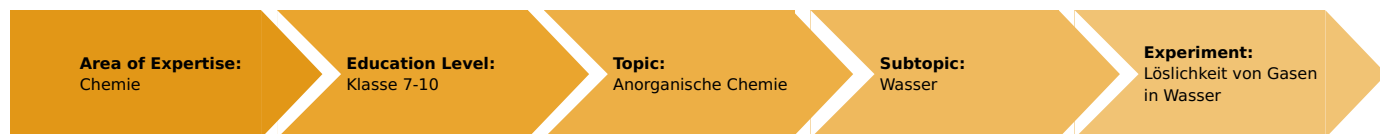


Solubility of gases in water (Item No.: P7154700)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

solubility, gases, water, material property

Task and equipment

Information for teachers

Learning objectives

- Gases dissolve in water, even though only slightly in most cases.
- The solubility of the gases increases with increasing pressure and falling temperature.

Notes on set-up and procedure

Preparation

Pour the mineral water for Experiment 2 into bottles corresponding to the number of groups. Let it stand for several hours in open bottles. The tap water for Experiment 1 should be taken fresh from the tap.

Remarks on the students' experiments

Ensure that the test tube is slipped over the funnel on the working surface and not on the wire gauze, as water can otherwise get into the gauze or the burner. The slipping-over procedure is facilitated by using funnels with short discharge tubes (e.g. powder funnels).



Hazards

- On heating the water, there is danger of spattering. Wear protective glasses!

Remarks on the method

This experiment returns to the topic "Substance properties" and consolidates it. In this context, the broad topic of eutrophication of water, mass fish death, etc. can be mentioned. However, a digression into the field of technical chemistry dealing with on the manufacture of mineral water is also possible.

Solubility of gases in water (Item No.: P7154700)

Task and equipment

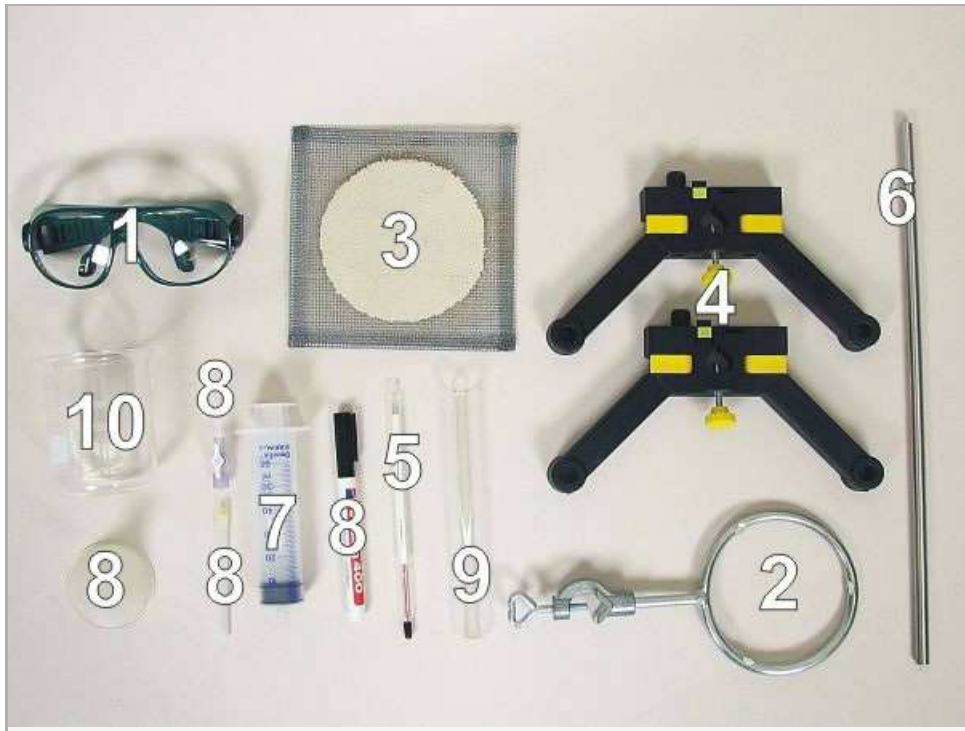
Task

Do gases dissolve in water?

