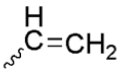
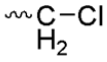
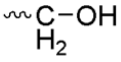
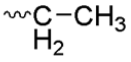
Ch 334 Code _____
Midterm #3
November 17, 2006

1. (3 pts) Circle the highest priority substituent of the following list:

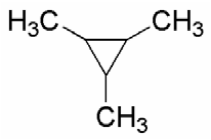
A.  B.  C.  D.  E. 

2. (4 pts) Rank the following groups in order of increasing priority. Place the letter in the blank provided.

a. —F b. —SH c. —$CH_2CH_2CH_3$ d. CH_2NH_2

_____ < _____ < _____ < _____

3. (3 pts) How many stereogenic centers are present in the following compound?

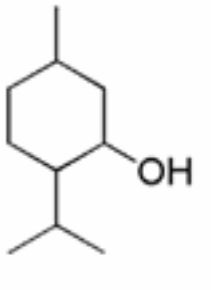


_____

4. (3 pts) How many stereogenic centers are present in 2,6-dimethyloctane?

_____

5. (5 pts) This question is based on the natural product menthol whose structure is drawn below.



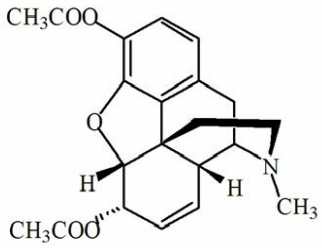
a. How many stereogenic centers are present in menthol? _____

b. Indicate where the stereogenic centers are by placing an asterisk at each center.

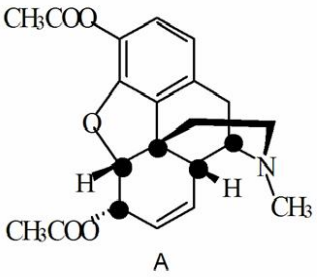
c. How many stereoisomers are possible for menthol? _____

6. (4 pts) Which drawing highlights all of the stereogenic centers in heroin, shown below? Place the letter of the correct response in the blank provided.

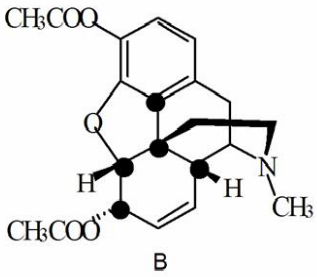
_____



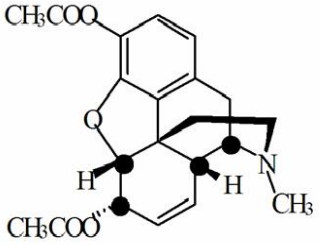
heroin
addicting drug



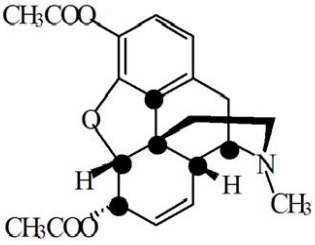
A



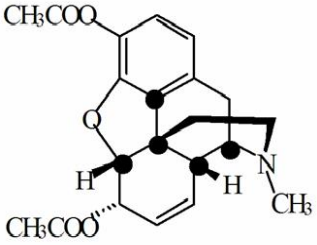
B



C



D

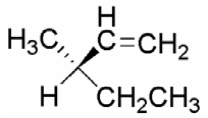


E

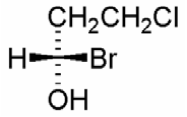
7. (4 pts) If a mixture of two enantiomers , A & B, has an ee of 60% of enantiomer A, what is the percentage of each enantiomer ?

Enantiomer A _____ Enantiomer B _____

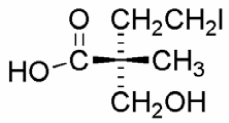
8. (6 pts) Designate the following compounds as *R* or *S*.



