UNIVERSITY
OF SKÖVDE

Cover sheet with information to the invigilator

School of Bioscience

Course Basic Chemistry

Examination Supervised Written Examination II

Course code Ke117G

Credits for written examination 5

Date 2024-01-08

Examination time 8.15-12.30

Available teacher Patric Nilsson

Available on phone number 070-2274574

Visiting the examination ☐ Yes, at
☒ No

Aids and other information for invigilators
Calculator. All answers must be given in the exam sheet. Additional and/or extra sheets will NOT be considered

Calculator ☒ Provided by the University
☒ Student's own calculator
☐ Not allowed

If you copy the exam papers yourself, provide the number of copies

Instructions to examinations responsible

All examination documents are to be handed in at Reprocentralen.

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UNIVERSITY
OF SKÖVDE

School of Bioscience

WRITTEN EXAMINATION

Course Basic Chemistry

Examination Supervised Written Examination II

Course code Ke117G | Credits for written examination 5

Date 2024-01-08 | Examination time 8.15-12.30

Examination responsible Patric Nilsson/Magnus Fagerlind

Teachers concerned

Aid at the exam/appendices. Calculator

Other All answers must be given in the exam sheet. Answers in additional sheets will NOT be 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 objective require the grade E or higher. To pass a learning objective, 50% correct answers are required

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

Examination results should be made public within 18 working days

Good luck!

Total number of pages

Supervised Written examination II (organic chemistry)

Course: Basic Chemistry (Ke117G)

Important information regarding the exam: The supervised written exam II examines three learning objectives in total

- name organic chemical substances and draw their structural formula. To pass the learning objective, 50% correct answers are required (20p in total)

- present different classes of organic substances, their properties, structures, reactivity and biological functions. To pass the learning objective, 50% correct answers are required. (30p in total)

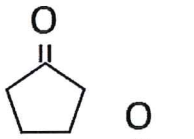
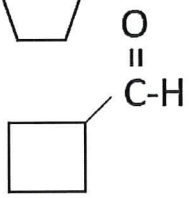
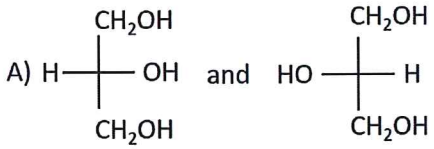
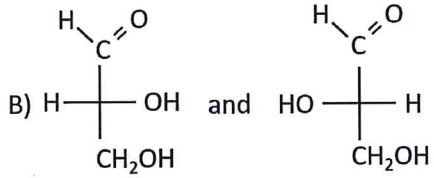
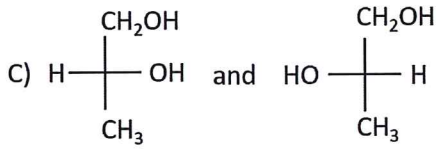
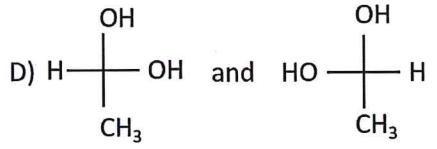
- describe the four classes of biological macromolecules, with focus on their structures and biochemical reactions and function. To pass the learning, 50% correct answers are required. (20p in total)

To pass the supervised written exam, all learning objectives require the grade E or higher. To pass a learning objective, at least 50 % correct answers are required. Important things to keep in mind while writing the exam: The teacher who corrects the exam is not a mind-reader. This means that you need to specific in your answers otherwise it is very difficult or even impossible to follow your line of thinking. In the end, this will make a huge difference in the number of points you get on a question if you, by chance, make a simple mistake. All answers should be given in this exam sheet. No additional or extra sheets are allowed. Answers given on an extra sheet will not be considered. Most importantly, believe in yourself. There are no surprises in this exam. We have talked about all the things over and over again.