Investigate whether water contains dissolved gases and the factors determining the solubility of the gases.



Equipment



Position No.	Material	Order No.	Quantity
1	Protecting glasses, clear glass	39316-00	1
2	Ring with boss head, i. d. = 10 cm	37701-01	1
3	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
4	Support base, variable	02001-00	1
5	Students thermometer, -10...+110°C, l = 180 mm	38005-02	1
6	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
7	Syringe 50 ml, Luer-lock	02592-00	1
8	Powder funnel, upper dia. 65mm	34472-00	1
8	Stopcock, 1-way, Luer-Lock	02594-00	1
8	Cannula 0.6x60 mm, Luer, 20 pcs	02599-04	(1)
8	Labor pen, waterproof	38711-00	1
9	Test tube, 18x188 mm, 10 pcs	37658-03	1
10	Glass beaker DURAN®, short, 250 ml	36013-00	1
	Butane burner f. cartridge 270+470	47536-00	(1)
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
Additional material			
	Mineral water, stale		
	Tap water		

Set-up and procedure

Set-up

Hazards

- On heating the water, there is danger of spattering. Wear protective glasses!



Set-up

Set up the support stand according to Fig. 1 and Fig. 2. Attach the support ring (Fig. 3) and place the wire gauze onto it (Fig. 4).



