UNIVERSITY
OF SKÖVDE

School of **Bioscience**

WRITTEN EXAMINATION

Course **Basic Chemistry**

Examination **Supervised examination II**

Course code **Ke117G**

Credits for written examination **5**

Date **20250110**

Examination time **14.15-18.30**

Examination responsible **Magnus Fagerlind/Patric Nilsson**

Teachers concerned **Patric Nilsson**

Aid at the exam/appendices Calculators

Other All answers must be given in the exam sheet. Answers given on additional/extra sheets are NOT considered.

Instructions

- ☐ Take a new sheet of paper for each teacher.
- ☐ Take a new sheet of paper when starting a new question.
- ☒ Write only on one side of the paper.
- ☒ Write your name and personal ID No. on all pages you hand in.
- ☒ Use page numbering.
- ☒ Don´t use a red pen.
- ☒ Mark answered questions with a cross on the cover sheet.

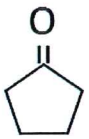
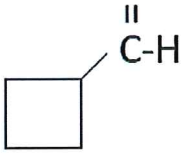
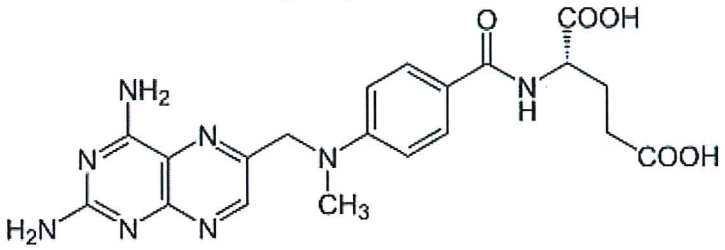
Grade points: To pass the exam, all learning objectives require the grade E or higher. To pass a learning objective, 50% correct answers are required.

Grade scale: F < 35 <= E < 42 <= D < 49 <= C < 56 <= B < 63 <= A

Examination results should be made public within 18 working days

Good luck!

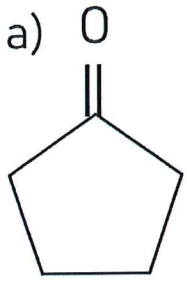
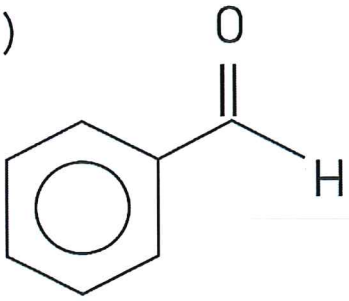
Learning objective: name organic chemical substances and draw their structural formula. To pass the learning objective, 50% correct answers are required (10 out of 20p is required)

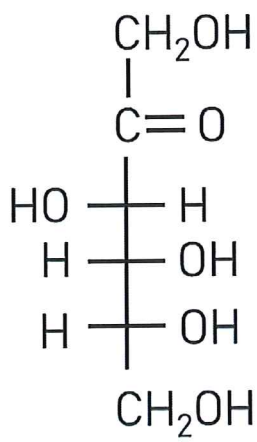
1	Use the following condensed and line-angle formulas A to F to answer the true and false statement below A) $CH_3\text{-}CH_2\text{-}C(=O)\text{-}CH_2\text{-}CH_3$ B) $CH_3\text{-}CH_2\text{-}CH_2\text{-}C(=O)\text{-}CH_3$ C) $CH_3\text{-}C(=O)\text{-}CH_2\text{-}CH_2\text{-}CH_3$ D) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}C(=O)\text{-}H$ E)  F)  a) A and B are structural isomers b) D and F are aldehydes c) B and C are the same compound d) A and C are the same compound e) E and F are structural isomers f) A is chiral	3
2	Methotrexate is used in chemotherapy and as an immunosuppresant. Name the functional groups in methotrexate 	5
3	Draw the condensed structural formula or line-angle formula for a) 2,4-dimethyl-2-pentanol b) 4-ethyl-2-hexanethiol	1 1

	c) Ethoxy butane	1
	d) 2-bromo-3-chloro-hexanal	1
	e) 2-methylpropanoic acid	1
	f) Ethylammonium chloride	1
	g) 4-oxo-pentanoic acid	1
	h) Ethyl-4-mercaptobutanoate	1