_____

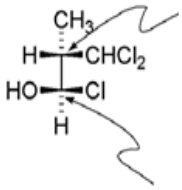


_____

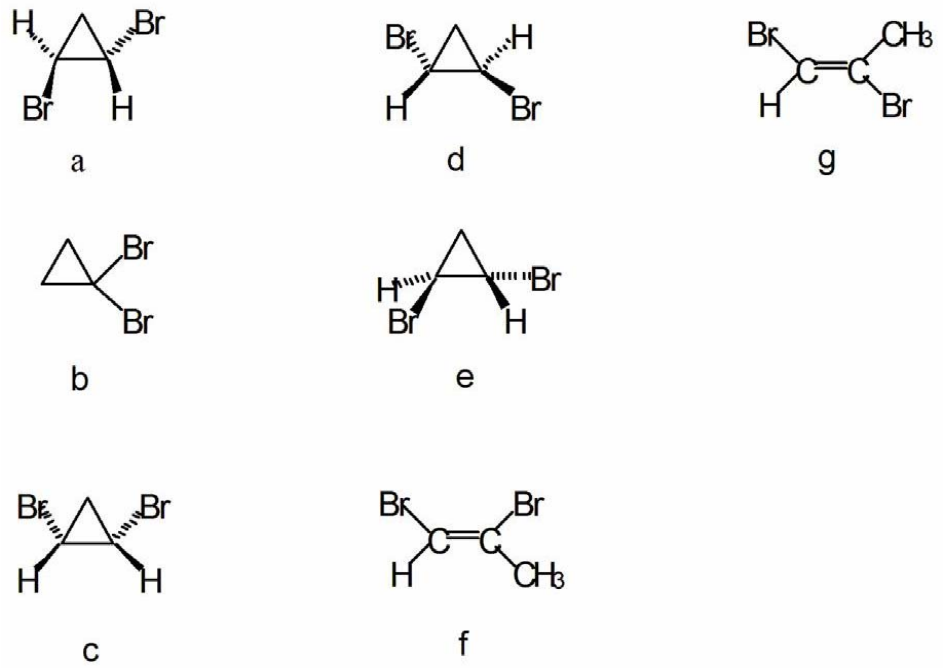


_____

9. (4 pts) Designate each of the stereogenic centers as R or S.



10. (5 pts) Consider the following molecules:



Place the Roman numeral of the appropriate statement in the blanks provided to indicate the relationship between the members of the pairs of compounds below.

I. They are enantiomers.
II. They are diastereomers.
III. They are constitutional isomers.
IV. They are two representations of the same compound.
V. They are not isomers of each other.

1. How are **b** and **d** related to each other? _____

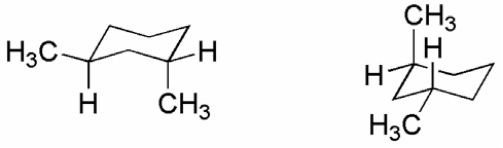
2. How are **d** and **e** related to each other? _____

3. How are **c** and **e** related to each other? _____

4. How are **a** and **f** related to each other? _____

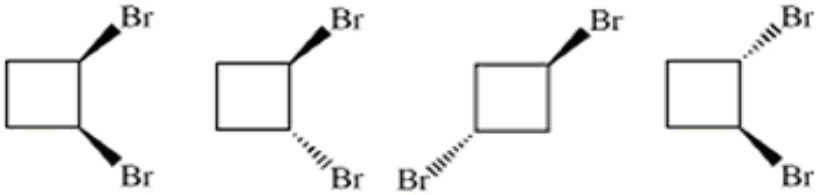
5. How are **f** and **g** related to each other? _____

11. (3 pts) How are the following two molecules related to each other? Circle the correct response.

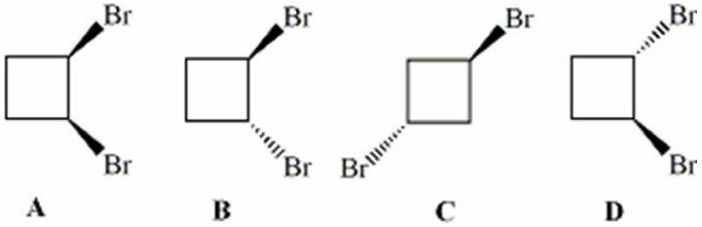


a. They are enantiomers.
b. They are diastereomers.
c. They are constitutional isomers.
d. They are two representations of the same compound.
e. They are not isomers of each other

12. (6 pts) Indicate whether each of the following compounds are chiral or achiral by writing the words "chiral" or "achiral" under each molecule. If the molecule contains a mirror plane draw a line to show the position of the mirror plane. If any of the compounds are meso compounds, write the word "meso" under the structure.



13. (3 pts) Circle the correct answer to each question concerning the structures below.



a. An equal mixture of compounds **A** and **C** is:

optically active optically inactive

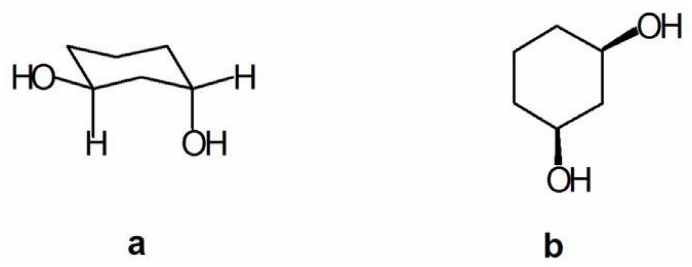
b. An equal mixture of compounds **B** and **D** is:

optically active optically inactive

c. If a mixture having all four compounds were separated by distillation, how many different fractions would be obtained?

