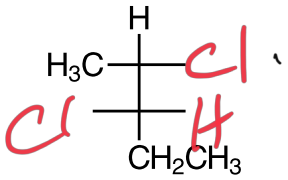
CHM 3342 Exam 2

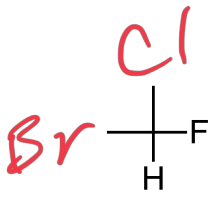
TUD Department of Chemistry
Spring 2019

200 points total

25 pts 1) Place the necessary groups on the structures below to give the specified compound:

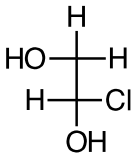


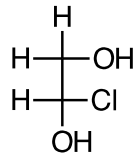
(2R,3S)-2,3-d*ichloropentane*



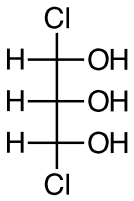
(R)-bromochlorofluoromethane

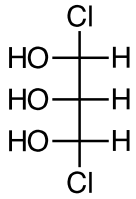
30 pts 2) Label each pair of compounds as either identical, structural isomers, enantiomers, or diastereomers:



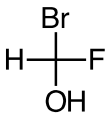


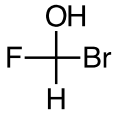
identical



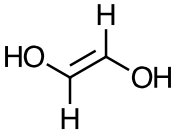


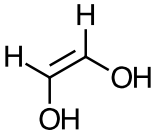
identical





enantiomers

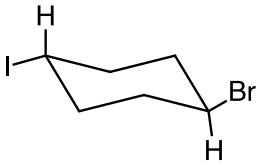




diastereomers

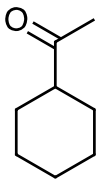
20 pts 3) Name the compounds below:.

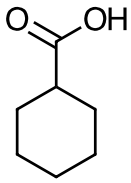
bicyclo[3.3.2]decane



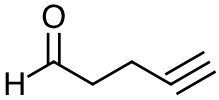
1-bromo-4-iodo cyclohexane

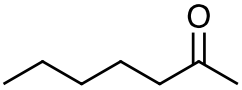
15 pts 4) Briefly describe the IR spectral characteristics that would allow you to distinguish between the following pairs of compounds:



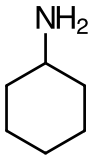


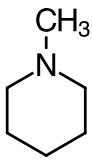
3600 cm^{-1} O–H





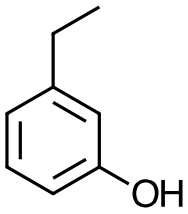
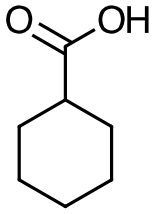
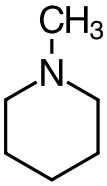
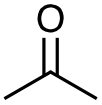
2150 cm^{-1} C≡C



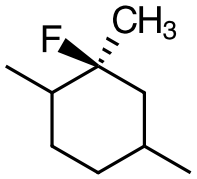


3400 cm^{-1} N–H

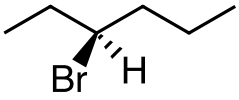
25 pts 5) Fill in the table below with the results of the simple chemical tests indicated. Use a + to indicate soluble and a o to indicate insoluble or a + to indicate bubbles with bicarbonate and a 0 to indicate no bubbles.

				
Water solubility	0	0	0	+
H_2SO_4 solubility	+	+	+	+
dil aq NaOH solubility	+	+	0	+
dil aq HCl solubility	0	0	+	+
bubbles with aq HCO_3^{1-}	0	+	0	0

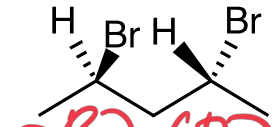
25 pts 6) Label the asymmetric carbons in the following as R or S. Redraw the bottom one as a Fisher projection:



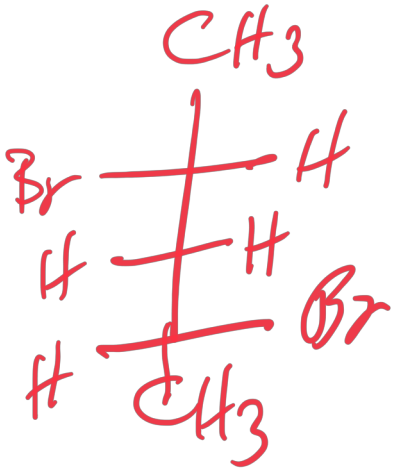
(S) -



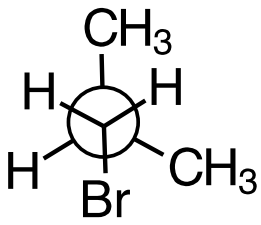
(S) -

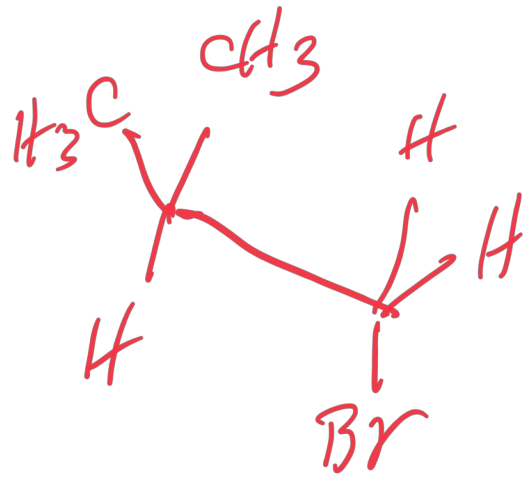


(R) (R)

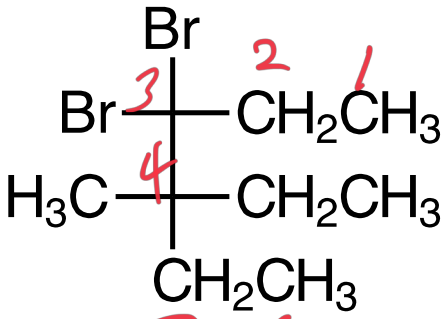


20 pts 7) Name the compounds below:





1-bromo-2methyl propane



3,3-dibromo-4-ethyl-4-methyl hexane

40 pts 9)Four points each with three free misses

1) In the first propagation step of the free radical chlorination of methane, which of the following occurs? 1) E

A) A carbon radical reacts with a chlorine radical.
B) A carbon radical reacts with Cl_2.
C) Two chlorine radicals combine.
D) Cl_2 dissociates.
E) A chlorine radical abstracts a hydrogen.

2) For the compound below, the number of 1°, 2° and 3° hydrogens, respectively is _____. 2) C

A) 1, 6 and 0 B) 3, 6 and 2 C) 3, 6 and 1 D) 1, 3, and 1

3) Which of the following statements correctly describes the contribution of ΔS° to ΔG°? 3) E

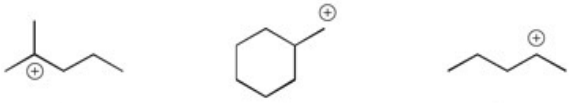
A) The entropy term makes a greater contribution to ΔG° in exothermic reactions.
B) The entropy term always makes a more significant contribution to ΔG° than does the enthalpy term.
C) The entropy term makes a greater contribution to ΔG° at low temperatures.
D) The entropy term makes a greater contribution to ΔG° in endothermic reactions.
E) The entropy term makes a greater contribution to ΔG° at high temperatures.

4) Given the chlorination of acetone shown below, choose the correct rate law. 4) E

$$CH_3COCH_3 + Cl_2 \rightarrow CH_3COCH_2Cl + HCl$$

A) rate = $[Cl_2]$
B) rate = $[CH_3COCH_3]$
C) rate = $[CH_3COCH_3][Cl_2]^{1/2}$
D) rate = $[CH_3COCH_3][Cl_2]$
E) cannot be determined from stoichiometry; must be determined experimentally

5) Rank the following carbocations in order of stability. (The most stable is first.) 5) D



I II III

A) I > II > III B) II > I > III C) III > I > II D) I > III > II

6) The major monobrominated product which results when ethylcyclohexane is subjected to free radical bromination is _____. 6) E

A) bromomethane
B) a primary bromide
C) a quaternary bromide
D) a secondary bromide
E) a tertiary bromide

7) If (*S*)–glyceraldehyde has a specific rotation of –8.7°, what is the specific rotation of (*R*)–glyceraldehyde? 7) A

A) +8.7°
B) 0.0°
C) –8.7°
D) cannot be determined from the information given

8) Which of the following statements is (are) true for the compound (*R*)–2–butanol? 8) D

A) This compound is optically active.
B) This compound is chiral.
C) This compound has an enantiomer.
D) all of the above
E) none of the above

9) Which of the following functional groups does <u>not</u> have at least one sp^2 hybridized carbon atom as a constituent of the group? 9) A

A) ether
B) ester
C) carboxylic acid
D) alkene
E) aldehyde

10) Which of the class of organic compound below contains a carbonyl group as a part of its structure? 10) E

A) ester
B) carboxylic acid
C) aldehyde
D) ketone
E) all of the above

11) What term describes the structural relationship between <u>*cis*</u>–1,2–dimethylcyclopentane and <u>*trans*</u>–1,3–dimethylcyclopentane? 11) B

A) diastereomers
B) constitutional isomers
C) enantiomers
D) not isomers
E) conformers

12) Stereoisomers which are not mirror image isomers are _____. 12) diastereomers

13) How many asymmetric carbons are present in the compound below? 1

3–ethyl–2,2,4–trimethylpentane