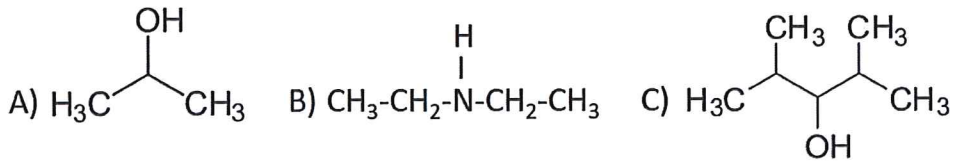
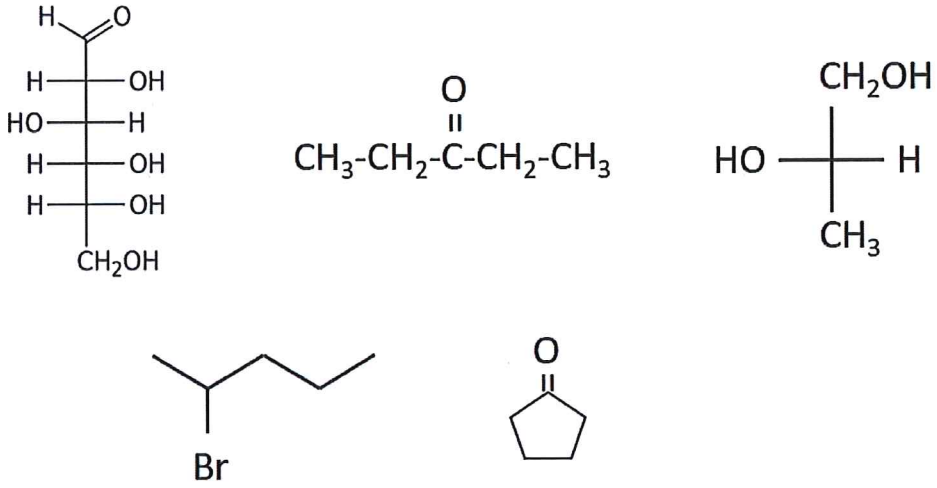
Good luck

Patric

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) ***C*** and **D** are structural isomers e) **E** and **F** are structural isomers f) **A** is chiral g) **A** and ***C*** are the same compound h) **B** and **E** are ketones	0.5p 0.5p 0.5p 0.5p 0.5p 0.5p 0.5p 0.5p
2	Identify each of the following pairs of Fischer projections as enantiomers or identical compounds A)  B)  C)  D) 	2p

3	Draw the condensed structural formula or line-angle formula for a) Methyl butanoate	1p
	b) 4-Oxo-pentanoic acid	1p
	c) 2,3-dichlorophenol	1p
	d) 4,5-dimethyl-2-hexene	1p
	e) Methoxy butane	1p
	f) 3-Hydroxy-3-methyl-pentanal	1p
	g) N, N-Dimethylmethanamine	1p
	h) N-Methylpropanamide	1p

4	Classify each of the following as primary (1), secondary (2), or tertiary alcohol and/or amine  	3p
5	In the figure below, identify the chiral carbons  	3p

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)*		
6	Draw the condensed structural formulas for the products from a) Acid (HCl) hydrolysis, and b) base (NaOH) hydrolysis of N-ethylbutanamide	2p 2p
7	Draw the structure and name the compound formed from the following reactions a) Methyl propanoate + NaOH (base hydrolysis of an ester) b) Methyl ethanoate + H_2O (Acid hydrolysis of an ester) c) Ethanoic acid + methanol (esterification) d) Butanoic acid + NaOH (neutralization of a carboxylic acid) e) Reduction of 2-methylpentanoic acid f) Oxidation of D-fructose (no need to draw the structure, just give the name	 2p 2p 2p 2p 2p 2p

	g) Reduction of 2-methyl-3-pentanone	2p
8	Draw the condensed structural or line-angle formula and give the IUPAC names for all the aldehydes and ketones that have the molecular formula C_4H_8O	6p
9	Why does the C=O double have a dipole, whereas the C=C double bond does not?	2p

