

CHM1321 D: Organic Chemistry I

Mid-Term 1- Winter 2022

Exam time: 75 minutes

(+15 minutes for scanning and uploading your document)


There are 15 questions on this exam. This is a **closed book** exam. No other resources besides pen, pencil, blank paper and molecular model kits (optional) are permitted. Use of virtual molecular models is not allowed.

Submit your document as a single pdf document. The submission must be under the file "Midterm 1 - submission". All pages should be upright and in the right order, and your answers must be legible to be graded.

Note: Your camera must be located so that we can see what is in front of you, especially your hands and all the exam papers you are writing on, as well as your head whether it is from the front or from the side. The camera must stay on at all times during the exam including when you are scanning and uploading your document.

IUPAC Periodic Table of the Elements

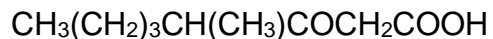
1 H hydrogen 1.008 (1.0078, 1.0082)	2 He helium 4.0026																
3 Li lithium 6.94 (6.938, 6.937)	4 Be beryllium 9.0122	5 B boron 10.81 (10.806, 10.821)	6 C carbon 12.011 (12.009, 12.012)	7 N nitrogen 14.007 (14.006, 14.008)	8 O oxygen 15.999 (15.999, 16.000)	9 F fluorine 18.998	10 Ne neon 20.180										
11 Na sodium 22.990	12 Mg magnesium 24.305 (24.304, 24.307)	13 Al aluminum 26.982	14 Si silicon 28.086 (28.084, 28.088)	15 P phosphorus 30.974	16 S sulfur 32.06 (32.059, 32.071)	17 Cl chlorine 35.45 (35.446, 35.457)	18 Ar argon 39.95 (39.792, 39.963)										
19 K potassium 39.098	20 Ca calcium 40.078(4)	21 Sc scandium 44.956	22 Ti titanium 47.867	23 V vanadium 50.942	24 Cr chromium 51.996	25 Mn manganese 54.938	26 Fe iron 55.845(2)	27 Co cobalt 58.933	28 Ni nickel 58.693	29 Cu copper 63.546(3)	30 Zn zinc 65.38(2)	31 Ga gallium 69.723	32 Ge germanium 72.630(6)	33 As arsenic 74.922	34 Se selenium 78.971(8)	35 Br bromine 79.904	36 Kr krypton 83.798(2)
37 Rb rubidium 85.468	38 Sr strontium 87.62	39 Y yttrium 88.906	40 Zr zirconium 91.224(2)	41 Nb niobium 92.906	42 Mo molybdenum 95.95	43 Tc technetium 98.906(2)	44 Ru ruthenium 101.07(2)	45 Rh rhodium 102.91	46 Pd palladium 106.42	47 Ag silver 107.87	48 Cd cadmium 112.41	49 In indium 114.82	50 Sn tin 118.71	51 Sb antimony 121.76	52 Te tellurium 127.60(3)	53 I iodine 126.90	54 Xe xenon 131.29
55 Cs caesium 132.91	56 Ba barium 137.33	57-71 lanthanoids	72 Hf hafnium 178.49(2)	73 Ta tantalum 180.95	74 W tungsten 183.84	75 Re rhenium 186.21	76 Os osmium 190.23(3)	77 Ir iridium 192.22	78 Pt platinum 195.08	79 Au gold 196.97	80 Hg mercury 200.59	81 Tl thallium 204.38 (204.38, 204.38)	82 Pb lead 207.2	83 Bi bismuth 208.98	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89-103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium	113 Nh nihonium	114 Fl flerovium	115 Mc moscovium	116 Lv livermorium	117 Ts tennessine	118 Og oganesson
57 La lanthanum 138.91	58 Ce cerium 140.12	59 Pr praseodymium 140.91	60 Nd neodymium 144.24	61 Pm promethium	62 Sm samarium 150.36(2)	63 Eu europium 151.96	64 Gd gadolinium 157.25(3)	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 227.04	90 Th thorium 232.04	91 Pa protactinium 231.04	92 U uranium 238.03	93 Np neptunium	94 Pu plutonium	95 Am americium	96 Cm curium	97 Bk berkelium	98 Cf californium	99 Es einsteinium	100 Fm fermium	101 Md mendelevium	102 No nobelium	103 Lr lawrencium			