1 2 3 4

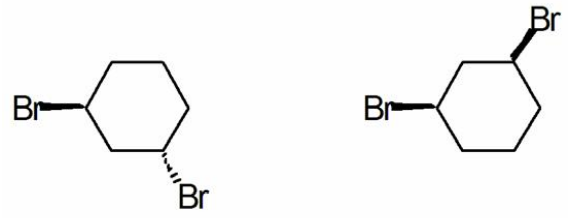
14. (3 pts) Indicate if the following statements are true or false about compounds **a** and **b** drawn below. Circle the correct response.



a **b**

True False Compounds **a** and **b** have different physical properties.
True False A mixture of **a** and **b** will show no optical activity.
True False Compounds **a** and **b** are both chiral.

15. (5 pts) Circle any of the following statements that are true about compounds **a** and **b** drawn below. There may be zero to five true statements.



a **b**

A. **a** and **b** can be separated by fractional distillation using an efficient fractionating column.

B. **a** and **b** rotate the direction of plane-polarized light to an equal amount but in opposite directions.

C. **a** and **b** are diasteriomers.

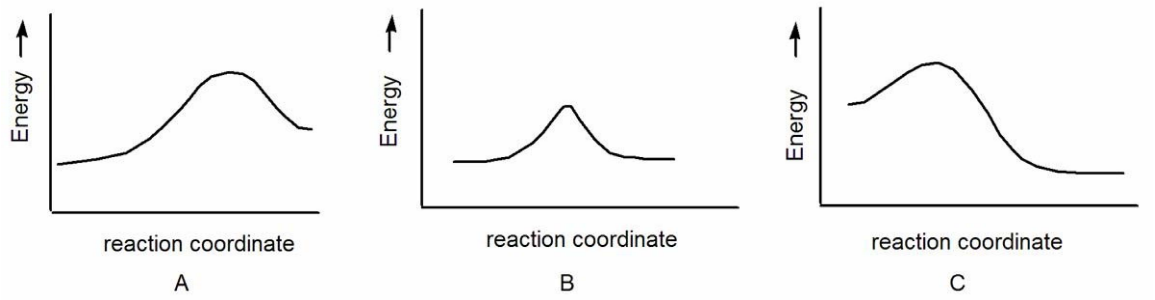
D. **a** and **b** are both chiral compounds.

E. A mixture of **a** and **b** will be optically inactive.

16. (7 pts) How many stereoisomers **exist** for 2,4-diethylpentane? _____

Draw all of them. Label any that are pairs of enantiomers and indicate which isomers would be diastereomers. Indicate if there are any meso compounds and label them.

17. (4 pts) Use the following diagrams to answer the questions below. Place the letter of the correct response in the blanks provided.



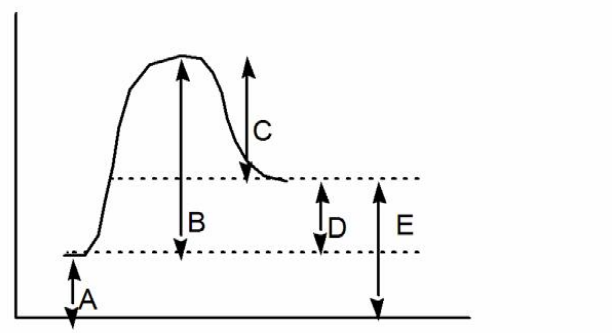
a. Which of the reactions is fast and has K_{eq}=0? _____

b. Which reaction has a positive ΔG? _____

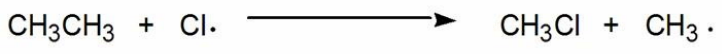
c. Which reaction is slowest? _____

d. In which reaction is $K_{eq} > 1$? _____

18. (3 pts) Which of the following represents ΔH in the following reaction? _____



19. (4 pts) A possible reaction of CH_3CH_3 with a chlorine radical is:

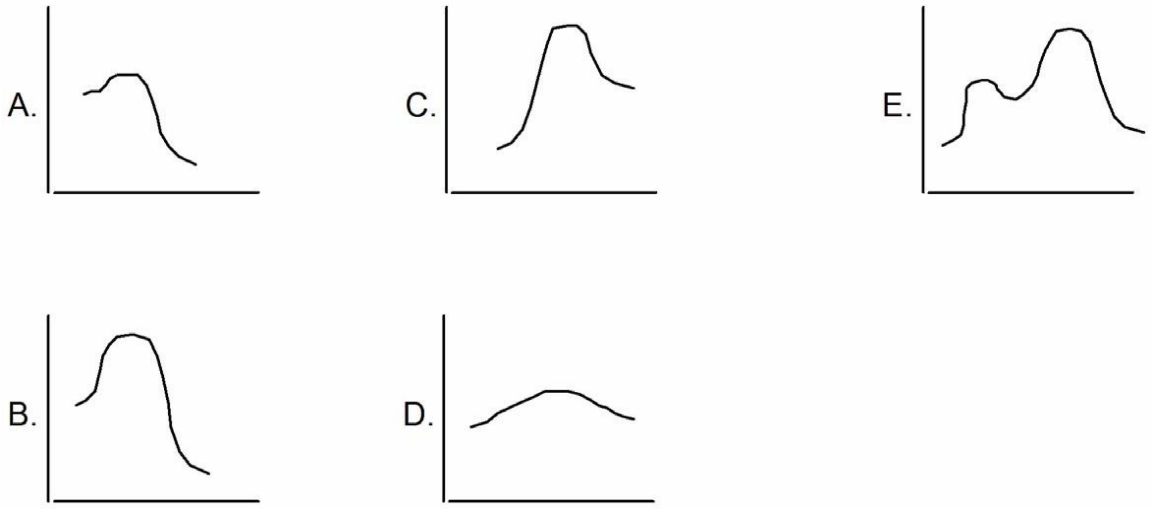


Bond dissociation energies are:

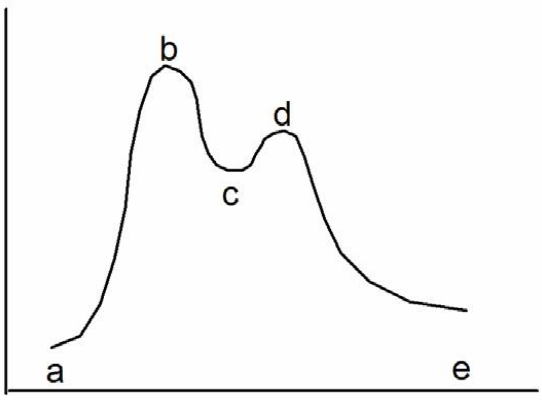
Bond A-B	ΔH kcal
Cl-Cl	58
CH_3-H	104
CH_3CH_2-H	98
CH_3-CH_3	88
CH_3-Cl	84
H-Cl	103

Calculate ΔH for this reaction. Show your work or no credit will be given.

20. (3 pts) Which of the following energy diagrams corresponds to a one-step exothermic reaction with a high energy of activation? Circle its letter.



21. (6 pts) Answer the following questions the energy diagram provided.



a. Which letter or letters label transition states? _____

b. Which letter or letters label intermediates? _____

c. How many steps are in the mechanism of this reaction? _____

d. Is this reaction endothermic or exothermic? _____

e. Circle the rate determining step

22. (4 pts) Given the following values, tell whether the starting material or product is favored at equilibrium. Circle the correct response.

$K_{eq} = 10$	starting material favored	product favored
$\Delta G = -5$ kcal/mol	starting material favored	product favored
$\Delta H = 8.5$ kcal/mol	starting material favored	product favored
$K_{eq} = 0.5$	starting material favored	product favored

23. (2 pts) A pure sample of (*S*)-phenylalanine has a specific rotation of $+70^{o}$. A mixture of the two enantiomers of phenylalanine gives a specific rotation of $+7.0^{o}$. What are the percentages of the S and R enantiomers in the mixture? Circle the correct answer.

a. 95% S, 5% R
b. 90% S, 10% R
c. 55% S, 45% R
d. 52.5% S, 47.5% R

24. (8 pts) Identify each of the following transformations as an oxidation, a reduction or neither.

a. $CH_3CH_2C{\equiv}CH \longrightarrow CH_3CH_2CH_2CH_3$ _____

b. $CH_3CH_2CH_2OH \longrightarrow CH_3CH_2CO_2H$ _____

c. $CH_3CH{=}CH_2 \longrightarrow CH_3CH_2CH_2Br$ _____

d. $CH_3CH_2CH_3 \longrightarrow CH_3CH_2CH_2Br$ _____

Periodic Table