**Test 1 and associated teacher’s notes**

[**MTA-ELTE Research Group on Inquiry-Based Chemistry Education**](https://mta.hu/kozoktatas-fejlesztesi-kutatasi-program/scientific-foundations-of-education-research-program-of-the-hungarian-academy-of-sciences-111618)

[**Research Programme for Public Education Development of the Hungarian Academy of Sciences**](https://mta.hu/kozoktatas-fejlesztesi-kutatasi-program/research-programme-for-public-education-development-of-the-hungarian-academy-of-sciences-111934)

*Note: More detailed instructions are available in Hungarian in the teacher’s guides, under the title “*[T1 teszt és javítási útmutatója](https://ttomc.elte.hu/rails/active_storage/blobs/eyJfcmFpbHMiOnsibWVzc2FnZSI6IkJBaHBBbE1NIiwiZXhwIjpudWxsLCJwdXIiOiJibG9iX2lkIn19--e84ad04b40e9b3a55c316097b1f71bddd2c7f910/T1_teszt_2022_08_30_UTMUTATO_HONLAPRA.docx?disposition=attachment)*” at* [*https://ttomc.elte.hu/publications/92*](https://ttomc.elte.hu/publications/92)

Test 1 (June, 2022)

Number of school:…(A) Number of teacher:…(B) Number of group:…(C) Number of student: …(D)

The aim of our research is to make the teaching of chemistry as interesting and effective as possible.

Thank you for completing this test to the best of your ability. This will help our work considerably. Write your answers on this sheet of paper. Please do not use any other paper.

1. a) What do we call particles that have both water-soluble and fat-soluble parts?

AC

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1. b) Why is it not good to use more detergent than necessary (apart from the fact that it is a waste of

money)? …………………………………………………………………………………………………………………………….

AD

2. Imagine that at home, the adults want to make Gundel pancakes with a **chocolate sauce that can be lit** because there is alcohol in it. The recipe reads (excerpt). *"…To the chocolate sauce, add the same volume of store-bought rum, mix, pour over the pancake and light it*." But there are **three types of rum** available in a nearby shop, one containing **40% alcohol by volume**, one containing **60% alcohol by volume** and one containing **80% alcohol by volume**. The rum is more expensive the higher the alcohol content. So, adults are left wondering which kind of rum to buy to make sure that the alcoholic chocolate sauce will catch fire after mixing. They remember that they can **experiment** with 100% alcohol by volume to see **which of the three types of rum has the lowest alcohol content that can be used to ignite the chocolate sauce**. At home, you have 100% pure alcohol, matches, ashtrays, tweezers, water, pieces of paper, glasses, small spoons and a kitchen volumetric measuring jug. **Help them to design the experiment with your answers below!**

a) Which of the materials available at home (and mentioned above) should be put into each glass during the experiments?

AE

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b) How should the contents of each glass be compared to the chocolate sauces that are made from different concentrations of rum bought from the shop?

AF

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c) What should be changed in each experiment because of your answer to question b) above?

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AG

d) Which of the properties of the contents of the glasses should be tested in each experiment?

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AH

e) How can you test the property of the contents of the glasses in your answer to d)?

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AI

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f) How can you decide which rum to buy based on the experience of the experiments?

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AJ

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g) Put a (**+**) sign in front of the statement(s) in the list below that is/are important and a (**-**) sign in front of the statement(s) that is/are not important (You can write a different sign after a clear strike-through if you change your mind.)

AK

The glasses must be of the same shape and volume.

AL

The liquids must be the same temperature.

The volumes of the liquids must be measured with equal accuracy.

AM

3. Why is cutting down trees in a wide swath of the forest a good way to prevent the spread of forest

fires ? ………………………………………………………………………………………………………………………………

AN

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4. a) What is a chemical reaction?

AO

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4. b) Which gas is produced by the reaction of limestone with acetic acid?

AP

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5. a) Sugar beet grown in a temperate climate contains on average 75% water and 25% dry substances; its sugar content varies from 13-19%. Sugar cane, on the other hand, is grown in warmer and wetter climates and accounts for about 79% of the world's sugar production. The matured cane stalk typically contains 11-16% fibre, 12-16% soluble sugars, 2-3% non-sugar carbohydrates and 63-73% water. What is more sugar made from in the world: sugar beet or sugar cane? **Justify your answer** based on the text above.

AQ

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5. b) Unrefined beet syrup is obtained by boiling the chopped root of sugar beet in water for a few hours to extract the sugar. Which property of the sugar is exploited in this separation process?

