Society of Chemists and technologists of Macedonia
Chemistry competitions for elementary and high school students

CODE:

(to be filled in by the jury at the end of the test here and on the envelope)

REGIONAL CHEMISTRY COMPETITION

April 6, 2019

1) The tests are stapled with an envelope on the top. In the envelope there is piece of paper on which you should fill in the requested data: name and surname, school, supervisor etc. and then close and **seal the envelope!**
2) Do not put any signature, or a mark on the envelope and on the test (the code should be filled in by the jury). If any signature or mark is found on the test or envelope, the competitor will be disqualified.
3) You should write on the test using a **blue pen**, answers written with pencil will not be considered.
4) A calculator can be used for the numerical problems. It is not allowed to use textbooks, any other book, notebook, paper, the periodic table, cell phone etc. Cell phones should be left on the teacher's desk or out of the test room.
5) All necessary data are provided in the test.
6) Any conversation between the competitors is forbidden. If you have any question, then the teacher in the room should call the responsible teacher for the competition.
7) Read the test carefully and answer the questions following the instructions by: encircling, writing down the solution and answer in the designated space in the test. The jury **will evaluate only the answers written in the designated space for it**, and the procedures for solving the problems will be checked. The back of every page of the test, that is empty, can be used for free writing and it will not be checked and evaluated!
8) The maximal number of points is **50**. In the first part of the test with multiple choice questions, each correct answer brings 2 points (maximum 30). The correct answers to the problems in the second part brings maximum 20 points.
9) The competition lasts **90 minutes**. The tests that are handed after the given time will not be considered for scoring.

We wish you a successful work!

For the jury only

Part I: _____

Part II: _____

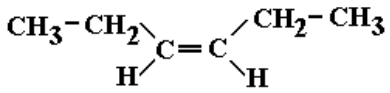
Total points:_____ Checked by (Name and Surname)

_____

TEST WITH QUESTIONS WITH MULTIPLE CHOICE ANSWERS (ONLY ONE CORRECT)
(Answer by encircling **only one** of the four offered answers under A, B, C or D)

1. Alkenes can be obtained by reaction of elimination of:
A. an acid.
B. hydrogen.
C. water.
D. all three mentioned above.

2. The name of this compound is:



A. hexene.
B. *trans*-hex-3-ene.
C. *cis*- hex-3-ene.
D. 1-ethyl-but-1-ene.

3. Which of the following compounds can be a monomer for obtaining a polymer?
A. Benzene.
B. Toluene.
C. Vinylbenzene.
D. Chlorobenzene.

4. Teflon is a polymer whose monomer is:
A. tetrafluorobenzene.
B. tetrafluoroethene.
C. tetraqchloroethene.
D. vinyl fluoride.

5. Characteristic reaction for benzene is the following:
A. alkylation.
B. acylation.
C. nitration.
D. all three mentioned above.

6. Halogenation of ethylbenzene in the presence of light occurs:
A. in ortho and para position in the benzene ring.
B. in meta position in the benzene ring
C. in the side chain (the ethyl group).
D. The reaction does not occur.

7. Mark the intruder!
A. Pyrole.
B. Pyridine.
C. Furane.
D. Cyclopentane.

8. Antifreeze is a water solution of:
A. ethanol.
B. propanol.
C. ethane-1,2-diol.
D. propane-1,2,3-triol.

9. In a reaction of chlorobenzene and sodium hydroxide the product is:
A. phenyl hydroxide.
B. phenol.
C. benzol.
D. benzyl alcohol.

10. The chemical bond between carbon and oxygen in the carbonyl bond can be characterized as:
A. sp^3-sp^3.
B. sp^2-sp^3.
C. polar.
D. non-polar.

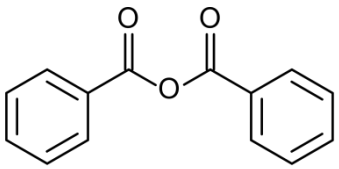
11. With reduction of acetone we obtain:
A. propan-1-ol.
B. propan-2-ol.
C. methanol and ethanol.
D. propanone.

12.Formalin is:
A. a solution of methanal.
B. a solution of acetaledhyde.
C. a solution of formic acid.
D. a solution of iodoform.

13. Butanoic acid can be obtained by:
A. hydrolysis of butyl amide.
B. oxidation of butan-1-ol.
C. oxidation of octan-4-one.
D. all three mentioned above.

14. The aqueous solution of potassium acetate is:
A. acidic.
B. neutral.
C. basic.
D. sweet.

15. This is the structure of:
A. benzophenone.
B. aspirin.
C. benzylanhydride.
D. anhydride of benzoic acid.



PROBLEMS

(Put the calculations and the answer to the problem at the designated place)
(M(C) = 12 g/mol; M(H) = 1 g/mol; M(O) = 16 g/mol; M(Br) = 80 g/mol)

1. a) Determine the molecular formula of an organic compound with acidic properties for which elementary analysis has revealed that w(C) = 60.87% and w(H) = 4.35% and that its molar mass is less than 200 g/mol. (3)

ANSWER: _____

b) Suggest possible structures and write down their names! (3)

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2. 46 g of an organic compound with density of 2.05 g/dm^3 (at standard conditions) burns completely producing 88 g of carbon dioxide and 54 g of water.

a) Determine the molar mass and the molecular formula of the compound! (2+2)

ANSWER: _____ _____

b) Suggest possible structural formulas, write the names of the suggested compounds and determine which one is the compound from the problem having in mind that it is a gas at standard conditions. (3)

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3. In a reaction between one hydrocarbon and bromine only one product is obtained with a molar mass of 151 g/mol. (2+3+2)

a) Determine the molecular formula of the hydrocarbon that reacted with bromine. Write down the chemical equation of the reaction.

ANSWER: _____ _____

b) Suggest the possible structures for the hydrocarbon with the determined molecular formula and write their names.

c) Which of the suggested compounds gives only one product in the reaction with bromine? Why?

ANSWER: _____