

No.	Items	Score																						
1	Circle the letter T , if the statement is true and the letter F , if it is false. 1) T F Atoms of the chemical element situated in the periodic system in the 5 th period, group 2, the main subgroup contain 88 protons in the nucleus. 2) T F Atoms of ²⁸ Si and ²⁷ Al contain the same number of neutrons in the nucleus. 3) T F The chemical element with electronic configuration 1s ² 2s ² 2p ⁶ 3s ² 3p ⁶ 3d ¹⁰ 4s ² 4p ³ has more pronounced non-metallic properties than selenium. 4) T F The chemical element, the atoms of which contain 35 electrons in the electron shell, in the volatile compound with hydrogen has the oxidation degree +1. 5) T F The mass of nitrogen of 44,8 l (STP) is equal to the mass of 12,04 · 10 ²³ carbon oxide (II) molecules.	L	L																					
		0	0																					
		1	1																					
		2	2																					
		3	3																					
		4	4																					
2	Spirulina is a photosynthetic microorganism, rich in proteins, vitamins and minerals, considered a natural superfood due to its antioxidant, detoxifying and immunostimulating properties. The bioactive compounds that are contained in spirulina are composed of the following chemical elements: S, K, Mg, O, C, H, Zn. Compose and write in the reserved space the chemical formula of an appropriate substance for each proposed characteristic, using <i>only</i> the elements from this row. <table><tr><th></th><th>Characteristic of the substance</th><th>Chemical formula</th></tr><tr><td>1</td><td>The molecules of the substance are formed by non-polar covalent bonds</td><td></td></tr><tr><td>2</td><td>Contains particles with the electronic configuration 1s²2s²2p⁶</td><td></td></tr><tr><td>3</td><td>The substance has an atomic crystalline lattice</td><td></td></tr><tr><td>4</td><td>The substance is a hydroxide of „d” element</td><td></td></tr><tr><td>5</td><td>It is a gas heavier than air</td><td></td></tr><tr><td>6</td><td>The substance is used in the manufacture of matches</td><td></td></tr></table>		Characteristic of the substance	Chemical formula	1	The molecules of the substance are formed by non-polar covalent bonds		2	Contains particles with the electronic configuration 1s ² 2s ² 2p ⁶		3	The substance has an atomic crystalline lattice		4	The substance is a hydroxide of „d” element		5	It is a gas heavier than air		6	The substance is used in the manufacture of matches		L	L
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0	0																							
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2	2																							
3	3																							
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3	Sodium sulfite is used to prevent oxidation in foods such as dried fruits, processed potatoes, wines, and natural juices, thereby extending their shelf life. The quantitative determination of sodium sulfite can be carried out using the following reaction scheme:" Na₂SO₃ + KMnO₄ + HCl → Na₂SO₄ + MnCl₂ + KCl + H₂O Establish for this process: the degrees of oxidation of all elements, the oxidant and the reductant, the oxidation and the reducing processes. Determine coefficients by electronic balance method and balance the equation reaction. 	L	L																					
		0	0																					
		1	1																					
		2	2																					
		3	3																					
		4	4																					
5	5																							
6	6																							
7	7																							

