UNIVERSITY
OF SKÖVDE

School of

WRITTEN EXAMINATION

Course Biochemistry

Examination Supervised written examination

Course code Ke314G | Credits for written examination 3

Date 20240302 | Examination time 9.15-12.30

Examination responsible Patric Nilsson/Mikael Ejdebäck

Teachers concerned

Aid at the exam/appendices; calculators

Other All answers must be given in the exam sheet. Answers given 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 objectives require the grade E or higher. To pass a learning objective, 50% correct answers are required.

F<50%<=E<60%<=D<70%<=C<80<=B<90%<=A

Examination results should be made public within 18 working days

Good luck!

Total number of pages

Supervised written examination (Biochemistry)

Course code: KE314G

Important information regarding the exam:

The supervised written exam examines two objectives in total:

- -describe the metabolism of carbohydrates, proteins and fats, and its regulation and integration, (10p in total)
- be able to describe the role of proteins as catalysts and perform enzyme kinetic analyses and
  calculations (40p 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 show every step in your calculations 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. It is strongly recommended that you make a flow-chart with all steps required to solve a question before you jump into your calculations.

All answers and calculations 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

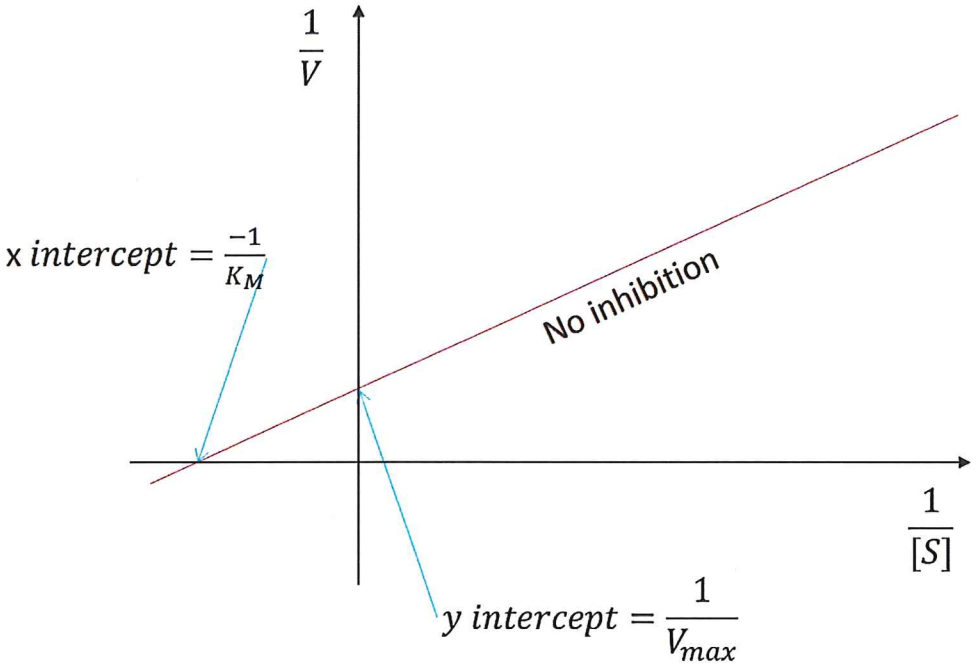
Patric and Mikael

Learning objective: *be able to describe the role of proteins as catalysts and perform enzyme kinetic analyses and calculations. To pass the learning objective, 50% correct answers are required. (5 out of 10p is required)*

1. In the figure below, a hypothetical Line-weaver Burk plot is depicted. In the figure below draw and explain how

   a) competitive inhibitor — 2p
   b) non-competitive inhibitor, and — 2p
   c) uncompetitive inhibitor — 2p

would affect K_M and V_{max}



2. Enzymes can be divided into classes depending on what reaction they catalyse. Complete the table below for four enzyme classes

Enzyme class	Reaction catalysed	Example	
Oxidoreductases			0.5p
Hydrolyases			0.5p
Transferases			0.5p
Lyases			0.5p

3.	Explain, in detail, how the pyruvate dehydrogenase complex converts 1 molecule of pyruvate to one molecule of acetyl-CoA (Hint: the enzyme consists of 3 subunits)	2p
Learning objective: *describe the metabolism of carbohydrates, proteins and fats, and its regulation and integration. To pass the learning objective, 50% correct answers are required. (20 out of 40p is required)*		
4.	The citric acid cycle is one of the most metabolic pathways in our cells. a) Explain the Krebs cycle in detail and highlight where NADH, FADH2, and GTP (converted to ATP) are produced	6p

	b) How many molecules of CO_2, ATP, FADH2, and NADH are generated from 1 glucose molecule	2p
	c) What is the role of the malate-aspartate shuffle and glycerol-3-phossphate shuffle	1p
5.	Name six electron carriers in the electron transport chain	3p
6.	Fatty acid synthesis a) Which enzyme is responsible for the conversion of Acetyl CoA to Malonyl-CoA	1p
	b) Explain the principles of Fatty acid synthesis	6p

	c) What is the role of NADPH in fatty acid synthesis and how is it generated?	4p
7	a) Explain the four steps involved in beta oxidation	6p

	b) Why is it called beta oxidation?	1p
	c) How many molecules of acetyl-CoA, NADH and FADH2 and ATP are produced when an 18-carbon fatty acid undergoes beta oxidation	4p
8	Explain how NH_3 or NH_4^+ is neutralized or converted into Urea in the Urea-cycle	3p

9	Explain how we adopt to endurance training at the physiological, cellular and molecular level	3p