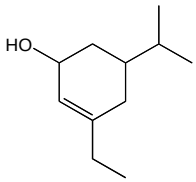
CHEM 2311
E2 practice-iv (answers *not* provided)

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) What is the IUPAC name of the following compound?



A. 5-ethyl-3-isopropyl-5-cyclohexenol **A**
B. 3-ethyl-5-isopropyl-2-cyclohexenol **B**
C. 2-ethyl-4-isopropylcyclohexen-6-ol **C**
D. 1-ethyl-5-isopropylcyclohexen-3-ol **D**

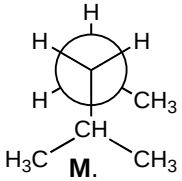
(ii) How many rings and/or π bonds does a compound with molecular formula $C_{15}H_{23}NOCl_2$ have?

E. 2 **F**. 3 **G**. 4 **H**. 5 **E F G H**

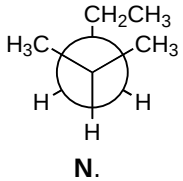
(iii) Which of the following can adopt a chair conformation with two equatorial methyl groups?

I. 1,1-dimethylcyclohexane **I**
J. *cis*-1,2-dimethylcyclohexane **J**
K. *trans*-1,3-dimethylcyclohexane **K**
L. *trans*-1,4-dimethylcyclohexane **L**

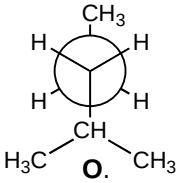
(iv) Which of the following represents the gauche conformation of 2-methylpentane looking along the C3-C4 bond?



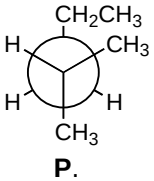
M.



N.



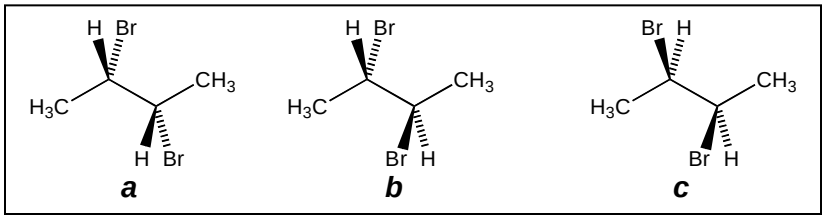
O.



P.

M **N** **O** **P**

Questions (v) – (viii) deal with structures a, b and c



(v) What is the stereochemical designation of compound ***c***?

Q. (2*R*,3*R*) **Q**
R. (2*R*,3*S*) **R**
S. (2*S*,3*R*) **S**
T. (2*S*,3*S*) **T**

(vi) How are compounds ***a*** and ***b*** related?

U. diastereomers **V**. enantiomers **W**. identical **X**. constitutional isomers **U V W X**

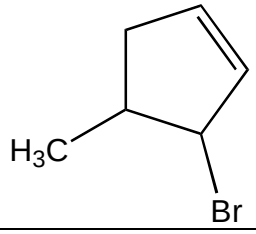
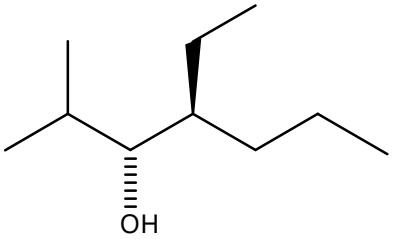
(vii) How are compounds ***a*** and ***c*** related?

Y. diastereomers **Z**. enantiomers **AA**. identical **BB**. constitutional isomers **Y Z AA BB**

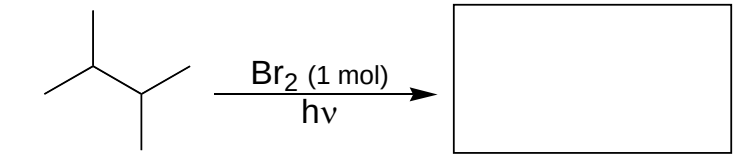
(viii) Which of the compound(s) is(are) achiral (i.e. NOT chiral)?