6	There are given the substances: <i>nitrogen, copper (II) oxide, aluminum hydroxide, zinc sulfate, carbon (IV) oxide, hydrogen sulfide</i>. Write the reactions equations according to the proposed schemes, using in each case one of the substances in the given line: for I - as a starting substance; for II - as a reaction product. I. As a starting substance a) KOH + → b) + H₂ → II. As a reaction product a) + → + Fe b) + → Na₂SO₄ +	L	L									
		0	0									
		1	1									
		2	2									
		3	3									
		4	4									
		5	5									
		6	6									
		7	7									
		8	8									
7	Write in the blank spaces in column I the semi-developed formulas of the corresponding organic substances, and in column II complete the sentences corresponding to these substances. <table><thead><tr><th>I</th><th>II</th></tr></thead><tbody><tr><td>1) Belongs to the homologous series of arenas</td><td>1) A physical property of this compound</td></tr><tr><td>2) Corresponds to the molecular formula C₃H₇NO₂ and it possesses amphoteric properties</td><td>2) Name of an homologue</td></tr><tr><td>3) It is used in the production of plastics</td><td>3) This substance can be identified with</td></tr></tbody></table>	I	II	1) Belongs to the homologous series of arenas	1) A physical property of this compound	2) Corresponds to the molecular formula C ₃ H ₇ NO ₂ and it possesses amphoteric properties	2) Name of an homologue	3) It is used in the production of plastics	3) This substance can be identified with	L	L	
		I	II									
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		0	0									
		1	1									
2	2											
3	3											
4	4											
5	5											
6	6											
8	In OLEDs synthesis, <i>hex-1-yne</i> is used as an intermediate in the formation of conjugated structures, which are essential for the production of displays for mobile phones, smartwatches, and other portable electronic devices. I. Write for this organic compound: a) the structural semi-developed formula b) the molecular formula II. Complete the blank spaces in the table for two organic substances corresponding to the specified characteristics. <table><thead><tr><th></th><th>Characteristics of organic compound</th><th>Structural semi-developed formula</th></tr></thead><tbody><tr><td>1</td><td>it is a carboxylic acid that contains the same number of <i>hydrogen</i> atoms as hex-1-yne</td><td></td></tr><tr><td>2</td><td>has the same number of <i>carbon</i> atoms as hex-1-yne and can be identified with silver oxide (ammonium solution)</td><td></td></tr></tbody></table> III. For one of the compounds noted in the table, make up: a) structural semi-developed formula of an isomer b) the name of the isomer according to the systematic nomenclature		Characteristics of organic compound	Structural semi-developed formula	1	it is a carboxylic acid that contains the same number of <i>hydrogen</i> atoms as hex-1-yne		2	has the same number of <i>carbon</i> atoms as hex-1-yne and can be identified with silver oxide (ammonium solution)		L	L
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		0	0									
		1	1									
		2	2									
		3	3									
		4	4									
		5	5									
6	6											

[illegible]

ПЕРИОДИЧЕСКАЯ СИСТЕМА ХИМИЧЕСКИХ ЭЛЕМЕНТОВ												
Группы	I		II	III	IV	V	VI	VII	VIII			
Периоды	1								2			
1	водород H 1,0079								гелий He 4,0026			
2	литий Li 6,941		бериллий Be 9,01218	бор B 10,81	углерод C 12,011	азот N 14,0067	кислород O 15,9994	фтор F 18,9984	неон Ne 20,179			
3	натрий Na 22,98977		магний Mg 24,305	алюминий Al 26,98154	кремний Si 28,0855	фосфор P 30,97376	сера S 32,06	хлор Cl 35,453	аргон Ar 39,948			
4	калий K 39,0983		кальций Ca 40,08	скандий Sc 44,9559	титан Ti 47,88	ванадий V 50,9415	хром Cr 51,996	марганец Mn 54,938	железо Fe 55,847	кобальт Co 58,9332	никель Ni 58,69	
	медь 63,546 Cu		цинк 65,38 Zn	галлий Ga 69,72	германий Ge 72,59	мышьяк As 74,9216	селен Se 78,96	бром Br 79,904	криптон Kr 83,80			
5	рубидий Rb 85,4678		стронций Sr 87,62	иттрий 88,9059 Y	цирконий 91,22 Zr	ниобий 92,9064 Nb	молибден 95,94 Mo	технеций [98] Tc	рутений 101,07 Ru	родий 102,9055 Rh	палладий 106,42 Pd	
	серебро 107,868 Ag		кадмий 112,41 Cd	индий In 114,82	олово Sn 118,69	сурьма Sb 121,75	теллур Te 127,60	йод I 126,9045	ксенон Xe 131,29			
6	цезий Cs 132,9054		барий Ba 137,33	лантан 138,9055 La	гафний 178,49 Hf	тантал 180,948 Ta	вольфрам 183,85 W	рений 186,207 Re	осмий 190,2 Os	иридий 192,22 Ir	платина 195,08 Pt	
	золото 196,9665 Au		ртуть 200,59 Hg	таллий Tl 204,383	свинец Pb 207,2	висмут Bi 208,980	полоний Po [209]	астат At [210]	радон Rn [222]			
7	франций Fr [223]		радий Ra 226,025	актиний 227,028 Ac	резерфордий [261] Rf	дубний [262] Db	сигборгий [263] Sg	борий [262] Bh	хассий [267,13] Hs	мейтнерий [168,14] Mt	дармштадтий [281] Ds	