……….......................................................................................................................................

AR

6. Disinfecting swimming pool water is essential to kill disease-causing bacteria and fungi. The most common traditional method of disinfection of pool water is chlorine treatment with bleach. **Why** should the chlorine content of the water not exceed the prescribed level?

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AS

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7. If someone sprays deodorant on themself in the bathroom, the odour will only be smelt after a while in the room. Do you think it takes a shorter time (with closed windows) in the heat of summer or in the cooler autumn weather before the smell is felt in the room? **Why?** (Give reasons for your answer.)

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AT

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Please also answer the following questions!

AU

* Write your end of first term grade in 7th grade chemistry in the box:
* The bigger the number you circle, the more you like chemistry.

(0: you do not like it at all, 5: you really like it):

AV

1 2 3 4 5

* The bigger the number, the more you consider it important to test ideas in sciences by experiments (0: not important at all; 5: very important)

AW

1 2 3 4 5

* The bigger the number, the more you agree with the following statement:

“I prefer the step-by-step experiments to the ones that I have to design.”

AX

1 2 3 4 5

Instructions given to the teachers to mark the students’ answers of the Test 1

Please complete the columns of the Excel spreadsheet with the marks obtained from following the instructions below. A student’s marks should be written in the appropriate row of the Excel spreadsheet.

Columns AC-AT contain marks for students’ answers.

Columns AU contains the student’s end of first term grade in 7th grade chemistry.

Columns AV-AX contain students’ attitude responses.

Abbreviations:

* DCK: disciplinary content knowledge;
* EDS: experimental design task

Column ‘AC’ (task 1.a)

If the expression “dual solubility” or any synonym appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘AD’ (task 1.b)

“Because it causes (environmental) pollution.” / “Because it is harmful to animals that live in the water.” or any synonymous answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AE’ (task 2.a)

If both “alcohol” and “water” appear in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AF’ (task 2.b)

If “in their alcohol content/composition/concentration” or any synonymous answer (see examples in the teacher’s guide) appear. Marks: 1

In any other case. Marks: 0.

1 item: higher order cognitive skills (EDS task)

Column ‘AG’ (task 2.c)

If “the alcohol/alcohol content/concentration” or any synonymous answer (see examples in the teacher’s guide) appear. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AH’ (task 2.d)

If “flammability” or any synonymous expression appears in the answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AI’ (task 2.e)

If “pieces of paper dipped in alcohol-water mixtures/solutions ignite” or any valid method appears in the answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AJ’ (task 2.f)

If “the lowest concentration of alcohol solution that can be ignited” or any synonymous expression appears in the answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AK’ (task 2.g)

If the student put a “-” sign in front of the following sentence: “The glasses must be of the same shape and volume.” Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AL’ (task 2.g)

If the student put a “+” sign in front of the following sentence: “The liquids must be at the same temperature.” Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AM’ (task 2.g)

If the student put a “+” sign in front of the following sentence: “The volume of liquids must be measured with equal care.” Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AN’ (task 3.)

If the following answer “if there is no combustible material, the fire/fast combustion will cease” or a synonymous answer appears (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AO’ (task 4.a)

If one of the following answers “a change when matter is transformed into a different substance” or “a change in which the particles change” or any synonym appears (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘AP’ (task 4.b)

If the expression “carbon dioxide” appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘AQ’ (task 5.a)

If “from sugar cane, because it accounts for about 79% of the world's sugar production” or any synonymous answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AR’ (task 5.b)

If the expression “solubility” or any synonym appears in the answer. Marks: 1

Marks: 0

1 item: application (DCK task)

Column ‘AS’ (task 6)

If “because it would harm/poison people” or any synonymous reason appears in the answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘AT’ (task 7)

If “in the summer, because at higher temperatures particles move faster” or any synonymous reason appears in the answer (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘AU’

The student’s end of first term grade in 7th grade chemistry.

Column ‘AV’

The answer given by the student to the question how much he/she likes chemistry. (Insert the number circled by the student.)

Column ‘AW’

The answer given by the student to the question how important he/she thinks it is in science to test ideas by experiments. (Insert the number circled by the student.)

Columns ‘AX’

The answer given by the student to the question: “The bigger the number, the more you agree with the following statement: »I prefer the step-by-step experiments to the ones that I have to design.” (Insert the number circled by the student.)

END OF EVALUATION OF THE TEST 1