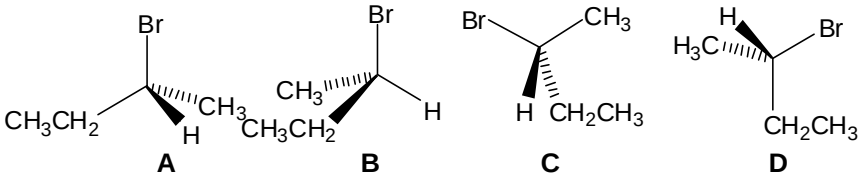
CHEM 2311
E2 Practice-iii (answers *not* provided)

YOU MAY USE A SMALL MODEL KIT ON THIS EXAM

1. (32 points) Circle the letter *on the right* which corresponds to the answer to each question. There is only one correct answer for each question.

(i) Which of the following structures is different from the other three?



A
B
C
D

(ii) How many stereoisomers of 3-bromo-2-butanol, $CH_3CH(OH)CHBrCH_3$, exist?

E. 1 **F.** 2 **G.** 3 **H.** 4

E
F
G
H

(iii) How much of the R enantiomer is present in 10 g of a mixture which has an enantiomeric excess of 20% of the S isomer??

I. 1.0 g **J**. 2.0 g **K.** 4.0 g **L.** 6.0 g

I
J
K
L

(iv) Which of the following statements is true?

M. All mirror images are enantiomers
N. All molecules that have stereocenter centers are chiral
O. Isomers that are not superimposable on their mirror images are enantiomers
P. Superimposable structural isomers are enantiomers

M
N
O
P

(v) Which of the following formulas is a valid molecular formula?

Q. C_4H_{12} **R.** C_7H_{11} **S.** $C_4H_5Br_2O$ **T.** C_4H_9N

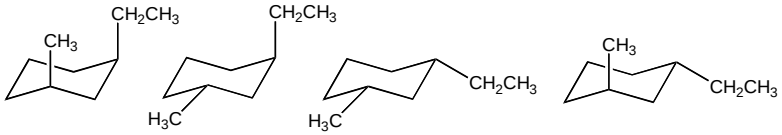
Q
R
S
T

(vi) How many double bonds or rings are present in a compound the molecular formula C_7H_{10}?

U. 0 **V.** 1 **W.** 2 **X.** 3

U
V
W
X

(vii) Which of the following is the most stable conformation of *trans*-1-ethyl-3-methylcyclohexane?



Y. **Z.** **AA.** **BB.**

Y
Z
AA
BB

(viii) What is the approximate dihedral angle between the two chlorine atoms in a chair conformation of *cis*-1,2-dichlorocyclohexane?

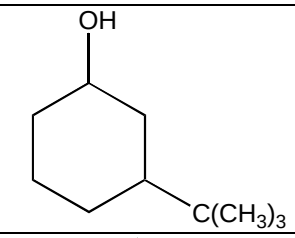
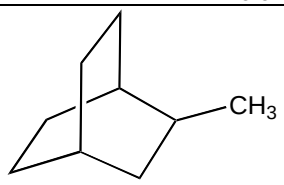
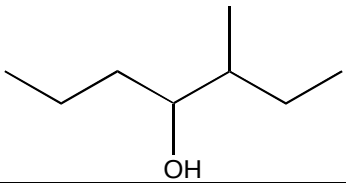
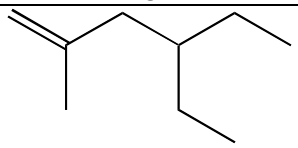
CC. 60° **DD.** 109.5° **EE.** 120° **FF.** 180°

CC
DD
EE
FF

2. (16 points). Provide line bond structures for each of the following, clearly indicating stereochemistry wherever appropriate.

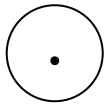
(a) *trans*-1-chloro-2-butene	(b) *cis*-1,2-dimethylcyclopropane
(c) A <u>chiral</u> compound which has *no stereogenic atoms*	(d) An <u>achiral</u> compound which *does have stereogenic atoms*

3. (20 points) Provide systematic IUPAC names for each of the following compounds.

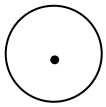
	
	
	
	

4. (20 points). Provide the structure of each of the following.

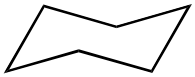
(a) The Newman projection along the C2-C3 bond of the lowest energy conformation of 2,3-dimethylbutane



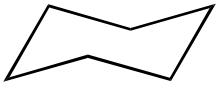
(b) The Newman projection along the C2-C3 bond of the highest energy conformation of 2,3-dimethylbutane



(c) The lowest energy chair conformation of *trans*-1-*tert*-butyl-3-methylcyclohexane.



(d) The lowest energy chair conformation of *trans*-1-*tert*-butyl-4-methylcyclohexane.



5. (16 points) The specific rotation of (*S*)-2-butanol, $[\alpha]_D^{25}$, of +14.

(i) What is the specific rotation of (*R*)-2-butanol? _____

(ii) Is (*S*)-2-butanol designated as the *d*- or *l*- enantiomer? _____

(iii) Is (*S*)-2-butanol designated as the (+) or (-) enantiomer? _____

(iv) A 0.1 g/mL solution of 2-butanol in a 1 dm polarimeter cell gives a rotation of –0.35°. What is the specific rotation of this sample? _____

(iv) What is the %ee of a sample of 2-butanol which gives a specific rotation of -7°? _____

(v) What mass of (*S*)-2-butanol is present in a 10 g mixture of the two enantiomers which has an enantiomeric excess (*ee*) of 30% of the S-enantiomer? _____