



**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.



Answer by circling the letter in front of the given answers. Each correct answer is worth 2 points. Writing with a pencil, circling two or more answers or crossing over the answer will be penalized by 0 points.

I. MULTIPLE CHOICE TEST WITH ONE CORRECT ANSWER  
(Answer by circling just one of the answers marked with A, B, C or D)

- What is **NOT** true?
  - Gases can flow.
  - Gases can be spread indefinitely.
  - If placed in the same container, the gases diffuse into each other practically immediately.
  - To transfer liquids to the gaseous state, they should be heated at high temperatures.
- Based on the data in the table, in a temperature range of  $-10^{\circ}\text{C}$  to  $10^{\circ}\text{C}$ , in liquid aggregate state is/are:

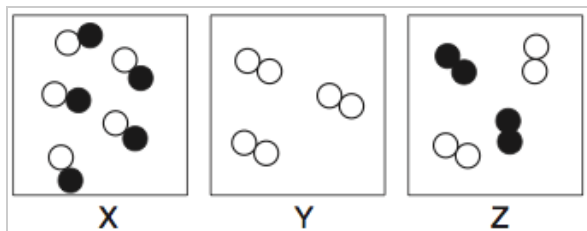
Substance	$t_m / ^{\circ}\text{C}$	$t_b / ^{\circ}\text{C}$
Bromine	-7	59
Chlorine	-101	-34
Ethanol	-117	78
Mercury	-39	357

  - Only ethanol.
  - Only mercury.
  - Ethanol and mercury.
  - Ethanol and bromine.
- Vesna wanted to do a research to answer the question: "Which material is the best for making umbrellas?". But she wanted to ask the question differently. What is the best question to ask about this research?
  - Which material is the heaviest and allows water to pass?
  - Which material is the lightest and waterproof?
  - Which material is the most colorful?
  - Which material is the lightest and most colorful?
- Andrej had one bag of flour and one bag of feathers. He wanted to examine which material was softer. What should he do?
  - To touch the materials in both bags and say which one is softer.
  - Ask two friends to touch the materials in both bags and say which one is softer.
  - Ask ten friends to touch the materials in both bags and say which one is softer.
  - Ask ten friends to look at the materials in both bags and say which one is softer.
- Which list contains only metals?
  - Helium, carbon, gold.
  - Sodium, chromium, copper.
  - Iodine, iron, nickel.
  - Phosphorus, nitrogen, oxygen.
- What is correct?
  - The metals have low melting temperatures.
  - Metals are weak conductors of heat.
  - Solid non-metals are shiny.
  - Solid non-metals are brittle.
- What of the listed below conducts electricity?
  - Lead for a pencil.
  - Aluminum foil.
  - Steel wire.
  - All above.
- The chemical formula  $\text{F}_2$  denotes:
  - One atom of fluorine.
  - One molecule of fluorine.
  - Two molecules of fluorine.
  - One formula unit of fluorine.
- Circle the **wrong** option. The chemical symbol Cu can indicate:
  - Element copper.
  - Elementary substance copper.
  - One copper molecule.
  - One copper atom.
- Which of the following formulas are formulas of elementary substances and which of compounds?
  - $\text{O}_2$
  - $\text{H}_2\text{SO}_4$
  - $\text{O}_3$
  - NO
  - Of elementary substances: 1 and 3; of compounds: 2 and 4.
  - Of elementary substances: 1; of compounds: 2, 3 and 4.
  - Of elementary substances: 2 and 4; of the compounds: 1 and 3.
  - Of elementary substances: 2, 3 and 4; of compounds: 1.
- Which of the following does **NOT** represent a mixture?
  - Coffee.
  - Milk.
  - Ethanol.
  - Vinegar.

12. The air is:

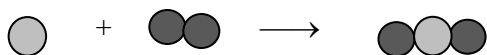
- A. An element.
- B. An elementary substance.
- C. A compound.
- D. A mixture.

13. Which of the diagrams X, Y and Z represents a mixture of elementary substances?



- A. Only X.
- B. Only Z.
- C. X and Y.
- D. X and Z.

14. Which word equation corresponds to the reaction shown in the corpuscular diagram (particle diagram)?



- A. Sulphur + oxygen  $\rightarrow$  sulphur dioxide
- B. Sulphur + oxygen  $\rightarrow$  sulphur trioxide
- C. Hydrogen + oxygen  $\rightarrow$  water
- D. Carbon + oxygen  $\rightarrow$  Carbon monoxide

15. Which metal element colors the flame yellow?

- A. Potassium.
- B. Lithium.
- C. Calcium.
- D. Sodium.

16. The name of the compound whose chemical formula is  $\text{Li}_3\text{N}$  is:

- A. Trilithium mononitride.
- B. Lithium nitride.
- C. Lithium nitrogenate.
- D. Lithium nitrate.

17. Two statements are given:

- i. When bring in contact the yellow-green gas chlorine with silvery-white metal sodium, white crystals of sodium chloride (table salt) are formed..
- ii. With the help of a magnet, you can separate dark brown iron filings from white sand.

