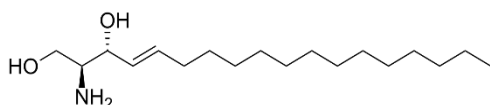


**A periodic table with the necessary data is given on the last page of the test!**

1. D-glucose reduction produces:

- A. D-sorbitol
- B. D-mannitol
- C. D-erythrosis
- D. D-gluconic acid

2. The picture given below shows the structure of:



- A. Lipoprotein.
- B. Sphingosine.
- C. Fatty acid.
- D. Tocopherol.

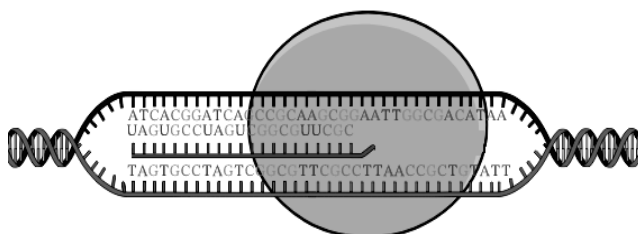
3. The Tollens reaction is used to detect compounds that contain in their structure:

- A. Aldehyde group.
- B. Aromatic ring.
- C. Peptide bond.
- D. Ester bond.

4. The hemoglobin contains in its structure, the following derivative (see below) as a prosthetic group:

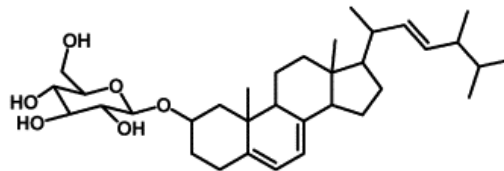
- A. Cyclopentanophenanthrene derivative.
- B. Phosphatidylcholine derivative.
- C. Pyrimidine derivative.
- D. Porphyrin derivative.

5. The following picture shows the process of:



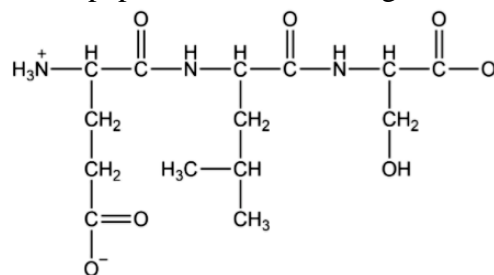
- A. Replication.
- B. Transcription.
- C. Translation.
- D. Denaturation.

6. The structure given on the image below represents:



- A. Lipoprotein.
- B. Glycolipid.
- C. Glycoprotein.
- D. Sphingolipid.

7. Which of the following statements about the tripeptide shown in the figure is true?



- A. The peptide contains one polar amino acid.
- B. The peptide contains one nonpolar amino acid.
- C. The total charge of the peptide is 2<sup>-</sup>.
- D. The peptide contains three peptide bonds in its structure.

8. Which of the following vitamins does NOT belong to the group of B vitamins?

- A. Pyridoxamine.
- B. Thiamine.
- C. Tocopherol.
- D. Riboflavin.

9. Which of the following subshells cannot exist in an atom?

- A. 4f
- B. 3f
- C. 5g
- D. 5f



10. Which molecule is non-polar?

- A.  $\text{NH}_3$
- B.  $\text{N}_2\text{O}$
- C.  $\text{SO}_2$
- D.  $\text{CO}_2$

11. An electron is characterized by a principal quantum number  $n = 5$  and a magnetic quantum number  $m_l = -3$ . Which of the following statements is correct?

- A. The electron could belong to the d subshell.
- B. The spin quantum number,  $m_s$ , must have a value of  $+\frac{1}{2}$ .
- C. The orbital quantum number can be 0, 1, or 2.
- D. The spin quantum number  $m_s$  can have a value of  $+\frac{1}{2}$  or  $-\frac{1}{2}$ .

