

School of Bioscience

WRITTEN EXAMINATION

Course Basic Chemistry

Examination Supervised examination II

Course code Ke117G

Credits for written examination 5

Date 2024-03-02

Examination time 9.15-13.30

Examination responsible Patric Nilsson/Magnus Fagerlind

Teachers concerned Patric Nilsson

Aid at the exam/appendices Calculators

Other All answers must be given in the exam sheets. 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!

Supervised written examination II.

Date: 2024 – 03 – 02

Course code: Ke117g

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)

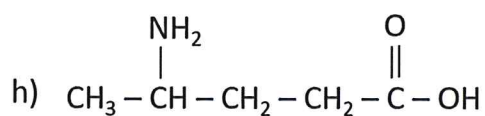
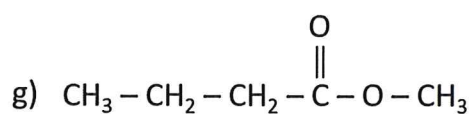
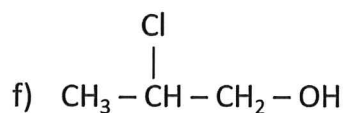
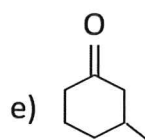
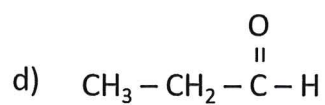
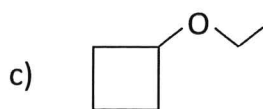
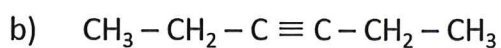
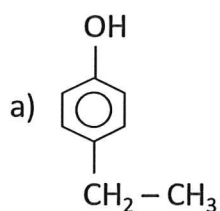
To pass the supervised written exam, all learning objectives require the grade E or higher. To pass a learning objective, at least 50 % correct answers are required. Important things to keep in mind while writing the exam: The teacher who corrects the exam is not a mind-reader. This means that you need to be 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. You need 10/20 to pass the learning objective

Question 1. Give the UPAC name for each of the following compounds. (8p)

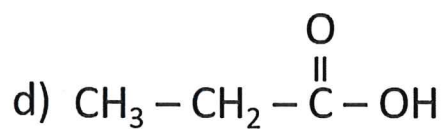
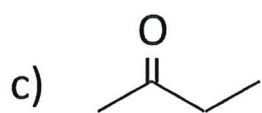
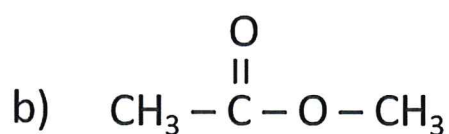
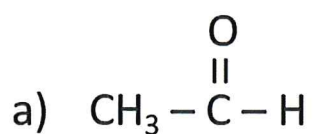


Question 2. Draw the condensed structural formula or line angle formula for each of the following:

- a) Propanamide (propionamide) (1p)
- b) 3-Methyl-1-butanamide (1p)
- c) 2,3-dimethylbutanoic acid (1p)
- d) Ethyl hexanoate (1p)
- e) Ethanoic acid (1p)
- f) 2-Methylpropene (1p)
- g) Propanone (1p)
- h) Methoxymethane (dimethyl ether) (1p)

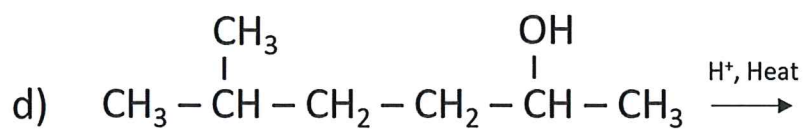
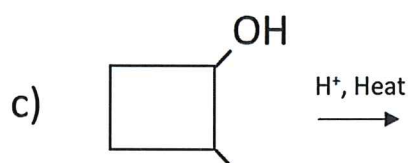
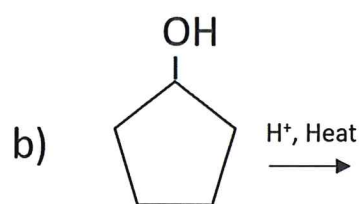
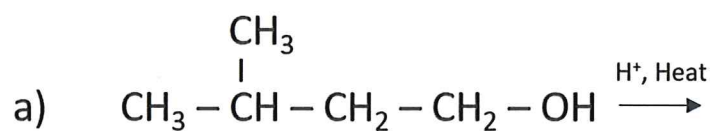
Question 3. Hexylresorcinol, an antiseptic ingredient used in mouth washes and throat lozenges, has the IUPAC name of 4-hexyl-1,3-benzenediol. Draw its condensed structural formula. (2p)