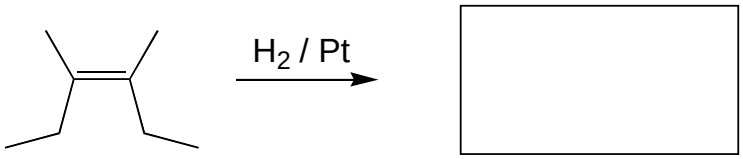
CC. only ***a*** **DD**. only ***b*** **EE**. only ***c*** **FF**. ***a*** and ***c*** **CC DD EE FF**

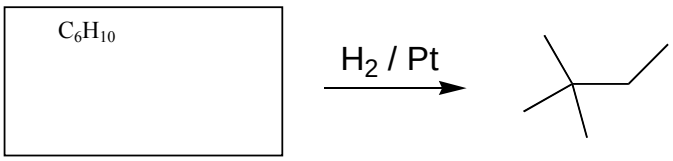
2 (a). Provide IUPAC names for compounds ***d*** and ***e***, and line-bond structures for compounds ***f*** and ***g*** [your answers for ***e*** and ***f*** must clearly indicate the configuration of the stereogenic carbon atoms] [20 points]

	structure	name
d		
e		
f		*S*-3-methyl-1-pentene
g		bicyclo[2.2.2]octane

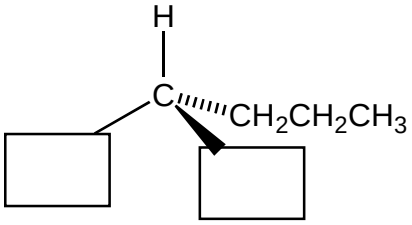
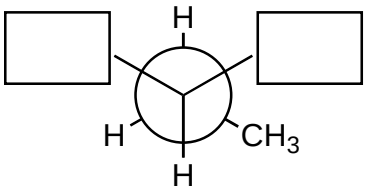
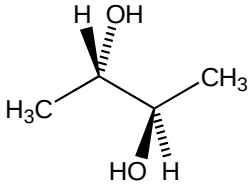
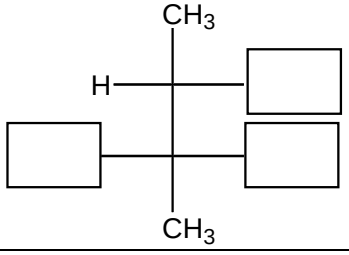
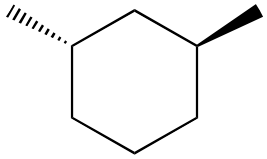
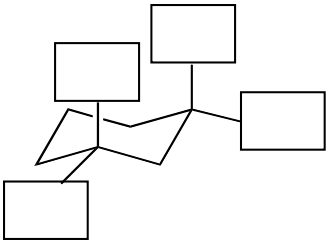
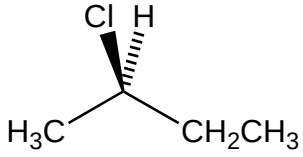
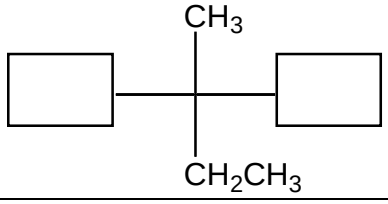
(b) Provide the *major* product of the first two reactions below, and the starting material of the third reaction. *Your structures should show stereochemistry wherever appropriate.* Note that the formula of the starting material for the third reaction is given [12 points]







3. Complete the structures on the right by placing the correct substitiuents in each box [20 points]

S-3-bromohexane	
Newman projection of *R*-2-butanol	
Fischer projection of: 	
The chair conformation of 	
The Fischer projection *of the enantiomer* of 	

4. (16 points)

(i) What is the % enantiomeric excess (%ee) of a mixture consisting of 40% of the *R*-enantiomer and 60% of the *S*-enantiomer of a compound*?*

_____%*ee* of the _____ enantiomer

The specific rotation, [α], of the *R*-enantiomer of compound ***h*** is +120°.

(ii) What is the specific rotation, [α], of a 40:60(*R*:*S*) mixture of the enantiomers of ***h****?* _____°

A 0.5 g/mL solution of a mixture of enantiomers of compound ***h*** gives an observed rotation, α_{obs}, of -48° in a 10 cm (1 dm) polarmeter.

(iii) What is the specific rotation, [α], of this mixture _____°

(iv) What is the enantiomeric excess of this mixture? _____%*ee* of the _____ enantiomer

(v) How many grams of the *R*-enantiomer are in 10 g of the mixture in part (iv)? _____g