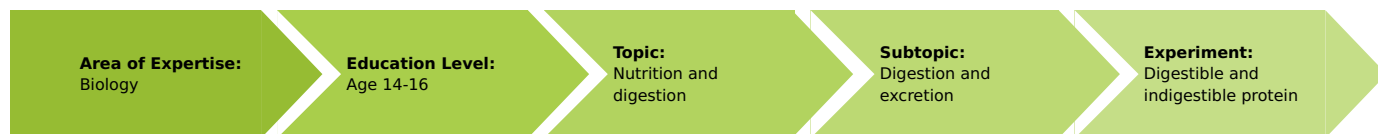


Digestible and indigestible protein (Item No.: P8012900)

Curricular Relevance



Difficulty



Difficult

Preparation Time



10 Minutes

Execution Time



30 Minutes

Recommended Group Size



2 Students

Additional Requirements:

- Boiled fish
- Boiled egg white
- Boiled lean beef or pork
- Cheese

Experiment Variations:

Keywords:

Proteins, Amino acids

Task and equipment

Information for teachers

Additional Information

Proteins are biological macromolecules that are made up of amino acids. The human body is able to form 20 different amino acids, 8 additional amino acids are essential for humans but cannot be produced by the body and must therefore be taken in with our food. Overall more than 250 naturally occurring amino acids are known.

Considering that most proteins consist (in average) out of 100 to 300 amino acids, it becomes apparent how many different proteins exist.

Different proteins, which are also in our food, are differently digested by our body, which is why we speak of easily digestible and indigestible proteins.

Hints on Set-up and Action

- Because of the waiting time, 2 days are required to carry out the experiment.

Hint

The result of the experiment depends highly on the size of the sample and the reaction time, i.e. the duration of heating to 40 °C and the subsequent waiting time.

Digestible and indigestible protein (Item No.: P8012900)

Task and equipment

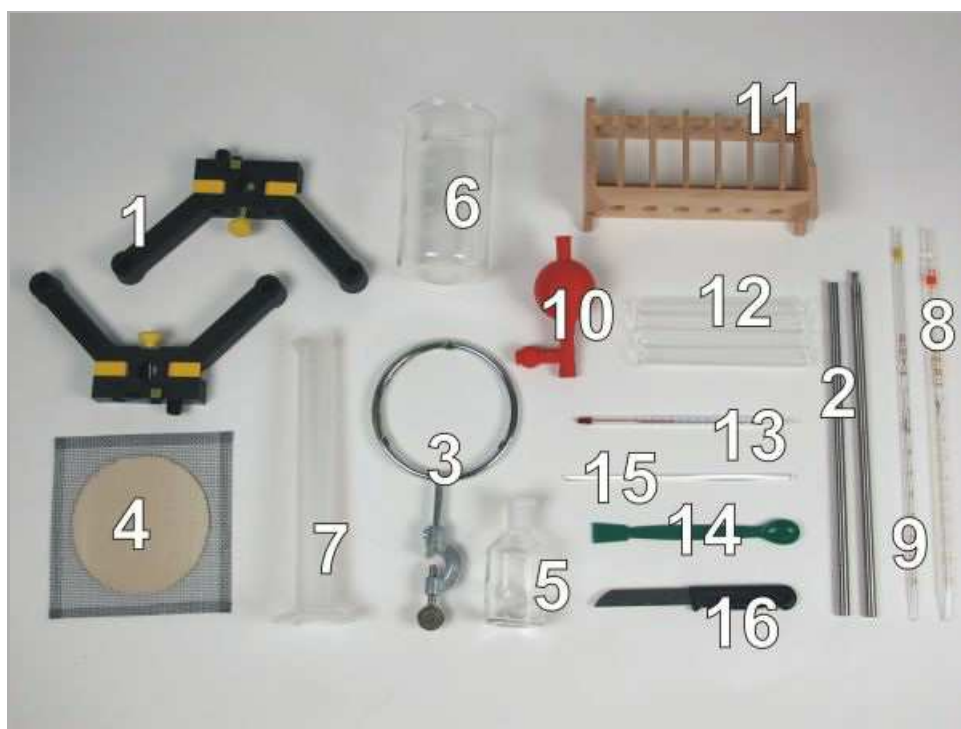
Task

Are all proteins equally well digestible?