Fig. 1

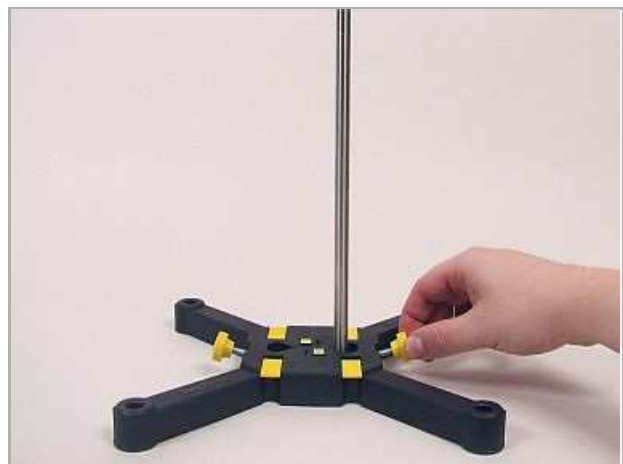


Fig. 2

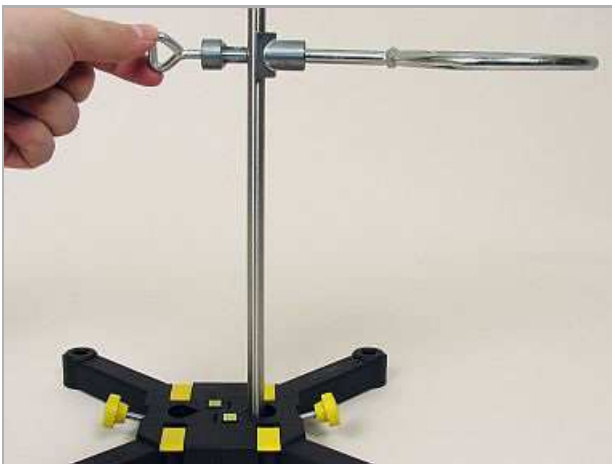


Fig. 3

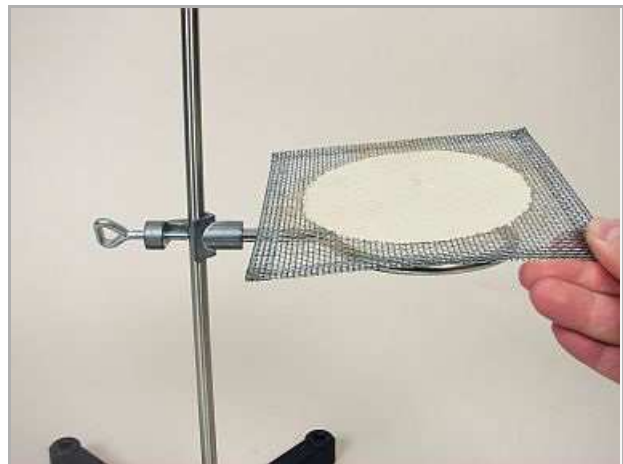


Fig. 4

Place the burner under the support ring (Fig. 5). Adjust the latter's height such that the hot region of the flame heats the wire gauze (Fig. 6).



Fig. 5

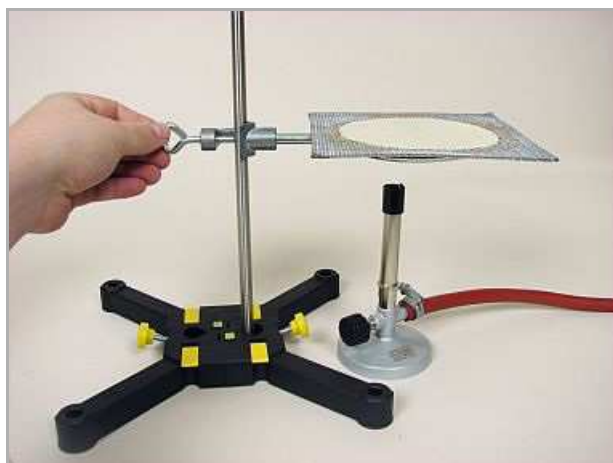


Fig. 6

Fill the beaker 4/5-full with tap water. Subsequently place the funnel with its discharge opening upwards in the glass beaker (Fig. 7). Fill a test tube to the brim with tap water (Fig. 8), seal it with your thumb (Fig. 9), invert it, and slip it over the discharge opening of the funnel, which is under the water's surface (Fig. 10).



Fig. 7

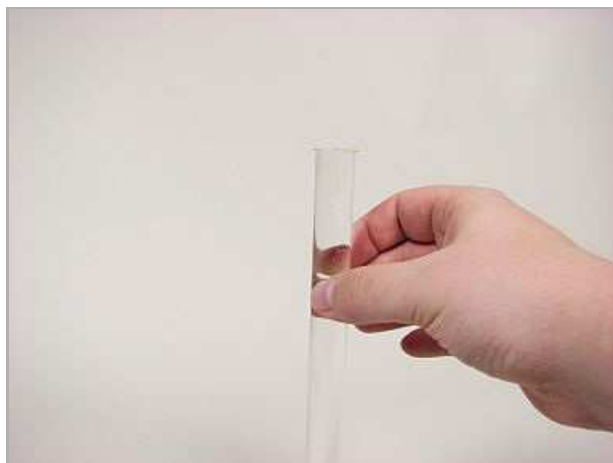


Fig. 8



Fig. 9



Fig. 10

Procedure

Procedure

Place the glass beaker cautiously and without spilling any water away onto the wire gauze. Heat the beaker over a small flame (Fig. 11).

