Unit V.

Online test (typical questions)

- 1. State the number of double carbon–carbon bonds in the molecules of the following compounds:
 - 1) arachidonic acid 2) 1-palmitoyl-2,3-dilinolenoylglycerol
 - 3) trioleoylglycerol 4) tristearoylglycerol
- 2. The molecule of 1-oleoyl-2-palmitoyl-stearoylglycerol contains the residues of:
 a) different fatty acids
 b) the same fatty acids
 c) glycerol
 d) sphingosine
- 3. Identify the ester bond in the following molecule:

 $CH_2O - C(O)R$ CHO - C(O)R O CHO - C(O)R O $CH_2O - P - OH$ OH 3

CH₂O-C(O)R
CHO-C(O)R
The hydrolysis of
$$\begin{vmatrix} O \\ O \\ CH_2O-P - OH \\ OH \end{vmatrix}$$
 produces:

4.

a) aldehydes; b) carboxylic acids; c) glycerol; d) phosphoric acid.

- 5. The hydrolysis of a lipid produced glycerol, 2-aminoethanol, palmitic, linoleic and phosphoric acids. State the type of the initial lipid:
 a) colaminecephaline;
 b) ceramide;
 c) cerebroside;
 d) glycerophospholipid.
- 6. Which compounds will decolourise bromine water?a) stearic acidb) palmitic acidc) oleodistearind) arachidonic acid
- 7. Which statements are true?
 a) triacylglycerols derived from animal tissues are usually liquid compounds
 b) the molecule of a phosphatidylserine contains the residue of an amino acid
 c) soaps are sodium or potassium salts of fatty acids
 d) the budgebais of complex limits are decee on the fatter exists and cleakely
 - d) the hydrolysis of complex lipids produces only fatty acids and alcohols Noteb the neuron of fottee solds (1, 5) with their compositions (a, b).
- 8. Match the names of fatty acids (1-5) with their compositions (a-f):
 1) palmitic; 2) linoleic; 3) linolenic; 4) oleic; 5) arachidonic.
 a) 20:4 5,8,11,14; b) 18:1 9; c) 18:0; d) 18:2 9,12; e) 16:0; f) 18:3 9,12,15.
- 9. Match the types of acid (1-3) with their names (a-d):

1) <i>ω</i> -3:	2) ω -6:	3) ω -9.
1)00,5,	2) 00 0,	$J \omega J$

a) palmitic; b) linoleic; c) linolenic; d) oleic.

- 10. Match the structural formulae (1 or 2) with the names of lipids (a–e): $CH_2O-C(O)C_{17}H_{33}$ $CH_2O-C(O)C_{17}H_{35}$
 - 1) $CHO-C(O)C_{17}H_{31}$ CH₂O-C(O)C₁₇H₃₁ CH₂O-C(O)C₁₅H₃₁ 2) $CHO-C(O)C_{17}H_{29}$ CH₂O-C(O)C₁₅H₃₁
 - a) 2-linolenoyl-1-oleoyl-3-palmitoylglycerol
 - b) 2-linolenoyl-3-palmitoyl-1-stearoylglycerol

c) 2-linolenoyl-3-oleoyl-1-stearoylglycerol d) 2-linoleoyl-1-oleoyl-3-palmitoylglycerol e) 1-linolenoyl-2-linoleoyl-3-palmitoylglycerol 11. Which of the following compounds can be hydrolysed under basic conditions? CH₂O-COC₁₇H₃₃ CH₂O-COC₁₇H₃₅ CH₂O-C₁₇H₃₅ c) CHO-C₁₇H₂₉ d) b) CHO—COC₁₇H₂₉ a) CHO—COC₁₇H₃₁ CH2O-C15H31 CH2O-COC15H31 $L_{H_2O} = P(O)OCH_2CH_2NH_3$ <u>d</u>– $CH_{3}(CH_{2})_{14}COOC_{30}H_{61}$ 12. Match the class name of lipids (1 or 2) with structures (a)–(e): 1) lecithin: 2) cephalin CH₂O-COC₁₇H₃₅ CH2O-COC17H35 CH₂O-COC₁₇H₃₅ a) CHO-COC₁₇H₃₃ b) CHO-COC₁₇H₂₉ c) $\dot{C}HO-COC_{17}H_{29}$ CH₂O-P(O)OCH₂CH₂NH₃ $LH_2O-P(O)OCH_2CH_3$ CH₂O-PO₃H₂ ÓН CH₂O-COC₁₅H₃₁ CH₂O-COC₁₇H₃₅ d) CHO-COC₁₇H₂₉ e) CHO-COC₁₇H₂₉ CH₂O—P(O)OCH₂CHCOOH L^{+} CH₂O—P(O)OCH₂CH₂ N^{+} (CH₃)₃ NH3 Ó-13. Which acid is the product of the transamination reaction for: a) alanine; b) aspartic acid? 1) CH₃CH₂CCOOH 2) HOOCCH₂CCOOH 3) HOOC(CH₂)₂CCOOH || 0 ö Ô 5) CH₃CCH₂COOH 4) CH₃CCOOH 14. Select all correct statements about the structure and properties of a peptide bond: 1) the hybridisation state of C, O and N atoms is sp^2 ; 2) the peptide bond can be hydrolyzed by both acids and bases; 3) the C=O bonds in peptides are longer than those in amino acids; 4) the peptide fragment is a three-centre p,π -conjugated system; 5) the peptide fragment is planar. 15. Match the names of amino acids with their formulae: 2) valine 1) glycine 3) asparagine 4) proline a) CHCHCOOH c) $H_2N-C-CH_2CHCOOH$ d) H_2NCH_2COOH b) (______) -соон NH2 16. For glycine pI = 6.0. In which forms does it exist at pH = 4.3? a) cationic and dipolar forms b) anionic and dipolar forms c) cationic and anionic forms d) dipolar form only 17. Choose the pH range for a buffer system of glycine ($pK_{a1} = 2.34$, $pK_{a2} = 9.60$) consisting of the cationic and dipolar forms: a) 1.34–3.34 b) 2.34–4.34 c) 7.60–9.60 d) 2.34–9.60 18. Match the names of peptides with their formulae: 1) glycylvaline; 2) alanylglycyl; 3) valylglycyl; 4) leucylvaline.