4	Draw the condensed structural formulas and write the IUPAC names for all the aldehydes and ketones that have the molecular formula C_4H_8O	4
Learning objective: present different classes of organic substances, their properties, structures, reactivity and biological functions. To pass the learning objective, 50% correct answers are required. (15 out of 30p is required)		
5	A strawberry nutritional drink used for a liquid diet is flavoured with methyl butanoate. a) Draw the condensed structural formula for methyl butanoate	1
	b) Write the IUPAC name of the carboxylic acid and the alcohol used to prepare methyl butanoate	2

	c) Use condensed structural or line angel formulas to write the balanced chemical equation for the acid hydrolysis of methyl butanoate.	2
	d) Use condensed structural or line angel formulas to write the balanced chemical equation for the base hydrolysis of methyl butanoate with NaOH.	2
6	Anisaldehyde, from Korean mint or blue licorice, is a medical herb used in Chinese medicine. The IUPAC name of anisaldehyde is 4-methoxybenzaldehyde. a) Draw the condensed or line-angle formula for anisaldehyde and identify all functional groups	4
	b) Draw the condensed or line-angle formula and name the product formed when anisaldehyde is oxidized	3

	c) Draw the condensed or line-angle formula and propose a name for the product formed when anisaldehyde is reduced. Also classified the product as 1°, 2° or 3°	3
7	Draw the condensed structural or line angle formula for the alcohol needed to give each of the following oxidation products. Also, classify the alcohols needed as 1°, 2° or 3°. a)  b) 	4
8	Sometimes several steps are needed to prepare a compound. a) Give the IUPAC names for all products needed to synthesize pentane from a 5-carbon alcohol	3

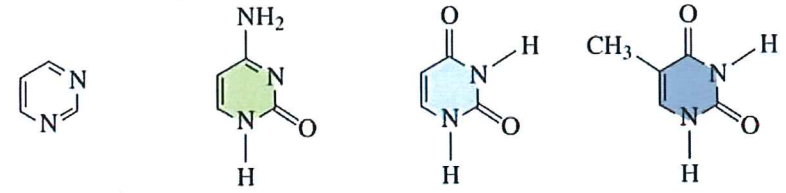
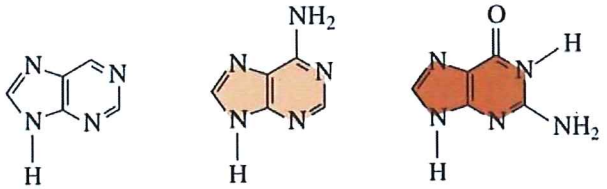
	b) Give the condensed or line-angle formulas for all molecules needed to synthesize pentane.	3
	c) Identify the type of <u>reactions</u> (at least two) required to synthesize pentane from a 5-carbon alcohol	3
<u>Learning objective</u>: describe the four classes of biological macromolecules, with focus on their structures and biochemical reactions and function. To pass the learning, 50% correct answers are required. (10 out of 20p is required)		
9	Carbohydrates. a) Name the molecule  	1

	b) Draw the Haworth structure of the β-isomer of the molecule in a)	2
10	Cellulose, amylose, amylopectin, and glycogen are all important polysaccharides in organisms. Complete the table below	4

	Cellulose	Amylose	Amylopectin	Glycogen
Organisms (Plants or animal)				
Monosaccharide (specify the monosaccharide and also if it is b or a)				
Types of bonds				
Branches (yes or no)				

11	Cholesterol is the most abundant and import steroid in the body a) Draw the steroid nucleus and highlight what the characteristics of the steroid nucleus	3

	b) Why is cholesterol so important?	3
12	True or false: (<u>wrong answer gives -0.5p</u>) a) The central carbon atom in an amino acid is called the β-carbon	0.5
	b) An amino acid is nonpolar when the R group is a hydroxyl, thiol or an amide	0.5
	c) An amino acid is acidic when the R group is a carboxylate	0.5
	d) There are 9 nonpolar amino acids	0.5
	e) The ammonium group is only found in non-polar amino acids	0.5
	f) The carboxylate group is found in all amino acids	0.5
	g) In peptides, amino acids are joined by ester bonds	0.5
	h) The amino acids differ by their R groups	0.5

13	In the figure below identify the purines and pyrimidines **Pyrimidine Bases in Nucleic Acids**  Pyrimidine **Purine Bases in Nucleic Acids**  Purine	3

Equations and tables

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HÖGSKOLAN
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Priority rules

High Priority

Group	Prefix	Suffix
Carboxylic acid	carboxy-	-oic acid
Ester	oxycarbonyl-	-oate
Amide	carbamoyl-	-amide
Aldehyde	formyl-	-al
Ketone	oxo-	-one
Alcohol	hydroxy-	-ol
Thiol	mercapto-	-thiol
Amine	amino-	-amine
Alkene	alkenyl-	-ene
Alkyne	alkynyl-	-yne
Alkane*	**alkyl-**	**-ane**
Ether	alkoxy-	-ane
Halo	halo-	-ane
Nitro	nitro-	-ane

Low priority

Periodic Table of the Elements