Test 1

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.

AA

1. a) What colour can be seen when iodine dissolves in petrol?............................................

1. b) Alcohol dissolves in water and in petrol. Explain this using your knowledge of the structure of alcohol particles.

AB

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2. a) Sea salt is made from seawater. Seawater is left to evaporate in sandy reservoirs. The solid that can be collected is a mixture of salt contaminated by sand.For the further treatment it is important to know what mass of salt is contained by a 100 g of sand-polluted salt. How could you separate the salt from the sand and determine the mass of the purified salt? **Write down the steps of the designed process.**

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AC

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2. b) Give a possible error that would mean the measurement as described, would not be accurate.

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AD

3. a) How could you test the glass was full with carbon dioxide?

AE

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3. b) How could you test that the potato contains starch?

AF

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4. a) Using your knowledge of the structure of matter, explain why sugar dissolves more slowly in cold water than in hot water. The cold and the hot water have the same volume and the same amount of sugar is put into both. Neither are stirred.

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AG

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4. b) We make a solution from plant leaves that contain green coloured materials. The dissolved substances in this solution are separated by a white chalk standing in the solution (as shown in the figure). The solution is drawn up into the chalk and the dissolved substances separate, appearing as coloured stripes of different heights. Why do the dissolved substances travel at different speeds up the chalk?

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AH

5. How can hydrogen gas be produced in a **test tube**?

AI

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6. At a party organised for adults spritzer is made using 1 dl (100 cm3) wine containing **12 percent by volume** alcohol and 3 dl (300 cm3) soda water. Calculate the **percent by volume of alcohol** in the spritze, show your working.

AJ

7. a) We mix hydrochloric acid and sodium-hydroxide solutions. Why can be red cabbage juice used to decide whether the particles influencing the acidity/alkalinity of hydrochloric acid or the sodium-hydroxide solution were in excess before we mixed the solutions?

AK

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7. b) In a messy household the following substances are kept in unlabelled boxes: tartaric acid, caustic soda (NaOH), Hyperol (in powder) and baking soda. We want to decide which substance is stored in which box. Aqueous solutions of each substance have been made. Plenty of **clean test tubes** are available, as is **phenolphthalein indicator**. **Samples taken from the solutions can be added to one another.** Write a plan, listing the steps you would take to identify the substances. Record your expected **observations** and write your **conclusions**.

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AL

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Please, give us the following information!

AM

The end-of-semester grade you got in chemistry:

* The larger the number you circle, the more you like chemistry:

AN

(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

AO

* 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.”

AP

1. 1 2 3 4
* Continue the following sentences. I find the most interesting at the chemistry lessons, when………

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I find the most boring at the chemistry lessons, when …………………………………………………………………………

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Instructions given to the teachers to mark the students’ answers of the Test 2

Teachers correcting the test can judge whether the particular answer is accepted, since that should be determined by the meaning of the answer.

Please fill in 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 ‘AA’-‘AL’ contain marks for students’ answers.

Columns ‘AM’ contains the student’s end-of-semester grade in chemistry.

Columns ‘AN’-‘AP’ contain students’ attitude responses.

Column ‘AA’ (task 1.a)

If one of the colours given in the teacher’s guide (purple/pink/lilac) is in the answer and no other colour(s) is/are mentioned. Marks: 1

In any other case. Marks: 0

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

Column ‘AB’ (task 1.b)

The particles/molecules of alcohol have water-friendly/polar/water soluble and oil-friendly/apolar/oil-soluble parts. Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AC’ (task 2.a)

Alternative answer I.:

Step 1: Adding water to the mixture (and stirring). Marks: 1

Step 2: The sand is filtered or the solution is decanted. Marks: 1

Step 3: The water is evaporated from the solution or the sand is dried. Marks: 1

Step 4: Measurement of the mass of the salt after the evaporation and drying or measurement of the mas of the dried salt and distraction of its mass from the 100 g mass of the original mixture. Marks: 1

Alternative answer II.:

Step 1: Measurement of the mass of water. Marks: 1

Step 2: Adding the water with known mass to the mixture (and stirring). Marks: 1

Step 3: The sand is filtered or the solution is decanted. Marks: 1

Step 4: Measurement of the mass of filtrate/salt solution and distraction of the mass of added water. The increase of mass was caused by the salt. Marks: 1

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

Column ‘AD’ (task 2.b)

If a concrete and acceptable factor that can cause error (see the teacher’s guide) appears in the answer. Marks: 1

In any other case. Marks: 0

1 item: higher order cognitive skills (EDS task)

Column ‘AE’ (task 3.a)

Use of a burning splint/candle or lime water. Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘AF’ (task 3.b)

Use of iodine solution. Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘AG’ (task 4.a)

Particles move faster at higher temperature or particles move more slowly at lower temperature. Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AH’ (task 4.b)