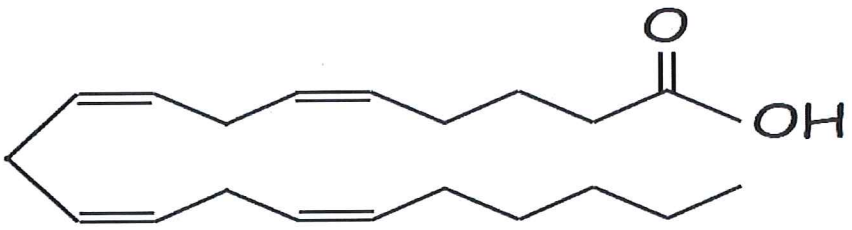
10	Which compound in each of the following pairs would have the higher boiling point? a) Propane or ethanal b) Propanal or pentanal c) Butanal or 1-butanol d) Propanone or pentanone	 0.5p 0.5p 0.5p 0.5p
11	True or false a) Hexanal is soluble in water b) Butanone is soluble in water c) 2-Pentanone is slightly soluble in water d) Methoxy methane is insoluble in water	 0.5p 0.5p 0.5p 0.5p

Learning objective: *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)*

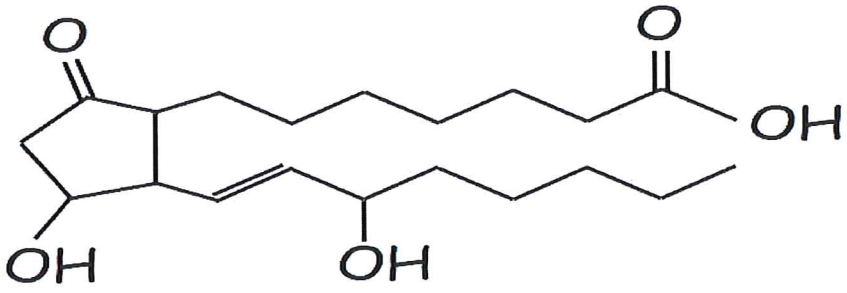
12 Cellulose, amylose, amylopectin, and glycogen are all important polysaccharides in organisms. Complete the table below

	Cellulose	Amylose	Amylopectin	Glycogen	
Organisms (Plants or animal)					1p
Monosaccharide (specify the monosaccharide and also if it is β or α)					1p
Types of bonds					1p
Branches (yes or no)					1p

13	Compare the structure and functional groups of arachidonic acid and prostaglandin PGE1 a) With respect to functional groups b) With respect to cis-trans double bonds c) What type of molecules are they? d) Other differences	 1p 1p 1p 1p

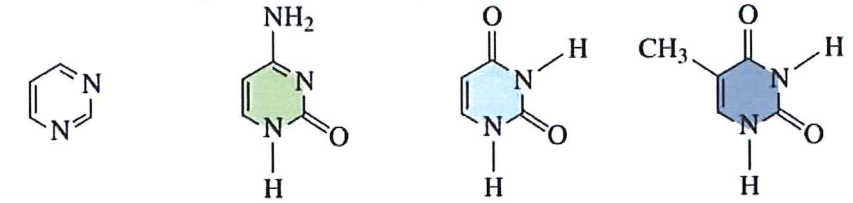
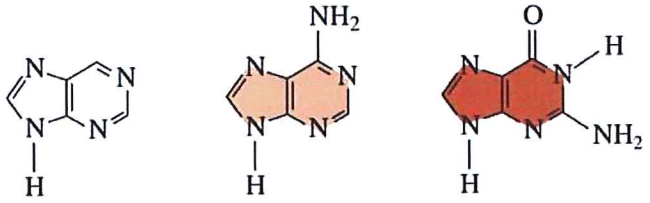


