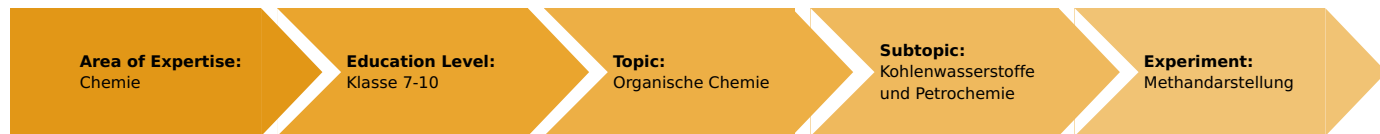


The characterization of methane (Item No.: P7170700)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

organic compounds, preparation of methane

Task and equipment

Information for teachers

Learning objectives

- Methane can be prepared from aluminium carbide and water.
- Methane is a colourless, combustible gas, which forms a mixture with air which is explosive in some proportions.

Notes on setup and procedure

Preparation:

We recommend that you test the aluminium carbide which is to be used beforehand. Should it have been stored for some time and only sluggishly react, 10% hydrochloric acid can be used instead of distilled water.

Remarks on the students experiments:

Ensure that the heating is not too strong and that the Bunsen burner flame is not brought too near to the mouth of the test tube. The experimental setup should be disassembled in a fume cupboard after extinguishing all open flames.



Hazard and precautionary statements

Aluminium
carbide:

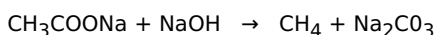
H261:	In contact with water releases flammable gas.
H315:	Causes skin irritation.
H319:	Causes serious eye irritation.
H335:	May cause respiratory irritation.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P302 + P352:	IF ON SKIN: Wash with soap and water.
P332 + P313:	If skin irritation occurs: Get medical advice/attention.
P403 + P233:	Store in a well ventilated place. Keep container tightly closed.
P501:	Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Hazards

- Explosive gases are evolved in the course of the experiment. Wear protective glasses. Air the room well when the experiment is finished!
- To make glass/rubber connections, wet the glass with glycerol so that it can be easily inserted!

Notes

Methane can be prepared on a laboratory scale from anhydrous sodium acetate and caustic soda:



This reaction can also be carried out as a school experiment, using the same apparatus. On an industrial scale, the major source of methane is natural gas.

Remarks on the method

The problems of energy supply and production and the use of natural gas can be taken as themes here, but also later in connection with petroleum recovery and refining. Point out the difference between producing substances on a laboratory and on an industrial scale.

Waste disposal

Allow the aluminium carbide to completely react with the water, then pour the contents of the tube into the acid and alkali waste container.

The characterization of methane (Item No.: P7170700)