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a) $H_2NCHC - NHCH_2COOH$ b) $H_2NCHC - NHCHCOOH$			
$CH(CH_3)_2$ CH_2 $CH(CH_3)_2$			
CH(CH ₃) ₂			
O O			
c) $H_2NCH_2C - NHCHCOOH$ d) $H_2NCHC - NHCH_2COOH$			
$CH(CH_3)_2$ CH_3			
19. The hydrolysis of the dipeptide Leu–Val under acidic conditions produces:			
a) $H_3\dot{N}$ – CHCOOH b) $H_3\dot{N}$ – CHCOOH c) $H_3\dot{N}$ – CHCOOH d) $H_3\dot{N}$ – CHCOOH			
$H_{2}CH_{2}CH_{1}(CH_{3})_{2}$ CH_{3} $CH_{2}CH_{1}(CH_{3})_{2}$ $H_{3}C-CH-CH_{2}CH_{3}$			
20. Which of the following is the product of decarboxylation for leucine?			
a) <i>tert</i> -butylamine b) isopentylamine			
c) 3-methylpentanoic acid d) 2-methylbutanoic acid			
21. Which of the following is the product of oxidative deamination for alanine?			
a) lactic acid b) pyruvic acid c) malic acid d) ethylamine			
22. The reaction of isoleucine with 2-propanol in the presence of hydrogen chloride)		
taken in excess gives:			
a) isoleucine isopropyl ester hydrochloride			
b) isoleucine isopropyl ester			
c) isopropyl ester of 2-aminohexanoic acid			
d) isoleucine hydrochloride			
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a) The secondary structure of a protein is stabilized by hydrogen bonds between amino acid side chains.

- b) Nucleoproteins, hemoproteins and lipoproteins are complex proteins
- c) Protein charge decreases with decreasing pH

d) The most common types of secondary structures are α -helix and β -pleated structure

- 30. Choose the correct and incorrect statements
 - a) Enzymes that contain a coenzyme part are complex proteins

b) The secondary structure of a protein is stabilized **only** by hydrogen bonds between amino acid side chains

- c) Hair α -keratin is classified as a fibrillar protein
- d) All proteins have several polypeptide chains in a molecule

Paper test (typical questions)

b) Phe (hydroxylation) \longrightarrow

f) Phe

d) Trp (decarboxylation) \longrightarrow

(aromatic

- **I**. $(8 \times 1 = 6 \text{ points}, 2 \text{ points} \text{names of the products})$
- a) Complete the following equations:
 - a) Val + acetyl SCoA \longrightarrow
 - c) Ser (elimination) \longrightarrow
 - e) Trp (decarboxylation) —
 - hydroxylation) \longrightarrow

g) Phosphatidylserine decarboxylation

- h) L-glycero-3-phosphate + $2C_{17}H_{29}C(O)SCoA$ —
- **b**) Write systematic and/or class names for the products.
- II (5 points)

a) Hydrolysis of a lipid produces glycerol, palmitooleic, stearic and linolenic acids. What group of lipids does this compound belong to? Draw the formula of this lipid and the double bond configuration for linolenic acid.

b) Draw the reaction of hydrolysis for this lipid in acidic medium. Indicate and name the bonds that break during the hydrolysis.

III. (5 points)

a) Draw the structural formula for the tripeptide Gln-Lys-Ala. Indicate peptide bonds, C-terminal and N-terminal. Estimate the pH value of the isoelectric point (pI > 7, pI < 7, pI \approx 7) for this peptide. Explain your answer.

b) Write the hydrolysis reaction for this peptide in KOH solution.