiment with those of the previous one. Which indication is more specific for the protein: the heating test or the Biuret reaction? Why? Compare the reactions of the peptone solution.

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Evaluation - Question 3

What does the result of this experiment prove?

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