Task and equipment

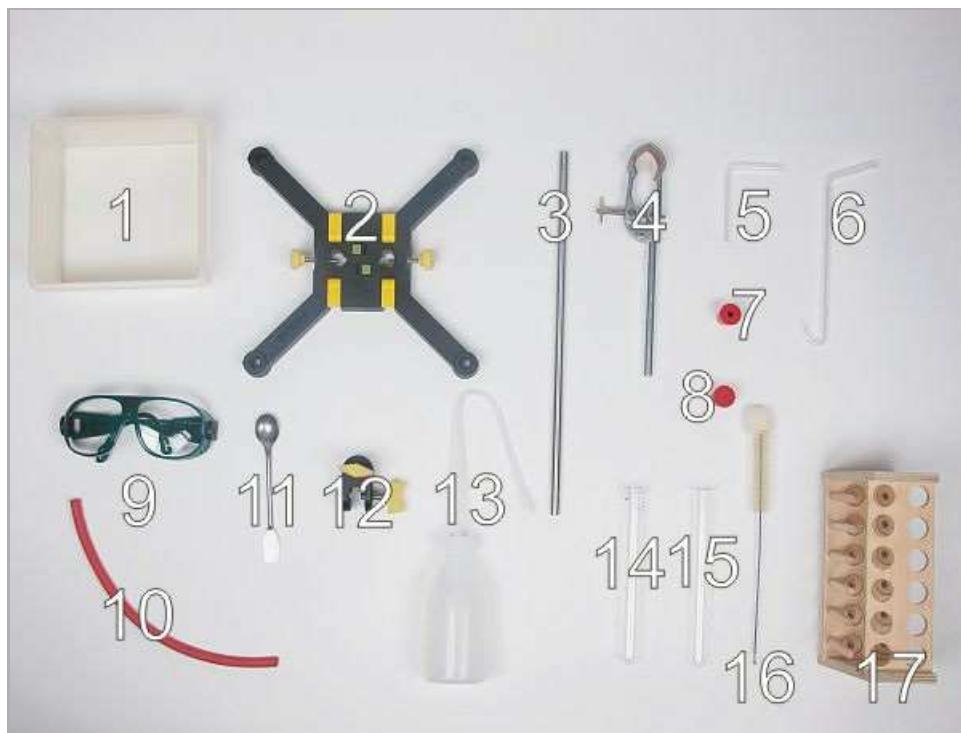
Task

How can methane be produced?

Produce methane and examine some of its properties.



Equipment



Position No.	Material	Order No.	Quantity
1	Dish, plastic, 150x150x65 mm	33928-00	1
2	Support base, variable	02001-00	1
3	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
4	Universal clamp	37715-00	1
5	Glass tube, right-angled, 10 pcs.	36701-52	1
6	Glass tubes, straight with tip, 10	36701-63	1
7	Rubber stopper, d = 22/17 mm, 1 hole	39255-01	1
8	Rubber stopper, d=22/17 mm, without hole	39255-00	1
9	Protecting glasses, clear glass	39316-00	1
10	Rubber tubing, i.d. 6 mm	39282-00	1
11	Spoon, special steel	33398-00	1
12	Boss head	02043-00	1
13	Wash bottle, 250 ml, plastic	33930-00	1
14	Test tube, 180x20 mm, DURAN, PN19	36293-00	1
15	Test tube, 180x18 mm, 100pcs	37658-10	(1)
16	Test tube brush w. wool tip, d25mm	38762-00	1
17	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
	Butane burner f. cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Glycerol, 250 ml	30084-25	1
	Aluminium carbide 25 g	31016-04	1
	Water, distilled 5 l	31246-81	1
Additional material			
	Water		

Set-up and procedure

Set-up

Hazards

- Explosive gases are evolved in the course of the experiment. Air the room well when the experiment is finished!
- Wear protective glasses!
- To make glass/rubber connections, wet the glass with glycerol so it can be easily inserted!



Setup

Set up the stand as shown in Fig. 1 to 3. Fix the Duran test tube at an angle at the universal clamp (Fig. 4).



Fig. 1



Fig. 2



Fig. 3



Fig. 4

Fill the plastic dish two thirds full with tap water. Fill the test tube with water and position it upside down in the dish (Fig. 5+6).



Fig. 5



Fig. 6

Connect the right-angled glass tube (wet the glass with glycerol!) to the untipped end of the straight glass tube (gas tube) with a piece of rubber tubing (Fig. 7).



Fig. 7

Procedure

Put a spatula tip of aluminium carbide at the bottom of the Duran test tube (Fig. 8). Pour distilled water on top of it, to a height of about 2 cm (Fig. 9). Close the Duran test tube with the stopper to which the right-angled tube and gas tube are connected (Fig. 10). Immerse the free end of the gas tube in the water in the dish.