INTERNATIONAL UNION OF PURE AND APPLIED CHEMISTRY

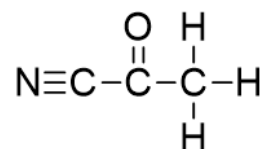
Question 1 (3 pts)

Draw the line structure of the following condensed structure:



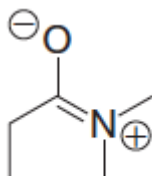
Question 2 (10 pts)

Assign the electron pair geometry and hybridization around each non-hydrogen atom in the molecule shown below:



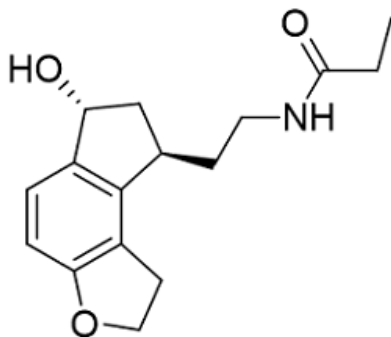
Question 3 (4 pts)

Convert the following to Lewis structure:



Question 4 (8pts)

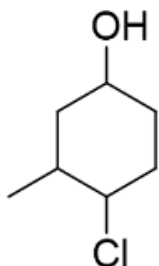
Which functional groups are present in the molecule shown below? Mark each and write the name of the functional group.



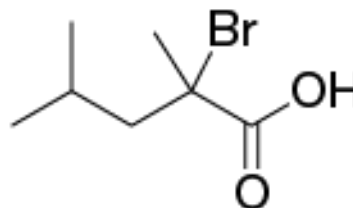
Question 5 (8pts)

What is the IUPAC name of the following compounds (For this question, you do not need to include R/S nomenclature)

A)

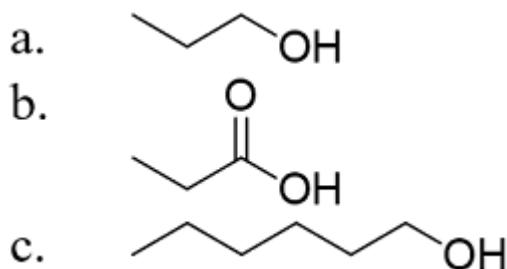


B)



Question 6 (3 pts)

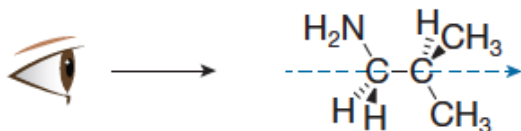
Rank the following in order of increasing solubility in water. Make sure to explain your answer.



Question 7 (10 pts)

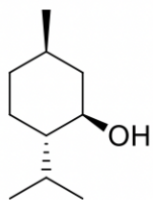
Part A) Draw the Newman projection of the following molecule along the indicated bond (the eye shows the desired perspective)

B) Draw the two conformers of this molecule that have the highest and lowest energy level. Label these two conformers. Which one is staggered, and which one is fully eclipsed?



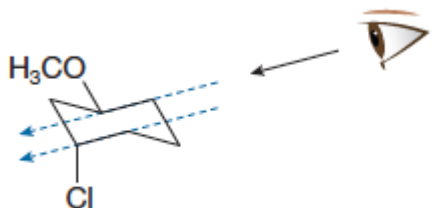
Question 8 (8 pts)

Draw both chair conformations of the molecule below. Indicate which is more stable and why?



Question 9 (8 pts)

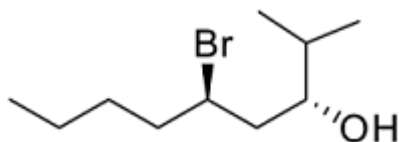
A) Convert the chair conformation into Newman projection, sighting the molecule along the bonds indicated by the arrow.



B) Draw this compound in a planar projection as viewed from above.