12. Which of the following particles are similar to a hydrogen atom?

- A.  $\text{He}^+$ ,  $\text{Li}^+$
- B.  $\text{He}^-$
- C.  $\text{Li}^+$ ,  $\text{Li}^{2+}$
- D.  $\text{Li}^{2+}$ ,  $\text{He}^+$

13. Which substance, lead(II) fluoride ( $\text{PbF}_2$ ) or lead(II) chloride ( $\text{PbCl}_2$ ) melts at a higher temperature?

- A.  $\text{PbCl}_2$
- B. both of them melt at the same temperature.
- C.  $\text{PbF}_2$
- D. there is not enough information given to make the conclusion.

14. Which of the following compounds are molecular, and which have structures based on a three-dimensional network of covalently bonded atoms?

- I.  $\text{KF}$    II.  $\text{P}_4\text{O}_{10}$    III.  $\text{SiCl}_4$    IV.  $\text{SiC}$

- A. I, II and III are molecular; and IV is a structure based on a three-dimensional network of covalently bonded atoms.
- B. II and III are molecular; IV is a structure based on a three-dimensional network of covalently bonded atoms.
- C. III and IV are molecular; II is a structure based on a three-dimensional network of covalently bonded atoms.
- D. I and II are molecular; IV is a structure based on a three-dimensional network of covalently bonded atoms.

15. The oxidation number of tin in  $[\text{Sn}(\text{OH})_6]^{2-}$ ;  $\text{SnHPO}_3$  and  $\text{NaSn}_2\text{F}_5$  is, respectively:

- A. +2, +2, +2
- B. +4, +2, +2
- C. +2, +2, +4
- D. +4, +3, +2

## Part II

(Write down the method of solving and the answer in the space provided)  
**A periodic table with the necessary data is given on the last page of the test!**

1. Match the statements that best define the given terms. (5 points)

<b>A</b>	Glucosamine	<b>1</b>	represents the order of the monosaccharide units in the polysaccharide.
<b>B</b>	Racemic mixture	<b>2</b>	is a compound in which the monosaccharide glucose is linked to a radical through a glycosidic bond.
<b>C</b>	Primary structure	<b>3</b>	is a mixture of equal amounts of the D and L forms of an optically active compound.
<b>D</b>	A steroid	<b>4</b>	represents the order of amino acid residues in the protein sequence.
<b>E</b>	Cofactor	<b>5</b>	is where the enzymatic reaction takes place.
		<b>6</b>	is a polycyclic compound that is considered a derivative of cyclopentanoperhydrophenanthrene.
		<b>7</b>	is a mixture containing equal amounts of two monosaccharides.
		<b>8</b>	is a derivative of glucose that contains an amino group.
		<b>9</b>	is a tightly bound non-protein part of the enzyme.
		<b>10</b>	is a polymer built from a large number of amino acid residues.

**A. 8      B. 3      C. 4      D. 6      E. 9**

2. A sample of an iron alloy weighing 1.850 g is treated with an excess of hydrochloric acid. The solution obtained, containing only  $\text{FeCl}_3$ , is diluted with water to 100.0 mL and it is suitably determined that the concentration of  $\text{Fe}^{3+}$  ions therein is  $0.103 \text{ mol}\cdot\text{L}^{-1}$ . What is the mass fraction of iron in the alloy? (4 points)

See the Macedonian version for the correct answers.

3. Cadaverine, obtained from the decomposition of meat, contains 58.77% C, 13.81% H, and 27.42% N. What is the ratio of the number of carbon, hydrogen, and nitrogen atoms in the molecule of this compound? (6 points)

See the Macedonian version for the correct answers.

4. A solution is prepared by dissolving 0.500 g of KCl and 0.500 g of  $\text{K}_2\text{S}$ . What is the quantitative concentration of: a) potassium ions and b) sulfide ions in the solution? (5 points)

See the Macedonian version for the correct answers.

1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 181.0	74 W 183.8	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.0	89 Ac 227.0	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (281)	111 Uuu (272)	112 Uub (285)	113 Uut (284)	114 Uuq (289)	115 Uup (288)			

58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)