Question 4. Identify each of the following as an aldehyde, a ketone, a carboxylic acid, or an ester: (2p)

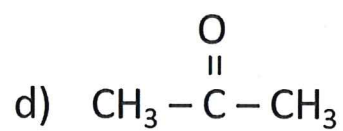
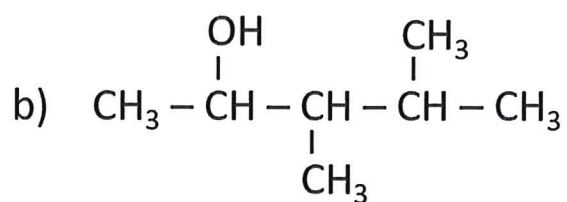
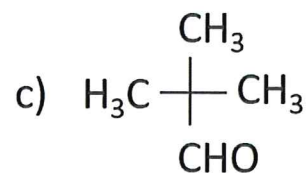
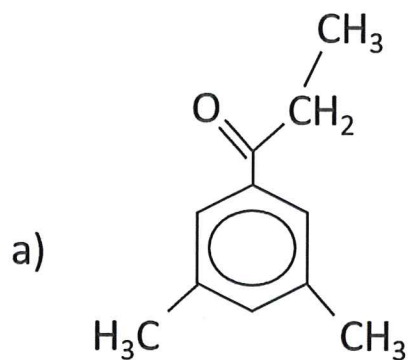


Learning objective: present different classes of organic substances, their properties, structures, reactivity and biological functions. To pass the learning objective, 50% correct answers are required. You need 15/30p to pass the learning objective.

Question 5. Draw the condensed or line-angle structural formula for the compound that is the major product of each of the following dehydration reactions: (5p)



Question 6. Draw the condensed or line-structural formula for the product, if any, when each of the following is oxidized. (6p)



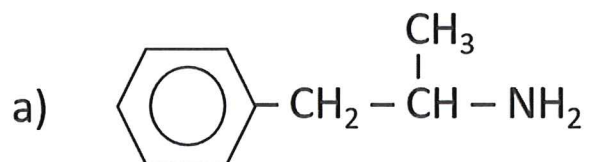
Question 7. Explain how fatty acids solubility and melting points are influenced by the presence of unsaturation/polyunsaturation and on the length of the hydrocarbon chain and why! (3p)

Question 8. Propylamine (59g/mole) has a boiling point of 48°C, and ethylmethanamine (59g/mole) has a boiling point of 37°C. Butane (58g/mole) has a much lower boiling point of -1°C. Explain (3p)

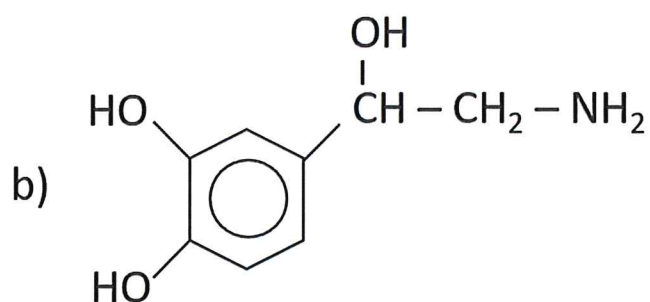
Question 9. Explain the terms stereoisomers, enantiomers and diastereomers? (3p)

Question 10. Identify the chiral carbon in each of the following naturally occurring compounds: (3p)

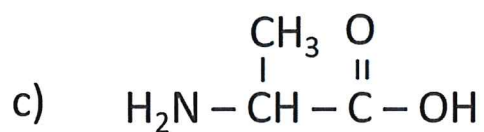
amphetamine



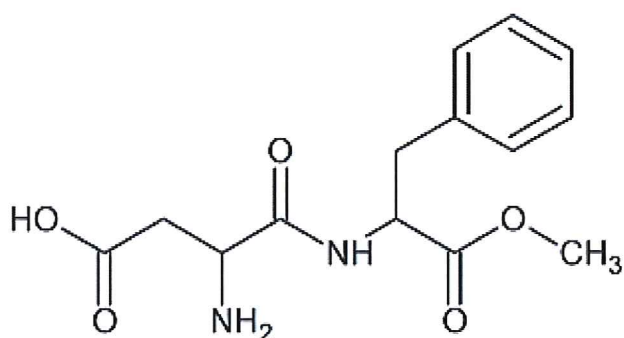
norepinephrine



alanine



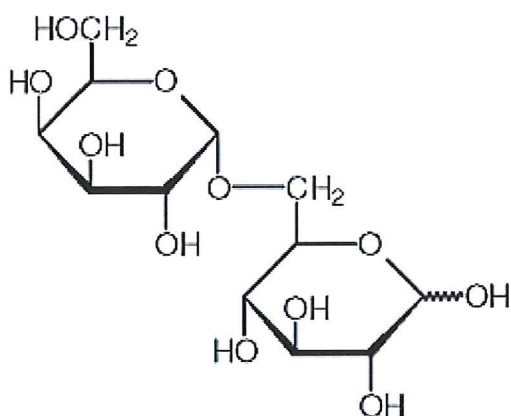
Question 11. The sweetener aspartame is made from two amino acids: aspartic acid and phenylalanine. Identify the functional groups in aspartame (see figure below) (4p)