What change is described with each of the statements?

i. ii.

- A. physical physical
- B. physical chemical
- C. chemical physical
- D. chemical chemical

18. Which of the following substances leads to chemical change if it is added to water?

- A. Cooking oil.
- B. Black Pepper.
- C. Vinegar.
- D. Effervette.

19. According to the law of conservation of mass, in a chemical reaction:

- A. The materia is neither destroyed nor preserved.
- B. The materia can be destroyed, but it can not change the shape.
- C. The materia can pass from one kind to another.
- D. If participate is formed, the mass at the end of the reaction is greater than the mass at the beginning.

20. Which of the following formulas is the formula of salt?

- A.  $\text{CH}_3\text{COOH}$
- B.  $\text{Na}_2\text{O}$
- C.  $\text{Fe}_2(\text{SO}_4)_3$
- D.  $\text{Mg}(\text{OH})_2$

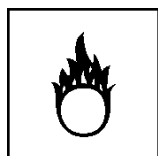
21. Which substance should be mixed with sodium hydroxide to form zinc hydroxide and sodium sulphate?

- A. Zinc sulphate.
- B. Zinc.
- C. Sulfuric acid.
- D. Hydrosulfuric acid.

22. In the reaction of sulfuric acid and magnesium oxide, products are:

- A. Magnesium sulphate, carbon dioxide and water
- B. Magnesium sulfate and hydrogen
- C. Magnesium sulphate and water
- D. Magnesium sulphate and oxygen

23. The symbol of the image warns of the danger of:



- A. Oxidising substances.
- B. Flammable substances.
- C. Toxic substances.
- D. Corrosive substances.

24. Acids are substances that:

- A. Causing burns.
- B. Contain the hydrogen element.
- C. Contain the oxygen element.
- D. Colors the water red.

25. Which of the listed substances has the lowest pH value?

- A. Milk.
- B. Baking soda.
- C. Lemonade.
- D. Ammonia.

Periodic Table of Elements																	
Group 1		Group 2-10										Group 11-18					
1 1.00794 H 1																	18 4.00260 He 2
2 6.941 Li 3	2 9.01218 Be 4											13 10.81 B 5	14 12.011 C 6	15 14.0067 N 7	16 15.9994 O 8	17 18.9984 F 9	18 20.180 Ne 10
3 22.98977 Na 11	3 24.305 Mg 12											13 26.98154 Al 13	14 28.086 Si 14	15 30.97376 P 15	16 32.065 S 16	17 35.453 Cl 17	18 39.948 Ar 18
4 39.0983 K 19	4 40.078 Ca 20	4 44.9559 Sc 21	4 47.867 Ti 22	4 50.9415 V 23	4 51.996 Cr 24	4 54.9380 Mn 25	4 55.845 Fe 26	4 58.9332 Co 27	4 58.9332 Ni 28	4 63.546 Cu 29	4 65.38 Zn 30	4 69.723 Ga 31	4 72.64 Ge 32	4 74.9216 As 33	4 76.64 Se 34	4 78.96 Br 35	4 83.796 Kr 36
5 85.4678 Rb 37	5 87.62 Sr 38	5 88.9058 Y 39	5 91.224 Zr 40	5 92.9064 Nb 41	5 95.94 Mo 42	5 98 Tc 43	5 101.07 Ru 44	5 102.906 Rh 45	5 106.42 Pd 46	5 107.868 Ag 47	5 112.41 Cd 48	5 114.818 In 49	5 118.71 Sn 50	5 121.760 Sb 51	5 127.60 Te 52	5 126.904 I 53	5 131.29 Xe 54
6 132.905 Cs 55	6 137.33 Ba 56	6 138.9055 La 57	6 175.07 Hf 72	6 178.49 Ta 73	6 180.94 W 74	6 183.84 Re 75	6 186.207 Os 76	6 190.23 Ir 77	6 193.224 Pt 78	6 196.967 Au 79	6 200.59 Hg 80	6 204.38 Tl 81	6 207.2 Pb 82	6 208.980 Bi 83	6 208.980 Po 84	6 208.980 At 85	6 222 Rn 86
7 87 Fr 87	7 88 Ra 88	7 89 Ac 89	7 104 Rf 104	7 105 Db 105	7 106 Sg 106	7 107 Bh 107	7 108 Hs 108	7 109 Mt 109	7 110 Ds 110	7 111 Rg 111	7 112 Cn 112	7 113 Uut 113	7 114 Uuq 114	7 115 Uup 115	7 116 Uuh 116	7 117 Uus 117	7 118 Uuo 118

KEY	
Atomic Mass →	12.011
Symbol →	C
Atomic Number →	6
Electron Configuration →	2-4

Selected Oxidation States: -4, +2, +4

Relative atomic masses are based on <sup>12</sup>C = 12 (exact)

Note: Numbers in parentheses are mass numbers of the most stable or common isotope.