Examine the speed with which various proteins are digested.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, l = 600 mm, d = 10 mm, split in 2 rods with	02035-00	1
3	Support ring, i.d. 130mm,w.boss	37722-03	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Bottle,nar.mouth,100ml,clear,p.st	41101-01	1
6	Glass beaker DURAN®, tall, 600 ml	36006-00	1
7	Graduated cylinder 100 ml, PP transparent	36629-01	1
8	Graduated pipette, 1 ml	36595-00	1
9	Graduated pipette 10 ml	36600-00	1
10	Pipettor,bulb,3 valves, 10ml max.	47127-01	1
11	Test tube rack f. 6 tubes, wood	37685-10	1
12	Test tube 160x16 mm, 10 pcs	37656-03	(4)
13	Students thermometer,-10...+110°C, l = 180 mm	38005-02	1
14	Spoon,w.spatula end,18 cm,plastic	38833-00	1
15	Glass rod,boro 3.3,l=200mm, d=5mm	40485-03	1
16	Knife, stainless	33476-00	1
	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
	Hydrochloric acid,approx.5% 250ml	30315-25	1
	Pepsin powder,soluble 100 g	30181-10	1
Additional material			
	Boiled fish		
	Boiled egg white		
	Boiled lean beef or pork		
	Cheese		

Set-up and procedure

First prepare a 1 % pepsin solution by giving 1 g pepsin in a bottle and adding 99 ml (99 g) of distilled water. Shake the bottle thoroughly until the pepsin has dissolved completely.

Fill each of four test tubes with 9 ml of 1 % pepsin solution and 5 % hydrochloric acid.

Then put a small piece of boiled egg white in one test tube, a small piece of boiled fish in the second, in the third a small piece of low-fat cheese and in the fourth a small piece of lean boiled beef or pork (Fig. 1).

All the small pieces should be about the size of a cherry.



Fig. 1

Set up a support stand with the support base and the support rod (Fig. 2 and Fig. 3), fix the support ring to the support rod and lay the wire gauze on it (Fig. 4).



Fig. 2

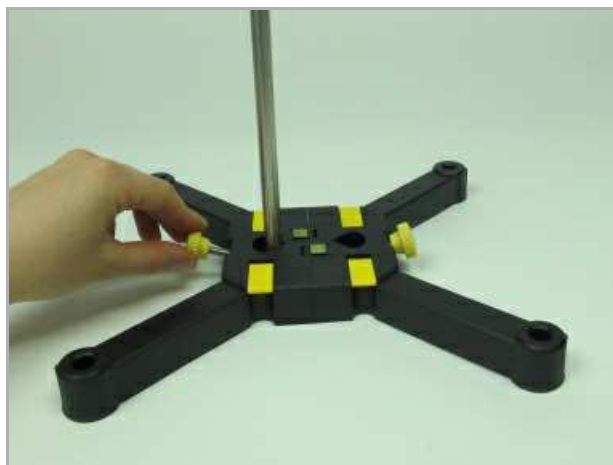


Fig. 3



Fig. 4

Attach the butane burner to the butane cartridge (Fig. 5-6).



Fig. 5



Fig. 6

Fill a 600 ml beaker up to the half with water and place it on the wire gauze. Using matches light up the butane burner place it underneath the wire gauze and warm it to reproduce body temperature to 35-40 °C. Put in the four test tubes and keep on checking the temperature with a thermometer maintaining it at approximate body temperature.

Put out the burner at the end of the lesson and leave the test tubes at room temperature.

Examine the different samples after 24 hours and write down your observations on the Results page. Use a glass rod to check the texture of the samples.

Report: Digestible and indigestible protein

Result - Observations

Note down your observations. How have the small pieces of foodstuffs changed by the next day?

Evaluation - Question 1

Which protein is digested quickest?