Arachidonic acid



Prostaglandin PGE_1

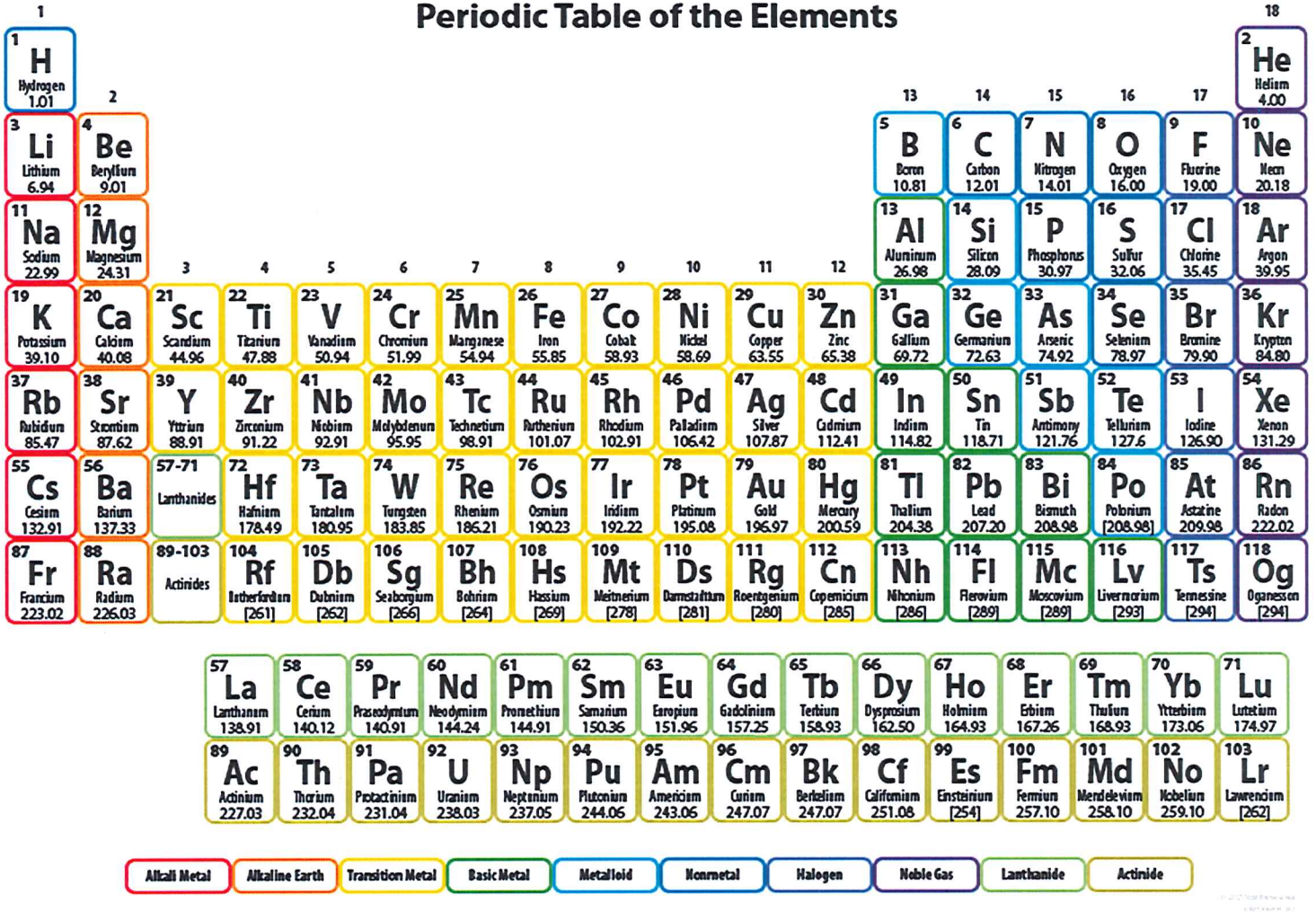
14	Cholesterol is the most important and abundant steroid in the body. a) The cholesterol molecule contains α steroid nucleus: what is characteristic of α steroid nucleus?	2p
	b) Cholesterol is also the precursor for other molecules and cholesterol derivatives are found in other molecules, which ones?	3p

15	In the figure below, identify the purines and pyrimidines **Pyrimidine Bases in Nucleic Acids**  Pyrimidine **Purine Bases in Nucleic Acids**  Purine	2.5p
16	**TRUE** or **FALSE**? a) An amino acid is acidic when the R group is an amine b) An amino acid has an α-carbon that is attached to $-NH_3^+$, $-COO^-$, -H group, and an R group c) The amino acids differ by their R groups d) An amino acid is basic when the R-group is a carboxylate e) In peptides, amino acids are joined by ester bonds f) Amin acids have a central carbon atom called the β-carbon g) An amino acid is nonpolar when the R group is H, alkyl or aromatic	0.5p 0.5p 0.5p 0.5p 0.5p 0.5p 0.5p

17	What are the differences between secondary and tertiary protein structures with respect to bonds?	1p

Well done ☺

Periodic Table of the Elements



Priority rules

High Priority

Low 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