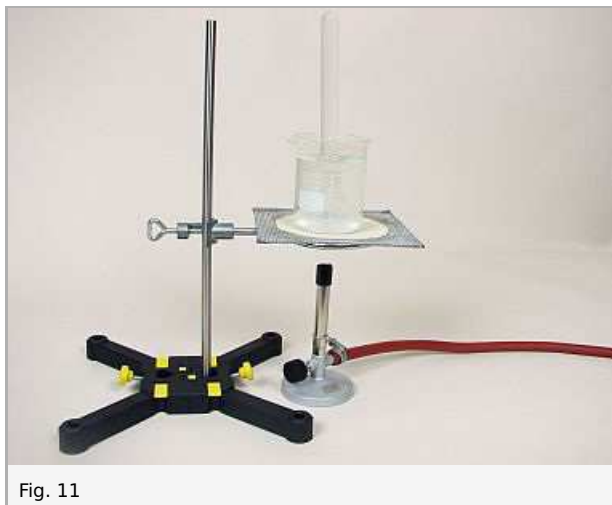


Fig. 11

Measure the temperature with the thermometer (Fig. 12). Stop heating when the water temperature has reached 30 °C. Wait approximately 5 minutes and then mark the water level in the test tube with the marking pencil.

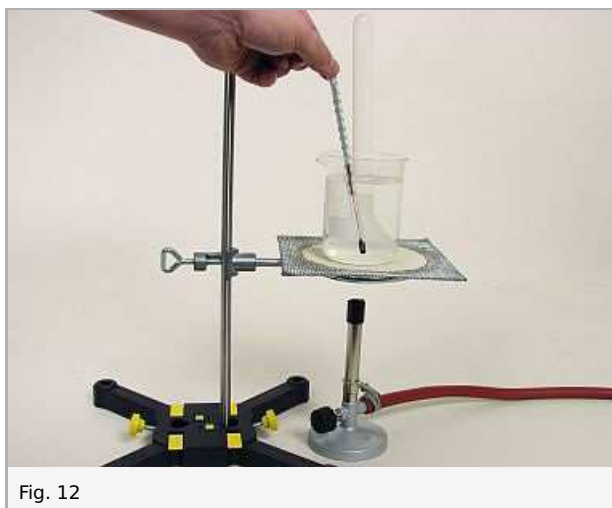


Fig. 12

Remove the glass beaker from the wire gauze. Replace the tap water in the beaker and the test tube with fresh tap water. Slip the test tube over the discharge opening of the funnel again. Now heat the water until it reached 70 °C; extinguish the burner flame and again wait for approximately 5 minutes. Here too, mark the level in the test tube.

Prepare the syringe as you can see in Fig. 13 - Fig. 15.

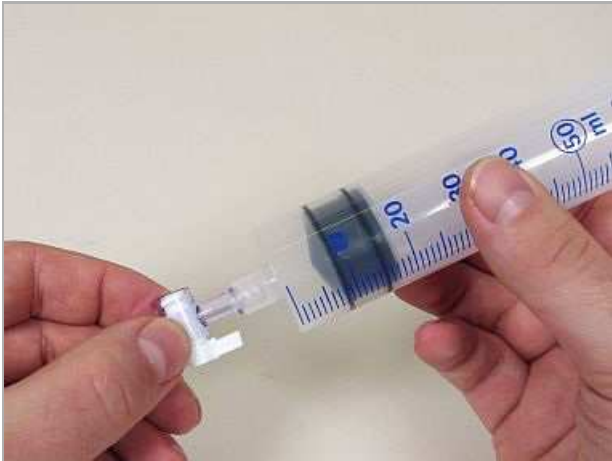


Fig. 13



Fig. 14



Fig. 15

Open the syringe's stopcock (Fig. 16) and press its plunger completely downwards (Fig. 17). Then suck approximately 5 ml of stale mineral water into the syringe. Ensure that no air is sucked in with it (Fig. 18). Close the stopcock of the syringe.



Fig. 16



Fig. 17



Fig. 18

Now generate an underpressure by pulling on the plunger; wait a moment and then push the plunger vigorously into the syringe again.

Report: Solubility of gases in water

Result - Observations

Note your observations

a) on heating the water:

b) during the pressure change:

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Evaluation - Question 1

Make conclusions based on the observed facts. Formulate them in a concise summarising statement.

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Evaluation - Question 2

Which gases are probably dissolved in the water? Which of these gases is the main ingredient of mineral water?

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Evaluation - Question 3

Give reasons why the gas collected in the test tube cannot be water vapour.

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