



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)

FOR THE JURY ONLY

Total points: _____

Checked by (Name Surname): _____

RULES FOR THE LOCAL CHEMISTRY COMPETITION 2019

- 1) The competition **starts at 10 o'clock and lasts for 60 minutes**. The tests that are handed after the given time will not be considered for scoring.
- 2) The tests are stapled with an envelope on the top. In the envelope there is piece of paper on which every competitor should fill in the requested data: name and surname, school, supervisor etc. and then close (seal) the envelope.
- 3) **No signature, or a mark is allowed on the envelope and on the test**. The code on the test, below and on the envelope, should be filled in by the jury after the test time is over. If any signature or mark is found on the test or envelope, the competitor will be disqualified.
- 4) The competitors should bring a blue pen with them. The test should be solved by this pen only. **It is not allowed to use a pencil.**
- 5) Each competitor should leave the **cell phone** at the teacher's desk at the beginning and take it back at the end after handing over the test.
- 6) A calculator can be used for the numerical problems.
- 7) A conversation between the competitors during the competition is forbidden as well as using books, notebooks, any other paper, the periodic table of the elements etc. All necessary data are given in the test.
- 8) The maximal possible number of points is **50**.
- 9) 2 points are awarded for every correct answer, and for a non-answered or not correctly answered question (more than one answer or crossed-out answer) no points are awarded.
- 10) If the competitor has a question then he calls the responsible teacher in the classroom (testator), who then calls the coordinator by cell phone. The coordinator, in presence of one more teacher, decides if he/she should answer the question of the contestant. The question should be asked quietly and be short and clear. If both teachers decide that the question should be answered, then the coordinator loudly repeats the question and the answer so all contestants in the classroom can hear it. If not, the coordinator loudly says "That is not relevant for the competition".
- 11) A competitor that does not follow any of these rules/recommendations shall be eliminated from the competition.

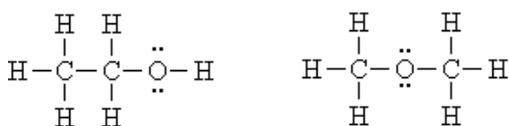


Select a single answer. For each correct answer you get 2 points. Using a pencil, selecting more than 1 answer and crossing over the answer is not allowed and will not be evaluated.

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. The first organic compound synthesized in a laboratory is:
A. carbonate.
B. carbamide.
C. urine.
D. uranate.
2. The carbon atom in organic compounds is:
A. always divalent.
B. sometimes divalent, sometimes four-valent.
C. always four-valent.
D. sometimes four-valent, sometimes three-valent.

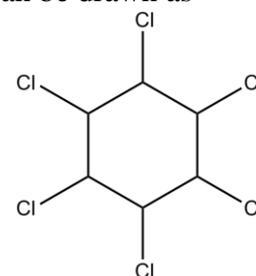
3. What is the relation between these two compounds?



- A. They are isomers.
B. They are isobars.
C. They are enantiomers.
D. There is no any relation.
4. What is the total number of σ -bonds in one molecule of this compound?
 $\text{CH}_3-\text{CH}=\text{C}=\text{CH}-\text{C}\equiv\text{C}-\text{H}$
A. 6
B. 10
C. 11
D. 12
5. What is the total number of π -bonds in one molecule of the same compound (cf. question 4)?
A. 5
B. 6
C. 3
D. 4
6. The number of sp^3 hybridized C-atoms in one molecule of the same compound (cf. question 4) is:

- A. 1
B. 2
C. 3
D. 4
7. Mark the compound with the highest boiling temperature!
A. Propane.
B. Acetone.
C. Methanal.
D. Methanol.
8. How many positional isomers of non-branched heptene exist?
A. 5
B. 2
C. 3
D. 4

9. The formula of lindane can be drawn as follows:



- So, lindane is:
A. hexachlorolindane.
B. hexachlorobenzene.
C. hexachlorohexane.
D. hexachlorocyclohexane.

10. In 1 mol of lindane:
A. there are $6,022 \cdot 10^{23}$ atoms of hydrogen.
B. there are $12,044 \cdot 10^{23}$ atoms of hydrogen.
C. there are $36,132 \cdot 10^{23}$ atoms of hydrogen.
D. there is no hydrogen.

11. A positive reaction with bromine solution i.e. discoloration of this solution, is achieved by addition of:
A. benzene.
B. methanol.
C. cyclohexane.
D. pentene.

12. Upon careful heating of ethanol with concentrated sulfuric acid above 170°C , we can obtain:
A. ethane. C. ethanal.
B. ethene. D. ethyne.



Select a single answer. For each correct answer you get 2 points. Using a pencil, selecting more than 1 answer and crossing over the answer is not allowed and will not be evaluated.

13. Which of these substances is NOT an aromatic compound:

- A. toluene.
- B. phenol.
- C. acetone.
- D. anthracene.

14. Mark the intruder:

- A. benzene.
- B. benzaldehyde.
- C. ethanal.
- D. acetone.

15. The molecular formula of a monohydroxyl alcohol with two C-atoms is:

- A. C_2H_4O
- B. C_2H_5O
- C. C_2H_6O
- D. C_2H_7O

16. Upon addition of water to pent-1-ene, you will obtain:

- A. pentane.
- B. pentanal.
- C. pentan-1-ol.
- D. pentan-2-ol.

17. Which of the following is the molecular formula of the cycloalkane with 14 hydrogen atoms?

- A. C_5H_{14}
- B. C_6H_{14}
- C. C_7H_{14}
- D. C_8H_{14}

18. Which of the given solvents is the most polar one?

- A. Heptane.
- B. Toluene.
- C. Ethanol.
- D. Tetrachloromethane.

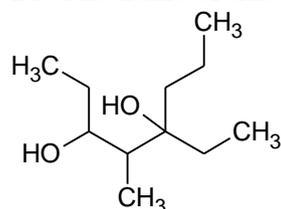
19. Upon addition of HBr to but-1-yne in a mole ratio of 2 : 1, respectively, the product is:

- A. 1,1-dibromobutane.
- B. 2,2-dibromobutane.
- C. 1,2-dibromobutane.
- D. 1,1,2,2-tetrabromobutane.

20. Dienes take part in reactions of:

- A. dehydration.
- B. polymerization.
- C. electrophilic substitution.
- D. elimination of hydrogen.

21. The name of this compound is:



- A. 4-methyl-5-propylheptane-3,5-diol.
- B. 4-ethyl-5-methyloctane-4,6-diol.
- C. 5-ethyl-4-methyloctane-3,5-diol.
- D. None of these three names is correct.

22. The mole fraction of carbon in the compound from the previous question is approximately:

- A. 15 %
- B. 20 %
- C. 30 %
- D. 40 %

23. One of the characteristic reactions for alcohols is:

- A. electrophilic substitution.
- B. nucleophilic substitution.
- C. nucleophilic addition.
- D. hydration.

24. Propane-1,2,3-triol is also known as:

- A. ethylene glycol.
- B. glycerol.
- C. phenol.
- D. aldol.

25. Functional isomers are the following two:

- A. acetone and acetaldehyde.
- B. propanone and propanol.
- C. propanone and propanal.
- D. propene and propyne.