Fig. 8



Fig. 9

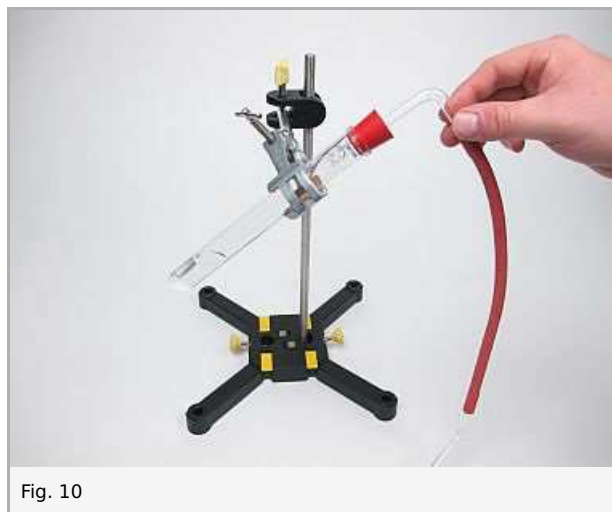


Fig. 10

Carefully heat the Duran test tube until formation of gas occurs. Turn the flame of the Bunsen burner down as low as possible. Wait about 30 seconds, then lead the gas into the inverted, water-filled test tube (Fig. 11). As soon as the test tube is filled with gas, close it with the rubber stopper and place it in the test tube rack (Fig. 12).

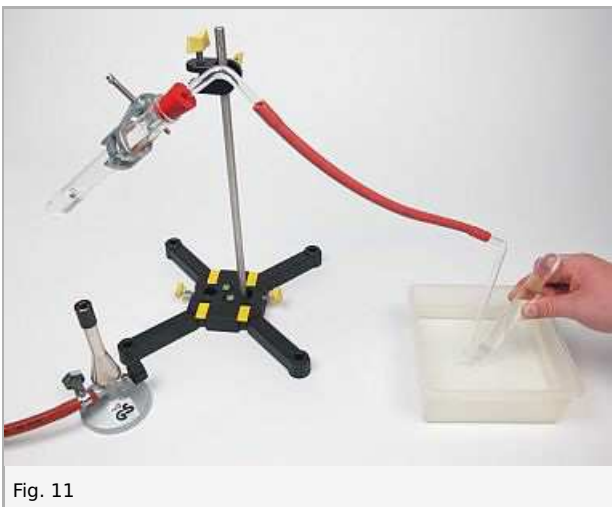


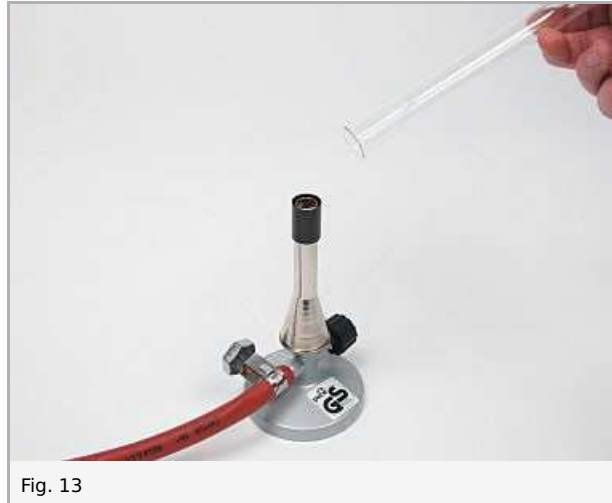
Fig. 11



Fig. 12

Take the tip of the gas tube out of the water and immediately extinguish the Bunsen burner.

Relight the Bunsen burner. Hold the test tube mouth down, remove the stopper and hold the mouth of the still inverted test tube at the Bunsen burner flame (Fig. 13).



Waste disposal

Allow the aluminium carbide to completely react with the water, then pour the contents of the tube into the acid and alkali waste container.

Report: The characterization of methane

Result - Observations

Note the observations you make.

- a) While heating the Duran test tube.
- b) When igniting the collected gas.

.....

.....

.....

.....

Evaluation - Question 1

Draw conclusions from your observations.

.....

.....

.....

.....

Evaluation - Question 2

Formulate the equation for the reaction which took place.

.....

.....

.....

.....

Evaluation - Question 3

Enter the observed properties of methane into the general data sheet, look up the missing entries in your text book to complete the data sheet.

Name of substance:	Methane	
	CH ₄	1
	colourless	1
	gaseous	1
	-184 °C	1
	-164 °C	1
	combustible, explosive in certain mixtures with air	1
	constituent of marsh gas, mine gas and natural gas	1
	gas for heating	1