



LABORATORY WORK NO. 6

WORKS WITH GASES

■ PRINCIPLE:

Preparation and proof of carbon dioxide CO₂, oxygen O₂, hydrogen H₂, sulfur dioxide SO₂ and ammonia NH₃ are the most widespread works with gases in a laboratory.

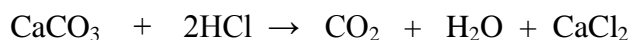
By means of reaction of solid substances with either acids or lyes we produce gas which we collect into the flask and we prove it by its characteristic properties.

Gases are either heavier or lighter than air and it is necessary to adjust apparatus accordingly.

TASK NO. 1: PREPARATION OF CO₂:

■ PRINCIPLE:

Carbon dioxide is prepared by decomposition of carbonates by means of acids:



■ AIDS:

litmus paper, skewer (stick), 2 beakers 250 ml, separator funnel 250 ml, stopper, side-arm flask 250 ml, candle

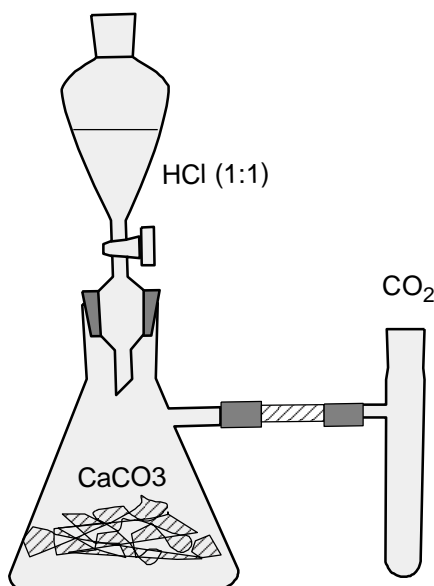
■ CHEMICALS:

particulate calcium carbonate CaCO₃, HCl (1:1), lime water Ca(OH)₂, litmus

■ PROCEDURE:

1. We assemble the apparatus according to the manual.
2. We put appr. 5 pieces of lime into the side-arm flask and we pour 50 ml of HCl (1:1) into the separator flask.
3. We begin to drop slowly HCl from the separator funnel and we observe the effervescence of the lime.
4. We collect the emergent CO₂ into the test tube.

Drawing of the apparatus: Preparation of CO₂



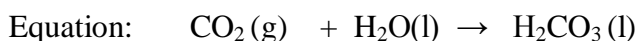
Proofs of carbon dioxide:

1. Carbon dioxide is introduced into saturated solution of calcium hydroxide (lime water). The originally colourless solution turns cloudy by the emerged sediment of calcium carbonate.



2. Carbon dioxide is gas heavier than air. We can collect it into the test tube. We touch a burning skewer to test tube filled with CO₂, it should burn low by effect of CO₂

3. We let carbon dioxide bubble into the test tube with water. CO₂ dissolves in water on formation of carbonic acid. After 3 minutes we inspect the reaction by pH paper. We write down the change of colouring.



TASK NO. 2: PREPARATION OF SO₂:

■ PRINCIPLE:

We prepare sulfur dioxide by burning of sulfur on burning spoon. We catch it by dissolving in water and we prove it as sulfurous acid.

■ AIDS:

litmus paper, scoop, burning spoon, Erlenmeyer (conical) flask, beaker 250 ml, stopper with opening, burner

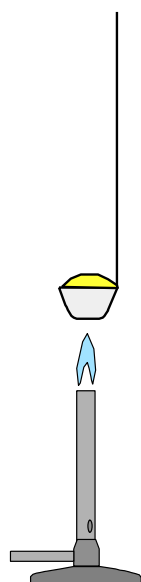
■ CHEMICALS:

sulfur, litmus, distilled water

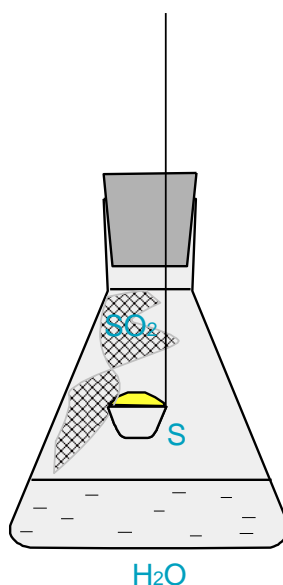
■ PROCEDURE:

Take on powdery sulfur S on burning spoon and heat it over the flame until it melts and starts to burn. Put it immediately into the Erlenmeyer flask filled with water with litmus and close it. Observe the formation of white smoke and the change of colouring.

