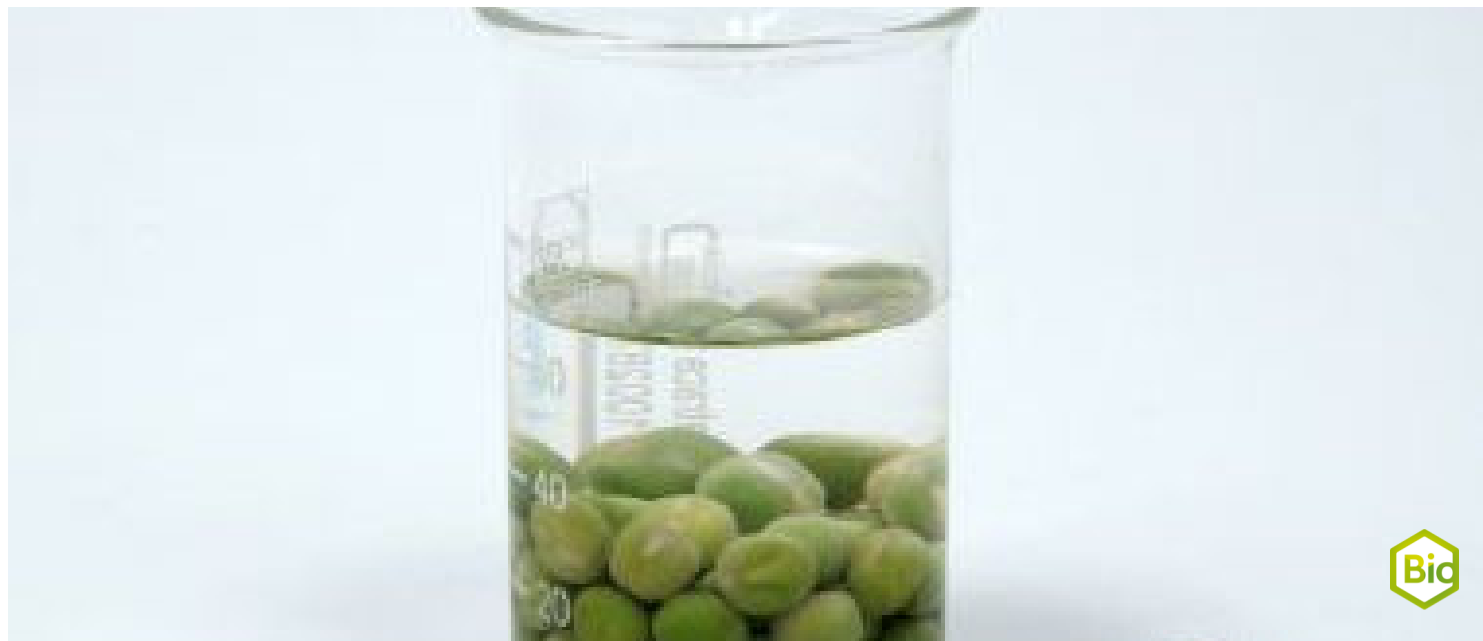


The swelling



Biology

Plant Physiology / Botany

Germination, growth, development



Difficulty level

easy



Group size

2



Preparation time

10 minutes



Execution time

40 minutes

This content can also be found online at:



<http://localhost:1337/c/612c9fed552ac900039f2006>

PHYWE

Teacher information



Application

PHYWE



Experimental setup for pea swelling

Swelling is generally defined as the absorption of liquid or vapour by a swelling body with an increase in its volume. Swelling is a purely physical process, which may also be observed, for example, when gelatin is soaked in water. However, even air-dried seeds, whose water content is usually around 5%, swell when they come into contact with water. Again, this is a purely physical aspect in which the metabolism of the seeds is not directly involved. For example, seeds which are already dead and no longer germinable swell just as well as those which are germinable.

Other teacher information (1/2)

PHYWE

Prior knowledge



Students should be familiar with the physical principle of swelling.

Scientific Principle



The seed coat is permeable to water, so that it can penetrate unhindered. Through the hydration of the plasma in the cells of the embryo, a turgor pressure builds up, which is later the driving force for the germination of the seed.

Other teacher information (2/2)

PHYWE

Learning objective



Students should recognize that pea seeds increase in both size and weight as they swell.

Tasks



The students calculate how much water the pea seeds absorb during swelling. To do this, they allow the peas to swell for 2-3 days.

Safety instructions

PHYWE



- The general instructions for safe experimentation in science lessons to be applied to this experiment.

PHYWE

Student Information



Motivation

PHYWE



Pea Swell

Swelling is generally defined as the absorption of liquid or vapour by a swelling body with an increase in its volume. Swelling is a purely physical process, which may also be observed, for example, when gelatin is soaked in water. However, even air-dried seeds, whose water content is usually around 5%, swell when they come into contact with water. Again, this is a purely physical aspect in which the metabolism of the seeds is not directly involved. For example, seeds which are already dead and no longer germinable swell just as well as those which are germinable.

Tasks



Swollen pea seeds

How much water do pea seeds absorb during swelling?

Investigate the increase in size of pea seeds due to swelling.

Equipment

Position	Material	Item No.	Quantity
1	Beaker, Borosilicate, tall form, 100 ml	46026-00	1
2	Graduated cylinder 100 ml, PP transparent	36629-01	1
3	Petri dish, d 100 mm	64705-00	1

Set-up

PHYWE

- Fill a measuring cylinder of 100 ml capacity up to the 50 ml mark with tap water.
- Add 50 dry pea seeds and swirl the graduated cylinder back and forth several times to check for any air bubbles.
- Remove trapped air bubbles.
- Read the level of the water in the graduated cylinder.



Remove any air bubbles

Procedure

PHYWE

- Pour the pea seeds with the water into a beaker of 100 ml capacity and cover it with half a Petri dish of 100 mm diameter.
- After two to three days, pour off the water from the beaker, take out the pea seeds and dry their surface carefully between an absorbent paper towel. The pea seeds have swelled.
- Fill the measuring cylinder again with tap water up to the 50 ml mark. Add the 50 swollen pea seeds and swirl the measuring cylinder back and forth several times to remove any trapped air bubbles. Read the water level.



Read water level

Report

Report

Task 1

Drag the words to the right place.

Swelling is generally defined as the absorption of liquid or steam by a swelling body with an in its . Swelling is a purely process, which can also be observed, for example, when soaking gelatine in water. During swelling, water is , during drying, water is .

☒ Check

Task 2

PHYWE

Choose the correct statements.

☐ Swelling is a purely chemical process.☐ The water content of air-dry seeds is usually above 50%. That is why it is important that the seeds swell to increase their water content.☐ The water content of air-dry seeds is usually around 5%.☐ Swelling is a purely physical process.☒ Check

Task 3

PHYWE

Which statements are correct?

- ☐ Swelling can only take place under the influence of sunlight, as it derives its energy from photosynthesis.
- ☐ The seed coat is impermeable to water. It must be removed before swelling.
- ☐ Through the hydration of the plasma in the cells of the embryo, a turgor pressure builds up, which is later the driving force for the germination of the seed.
- ☐ The seed coat is permeable to water so that it can penetrate unhindered.

✓ Check

Task 4

Use your measurements to calculate the volume of the pea seeds before and after swelling.