Alternative answer I.:

Particles of the different solutes are attracted/bonded with different forces to the particles of chalk or different strength relationship forms among the particles of chalk and the different particles of solutes. Marks: 1

Alternative answer II.:

The reason is the different polarity or structure of the particles. Marks: 1

In any other case. Marks: 0

1 item: application (DCK task)

Column ‘AI’ (task 5)

Alternative answer I.:

From (hydrochloric) acid with zinc or magnesium or any other metal that is applicable. Marks: 1

Alternative answer II.:

From water with an alkali metal or alkali earth metal. Marks: 1

Alternative answer III.:

From water with electrolysis if the hydrogen is collected in a separate test tube. Marks: 1

In any other case. Marks: 0

1 item: recall (DCK task)

Column ‘AJ’ (task 6.)

The volume of the solution is increased four times by the dilution. Therefore the concentration is decreased to the one forth of the original (3 percent by mass) or any other correct calculation.

Marks: 1

0: If the calculation is not correct.

1 item: application (DCK task)

Column ‘AK’ (task 7.a)

Alternative answer I.:

The red cabbage juice indicates with different colours if the solution is acidic/neutral/basic . Marks: 1

Alternative answer II.:

The red cabbage juice is a natural (acid-base) indicator. Marks: 1

In any other case. Marks: 0

1 item: understanding (DCK task)

Column ‘AL’ (task 7.b)

Alternative answer I.:

Step 1: Phenolphthalein is added to one part of each samples. The 2 colourless solutions contains the tartaric acid and the hydrogen peroxide. The two purple ones contain caustic potash and baking soda. Marks: 1

Step 2: One solution that is colourless with phenolphthalein is added to another part of the solutions that became purple (pink, cyclamen, magenta) colour with phenolphthalein**.** Marks: 1

a) If there is a fizz in one case, then that solution which had been colourless with phenolphthalein contains tartaric acid and the other solution which had been colourless with phenolphthalein contains hydrogen peroxide. The solution that had been purple with phenolphthalein and fizzed contains baking soda, which does not fizz is the solution of caustic potash. Marks: 1

b) If there is no fizz in any of the two cases, then the solution which had been colourless with phenolphthalein contains hydrogen peroxide and the other solution which had been colourless with phenolphthalein contains tartaric acid. Marks: 1

In this latter case a step 3 is also needed. The tartaric acid solution is added to both samples that had been purple with phenolphthalein. The one that fizzes is the solution of baking soda, the one that does not fizz is the solution of caustic potash. Marks: 1

Step 2 (alternative): One solution that became purple with phenolphthalein is added to another part of the solutions that was colourless with phenolphthalein**.** Marks: 1

a) If there is a fizz in one case, then this solution which had been purple with phenolphthalein contains baking soda and the other solution which had been purple with phenolphthalein contains caustic potash. The solution that was colourless with phenolphthalein and fizzed contains tartaric acid, which does not fizz is the solution of hydrogen peroxide. Marks: 1

b) If there is no fizz in any of the two cases, then the solution which had been purple with phenolphthalein contains caustic potash and the other solution which had been purple with phenolphthalein contains baking soda. Marks: 1

In this latter case a step 3 is also needed. The baking soda solution is added to both samples that had been colorless with phenolphthalein. The one that fizzes is the solution of the tartaric acid, the one that does not fizz is the solution of the hydrogen peroxide. Marks: 1

Alternative answer II.:

Step 1: Pairs of the samples are added together in every possible combination. When there is a fizz one of those solutions is the tartaric acid and the other is the baking soda. Marks: 1

Step 2: The solutions of the tartaric acid and the baking soda is separated by adding phenolphthalein to them. The one that is purple is the baking soda. Marks: 1. The other is the tartaric acid. Marks: 1

Step 3: The caustic potash and hydrogen peroxide are identified by adding phenolphthalein to both of them. The one that becomes purple is the caustic potash, the other is the hydrogen peroxide. Marks: 1.

Alternative answer III.: Any other plan that ensures the correct identification of the substances. (E.g. according to a method that has been tried in practice and works: cca. the same mass of caustic potash and baking soda are dissolved in cca. the same volumes of water and adding the same number of drops of phenolphthalein the purple colour of the caustic soda solution is more intense than the colour of the solution of baking soda.) In case of alternative solutions for each substance that could be correctly identified 1 mark is given (altogether 4 substances, 4 marks).

4 item: higher order cognitive skills (EDS task)

Column ‘AM’

The student’s end-of-semester grade in chemistry.

Column ‘AN’

Insert the number circled by the student.

Column ‘AO’

Insert the number circled by the student.

Column ‘AP’

Insert the number circled by the student.

Evaluation of the answers given to the last two questions concerning motivation is not required.

END OF EVALUATION OF THE TEST 1.