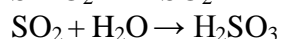
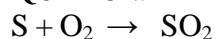
Drawing of the apparatus:



Burning of sulfur



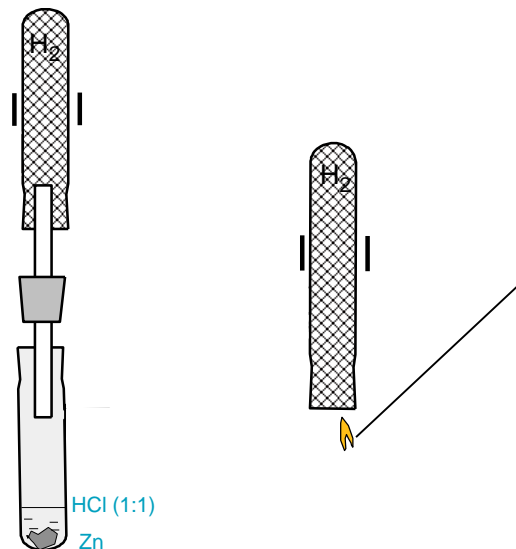
■ EQUATION:



TASK NO. 3: PREPARATION OF HYDROGEN

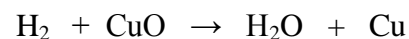
- **CHEMICALS:** HCl (1:1), Zn granulated, CuO, Na, phenolphthalein
- **AIDS:** 2 test tubes, stopper, spoon, glass tube, skewer, crystallization dish, gauze, knife
- **PROCEDURE:**
We pour 5 ml of HCl (1:1) into the first test tube, we add 1 granule of Zn. We close the first test tube by the stopper with the glass tube. We collect the generating hydrogen into the second test tube in a holder. After filling up, we remove the second test tube and we light hydrogen by means of the burning skewer.
The explosive mixture of hydrogen and oxygen burns up with characteristic sound – so-called barking (or shock).
- **Drawing of the apparatus:**

Preparation and proof of hydrogen



■ **EQUATION:**

Equation for the proof of hydrogen:





TASK NO. 4: PREPARATION OF OXYGEN O₂

■ **PRINCIPLE:**

Oxygen can be prepared by reactions of hydrogen peroxide with strong oxidants.

■ **AIDS:**

Erlenmeyer flask, scoop, skewer

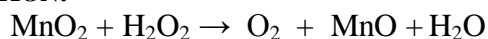
■ **CHEMICALS:**

MnO₂, 10% H₂O₂

■ **PROCEDURE:**

We put appr. 0,5 g of MnO₂ into the Erlenmeyer flask and we add appr. 10ml of 10% H₂O₂. The mixture begins to react violently. After appr. 5 min. we light the generated oxygen by the smoldering skewer.

■ **EQUATION:**



- **CONCLUSION:** Write down a brief summary of the results of analysis and preparation of gases.

■ **SAFETY:**

30% hydrogen peroxide is an extremely caustic substance, it causes lesion of eyes, it is necessary to use protective gloves during the work.

Sulfur dioxide is an irritating gas, work in a fume hood.



STUDENT'S SHEET No.6
WORKS WITH GASES

1. Vocabulary:

Match the English words with their Czech equivalents

1. separator funnel	A. laboratorní lžička	1.....
2. litmus	B. špejle	2.....
3. effervescence	C. dráždivý plyn	3.....
4. decomposition	D. krystalizační miska	4.....
5. side-arm flask	E. dělicí nálevka	5.....
6. introduce	F. šumění	6.....
7. skewer	G. rozklad	7.....
8. scoop	H. lakmus	8.....
9. crystallization dish	I. frakční baňka	9.....
10. irritating gas	J. zavádět	10.....

2. Translate the verbs into Czech:

pozorovat	.....
nalít	.....
jímat	.....
dokazovat	.....
zapsat	.....
reagovat	.....
zhasnout, dohořet	.....
způsobit	.....
připravit	.....
upravit, seřídít	.....

3. Translate the following chemical terms:

sulfur dioxide	.....
calcium carbonate	.....
lime water	.....
calcium hydroxide	.....
carbonic acid	.....
sulfurous acid	.....
hydrogen peroxide	.....
oxidant	.....



4. Answer following questions:

1. What aids do you need for task 1?
2. What chemicals do you need for task 1?
3. What chemicals do you need for task 2?
4. What equation is used for task 2?
5. What protective means do you have to use during the work with 30% hydrogen peroxide and sulfur dioxide?