Question 12. Methyl benzoate is not soluble in water; however, when it is heated with KOH, the ester forms soluble products. When HCl is added to neutralize the basic solution, a white solid form. Draw the condensed structural formulas for the reactants and products when methyl benzoate and KOH react. Explain what happens. (3p)

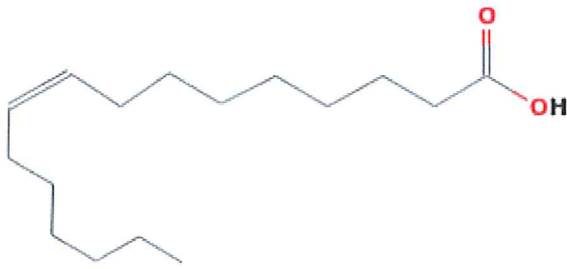
Learning objective: describe the four classes of biological macromolecules, with focus on their structures and biochemical reactions and function. To pass the learning, 50% correct answers are required. You need 10/20p to pass the learning objective

Question 13. Melibiose is a disaccharide that is 30 times sweeter than sucrose (see figure below).



- What are the monosaccharide units in melibiose? (2p)
- What type of glycosidic bond links the monosaccharides? (1p)
- Identify the structure as α - or β -melibiose. (1p)

Question 14. Palmitoleic acid is a fatty acid with the following condensed structural formula:



- a) How many carbon atoms are in palmitoleic acid? (0.5p)
- b) Is the fatty acid saturated, monounsaturated, or polyunsaturated? (0.5p)
- c) Give the shorthand notation for the number of carbon atoms and double bonds in vaccenic acid. (0.5p)
- d) Is it most likely to be solid or liquid at room temperature? (0.5p)

Question 15. Phospholipids are a family of lipids similar in structure to triacylglycerols.

- a) Phospholipids are further divided into two subgroups, which ones? (1p)
- b) In what way(s) are triacylglycerols and phospholipids similar? (1p)
- c) In what way(s) are triacylglycerols and phospholipids different? (1p)

Question 16. We classify amino acids into four different types of amino acids using their specific R groups.

a) Which groups? (2p)

b) What is characteristic of the different groups of amino acids? (4p)

Question 17. Identify the secondary structure (α helix, β -pleated sheet, or triple helix) described in each of the following statements:

a) A structure that has hydrogen bonds between adjacent polypeptide chains (1p)

b) Three helical polypeptides woven together (1p)

c) A peptide chain with a coiled or corkscrew shape is held in place by hydrogen bonds (1p)

Question 18. Describe the structure and organisation of the DNA-double helix. (2p)

Periodic Table of the Elements

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547
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57	La	Lanthanum	138.91
58	Ce	Cerium	140.12
59	Pr	Praseodymium	140.91
60	Nd	Neodymium	144.24
61	Pm	Promethium	144.91
62	Sm	Samarium	150.36
63	Eu	Euroium	151.96
64	Gd	Gadolinium	157.25
65	Tb	Terbium	158.93
66	Dy	Dysprosium	162.50
67	Ho	Holmium	164.93
68	Er	Erbium	167.26
69	Tm	Thulium	168.93
70	Yb	Ytterbium	173.05
71	Lu	Lutetium	174.97
89	Ac	Actinium	227.03
90	Th	Thorium	232.04
91	Pa	Protactinium	231.04
92	U	Uranium	238.03
93	Np	Neptunium	237.05
94	Pu	Plutonium	244.06
95	Am	Americium	243.06
96	Cm	Curium	247.07
97	Bk	Berkelium	247.07
98	Cf	Californium	251.08
99	Es	Einsteinium	252.08
100	Fm	Fermium	257.10
101	Md	Mendelevium	258.10
102	No	Nobelium	259.10
103	Lr	Lawrencium	262.10

Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Metalloid	Nonmetal	Halogen	Noble Gas	Lanthanide	Actinide
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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
Low priority		Nitro	nitro-	-ane