Test 0

Number of school:…… Number of teacher:….. Number of group:…….. Number of student: ..…..

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

Thank you for completing this test according to the best of your knowledge, because you help our work.

1. (a) What is the visible sign of a boiling in a liquid while it is heated?

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1. (b) In one dish, we boil 1 litre of water and in the other dish 2 litres of water. In which case is more heat required if the initial temperatures are the same? How many times more heat is needed?

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2. (a) The volume of water increases when it is frozen. How can you determine the number of times bigger the volume of ice is compared to the volume of water? Choose the equipment and the materials you need of the following items. (Note: you do not need all of them.) Describe how you would do the experiment and the calculation.

• water

• salt

• ice cubes

• ice cube tray

• freezer

• ruler

• permanent marker

• string

• volume measuring vessel

• glass jar (cylindrical, without a top)

• spoon

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2. b) How could you increase the accuracy of your measurement compared to the one you described above?

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3. a) What is between the particles of a gas? .............................................................................................

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3. b) The drawing illustrates an experiment when an uninflated baloon and an inflated balloon are placed in the two pans of the scale. The balloons have the same mass.

EMPTY BALLOON

INFLATED BALLOON

Use dots (**∙**) to show where air particles are in the diagram wherever there is air.

Points should be closer together where more particles are in a given volume.

3. c) Why are air particles closer together where you showed them to be?

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4. a) Explain the difference between melting and dissolution.

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4. b) Drawing **A** shows the beginning of distillation of a solution. Particles of the solvent are shown by white circles and the solid solute particles by black circles. Complete drawing **B** to show where the particles of solvent and solute are when the distillation is stopped after a while.

HEATING

COOLING

**A**

**B**

5) a) Name the component of air that feeds combustion...........................................................................

5. b) Of which gas is there more in the exhaled air than in the inhaled air?

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6. (a) To determine the energy stored in a food, a sample of the food is burned (combusted) and the energy released is measured. The energy content of the walnut, for example, can be determined by burning a piece of it and using the flame to heat some water. We know how much energy is needed to increase the temperature of 1 kg of water by 1 °C. What quantities must be measured to be able to calculate the energy content of the walnut?

1st quantity: ………………………………………………………………………………………………………………………………………..

2nd quantity: ……………………………………………………………………………………………………………………………………….

3rd quantity: ………………………………………………………………………………………………………………………………………..

6. b) Other factors can affect the result of the measurement. Name one or more of these factors.

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6. c) The energy content determined by the experiment is less than the true value. Explain why.

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Please, give us the following information! Your gender: boy / girl (Underline the right answer!)

• In the 6th grade, the end-of-the-school year grade you got from science: .......

• The larger the number you circle, the more you preferred the subject called ‘science’.

(0: you did not like it at all, 4: you really liked it): 0 1 2 3 4

• The bigger the number, the more you consider it is important to test ideas in sciences by experiments (0: not important at all; 4: very important): 0 1 2 3 4

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 A-D contain information about the student’s identity.

Columns E-V contain marks for students’ answers.

Columns W contains the student’s gender.

Columns X contains the student’s science mark in the previous year.

Columns Y-Z contain students’ attitude responses.

Column ‘A’:

Number of school (see it in the table sent by Luca Szalay on 16th September 2016).

Column ‘B’:

Number of teacher (see it in the table sent by Luca Szalay on 16th September 2016).

Column ‘C’:

Number of group (class) (see it in the table sent by Luca Szalay on 16th September 2016).

Column ‘D’:

Number of student: The number of student in the alphabetic list of names of the group (class).

Column ‘E’ (task 1.a)

If the word “bubble” or a synonym appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: recall (disciplinary content knowledge task: DCK task)

Column ‘F’ (task 1.b)

If the expression “2 litres” and the word “double” also appear in the answer. Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘G’ (task 2.a)

If a correct method for the measurement of the volume of the water (or the height of water in case of identical area) appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (experimental design task: EDS task)

Column ‘H’ (task 2.a)

If a correct method for the measurement of the volume of the ice (or the height of ice in case of identical area) appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘I’ (task 2.a)

If dividing the volume/height of the ice by the volume/height of the water appears in the answer. Marks: 1

In any other case. Marks: 0.

1 item: higher order cognitive skills (EDS task)

Column ‘J’ (task 2.b)

If a correct method is described to increase the accuracy of the measurement (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘K’ (task 3.a)

If the word “nothing” or “vacuum” or any synonym expression appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘L’ (task 3.b)

If the points are on the drawing where there is air and the points are denser inside the balloon. Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘M’ (task 3.c)

If the answer proves that the student understands and can apply the following correlation: There are more particles in a unit of volume inside the (blown up) balloon than in the unit of volume of the air around and/or the pressure is higher inside the (blown up) balloon than in the air around it. Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘N’ (task 4.a)

If the answer proves that the student understands: There are at least two substances in the case of dissolution. Marks: 1

In any other case. Marks: 0.

1 item: understanding (DCK task)

Column ‘O’ (task 4.b)

If the right hand side drawing shows that only the particles of solvent are in the right hand side vessel and the particles of solute are not. Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘P’ (task 5.a)

If the word “oxygen” appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘Q’ (task 5.b)

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

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘R’ (task 6.a)

If the mass of the walnut appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘S’ (task 6.a)

If the mass or the volume of the water appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘T’ (task 6.a)

If the temperature of the water or the change of temperature of the water or the temperature of the water before the beginning and after the finishing of the warming appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘U’ (task 6.b)

If a circumstance/condition appears in the answer that influences indeed the result of the measurement (see examples in the teacher’s guide). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘V’ (question 6.c)

If the answer proves that the student understands: there is a loss of heat or not only the water is warmed, but the materials around it too (e.g. the vessel, the air). Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘W’

1: If the gender in the answer concerning the student’s gender is a boy.

2: If the gender in the answer concerning the student’s gender is a girl.

Column ‘X’

The student’s grade in science in the end of the 6th grade.

Column ‘Y’

The answer given by the student to the question how much he liked the subject “science”. (Insert the number circled by the student.)

Column ‘Z’

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

END OF EVALUATION OF THE TEST 0