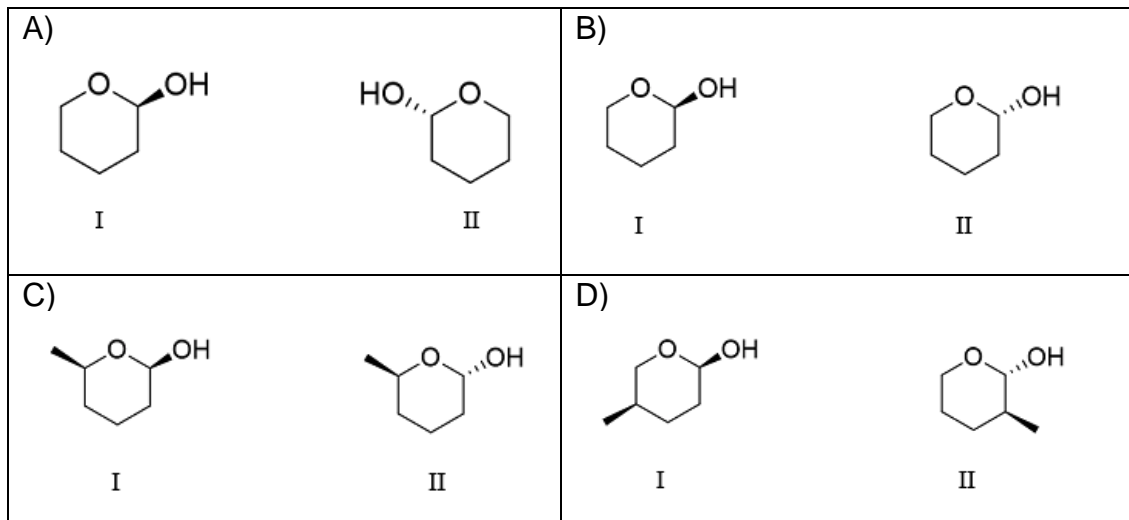
Question 10 (10 pts)

Determine the absolute configuration of the chiral center(s) in the molecule (R/S). Make sure to show the process you used to assign R/S.



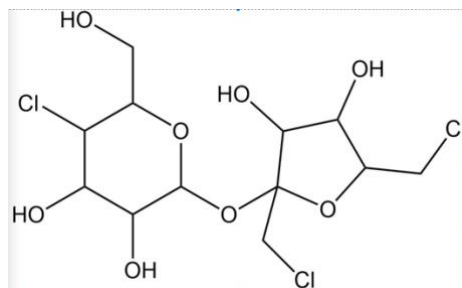
Question 11 (4 pts)

For each pair below, determine the stereochemical relationship (The stereochemical relationship between I and II: Identical molecules, Enantiomers, Diastereomers, Constitutional isomer). Make sure to explain/show how you reached your answer.



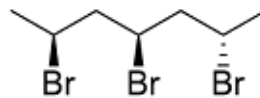
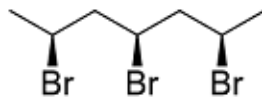
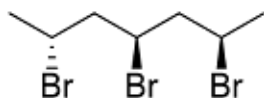
Question 12 (8 pts)

Sucralose™ is a sweetener found in soft drinks and low-calorie foods such as yogurt. The structure of Sucralose is shown. How many chirality centers (stereogenic centers) are present? Mark all the chiral centers.



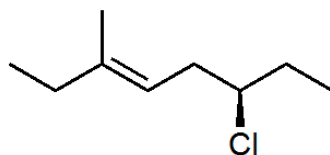
Question 13 (4pts)

Which of the compounds shown is/are meso? Why?



Question 14 (8 pts)

Name the compound below (make sure to include R/S or E/Z if applicable)



Question 15 (4 pts)

Indicate whether the following statements are true or false.

- A) Enantiomers have the same physical and chemical properties.
- B) D/L is used to describe the way enantiomers rotate the angle of polarized light where D stands for counterclockwise rotation and L stands for clockwise rotation.
- C) Among the intermolecular forces, hydrogen bonding is the strongest of all.
- D) π bonds are weaker than σ bonds due to having higher energy.