*Лантаноиды													
58 Ce церий 140,12	59 Pr празеодим 140,9077	60 Nd неодим 144,24	61 Pm прометий [145]	62 Sm самарий 150,36	63 Eu европий 151,96	64 Gd гадолиний 157,25	65 Tb тербий 158,9254	66 Dy диспрозий 162,50	67 Ho гольмий 164,9304	68 Er эрбий 167,26	69 Tm тулий 168,9342	70 Yb иттербий 173,04	71 Lu лютеций 174,967

**Актиноиды													
90 Th торий 232,0381	91 Pa протактиний 231,0359	92 U уран 238,0389	93 Np нептуний 237,0482	94 Pu плутоний [244]	95 Am америций [243]	96 Cm кюрий [247]	97 Bk беркли й [247]	98 Cf калифор- ний [251]	99 Es эйнштей- ний [252]	100 Fm фермий [257]	101 Md менделе- вий [258]	102 No нобелий [255]	103 Lr лоуренсий [260]

РАСТВОРИМОСТЬ В ВОДЕ КИСЛОТ, ОСНОВАНИЙ И СОЛЕЙ																	
	H ⁺	NH ₄ ⁺	Li ⁺	Na ⁺	K ⁺	Ba ²⁺	Ca ²⁺	Mg ²⁺	Al ³⁺	Cr ³⁺	Zn ²⁺	Mn ²⁺	Fe ²⁺	Fe ³⁺	Pb ²⁺	Cu ²⁺	Ag ⁺
ОН ⁻		P↑	P	P	P	P	M	H	H	H	H	H	H	H	H	H	-
F ⁻	P	P	M	P	P	M	H	H	M	H	P	P	H	H	H	P	P
Cl ⁻	P	P	P	P	P	P	P	P	P	P	P	P	P	P	M	P	H
Br ⁻	P	P	P	P	P	P	P	P	P	P	P	P	P	P	M	P	H
I ⁻	P	P	P	P	P	P	P	P	P	P	P	P	P	-	H	-	H
S ²⁻	P↑	P	P	P	P	P	P	P	-	-	H	H	H	-	H	H	H
SO ₃ ²⁻	P↑	P	P	P	P	H	H	H	-	-	H	-	H	-	H	H	H
SO ₄ ²⁻	P	P	P	P	P	H	M	P	P	P	P	P	P	P	H	P	M
CO ₃ ²⁻	P↑	P	P	P	P	H	H	H	-	-	H	H	H	-	H	-	H
SiO ₃ ²⁻	H	-	P	P	P	H	H	H	-	-	H	H	H	-	H	-	-
NO ₃ ⁻	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P
PO ₄ ³⁻	P	P	H	P	P	H	H	H	H	H	H	H	H	H	H	H	H
CH ₃ COO ⁻	P	P	P	P	P	P	P	P	P	-	P	P	P	-	P	P	P

Примечание: P – растворимое вещество, M – малорастворимое, H – практически нерастворимое; «-» - вещество не существует или разлагается водой; ↑ - вещество выделяется в виде газа или распадается с выделением газа

РЯД ЭЛЕКТРООТРИЦАТЕЛЬНОСТИ																			
F	O	N	Cl	Br	I	S	C	Se	P	H	As	B	Si	Al	Mg	Ca	Li	Na	K
4,0	3,5	3,07	3,0	2,8	2,5	2,5	2,5	2,4	2,1	2,1	2,0	2,0	1,8	1,5	1,2	1,04	1,0	0,9	0,8

РЯД НАПРЯЖЕНИЙ МЕТАЛЛОВ																			
Li	K	Ba	Ca	Na	Mg	Al	Mn	Zn	Cr	Fe	Ni	Sn	Pb	(H)	Cu	Hg	Ag	Pt	Au