

Chemistry 35

Exam 2

March 22, 2006

Print your name and SISD number on **EVERY PAGE** of the exam.

Write all answers on the exam.

There are two blank pages at the end of the exam for you to use as scratch paper.

1. (18 points) _____

2. (16 points) _____

3. (15 points) _____

4. (20 points) _____

5. (12 points) _____

6. (9 points) _____

7. (10 points) _____

Total (100 points) _____

IA	IIA	IIIA	IVA	VA	VIA	VIIA	GASES
1 H 1.00797						1 H 1.00797	2 He 4.0026
3 Li 6.939	4 Be 9.0122	5 B 10.811	6 C 12.0112	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.183
11 Na 22.9898	12 Mg 24.312	13 Al 26.9815	14 Si 28.086	15 P 30.9738	16 S 32.064	17 Cl 35.453	18 Ar 39.948

ΔG° (equatorial \rightarrow axial) (kcal/mole)

-H	0.0	-CO ₂ H	1.4
-F	0.2	-Me	1.7
-CN	0.2	-Et	1.8
-Cl	0.5	-CHMe ₂	2.2
-Br	0.5	-C ₆ H ₅	2.9
-OMe	0.6	-CMe ₃	5.4
-OH	0.9		

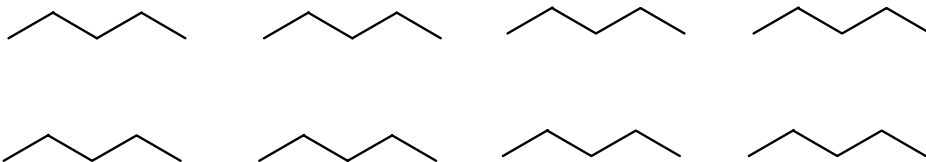
Name _____

SISD _____

1) (18 points) For each of the following molecules, write the number of stereocenters in the box. Use the templates to draw the **unique** stereoisomers and label their stereogenic centers as (R) or (S). **CIRCLE THE ANSWERS THAT YOU WANT GRADED.** There may be more templates than stereoisomers.

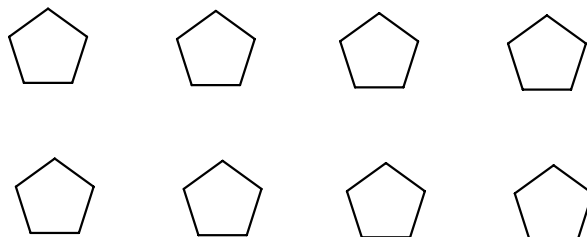
a) 2-chloro-4-methylpentane

← Stereogenic centers



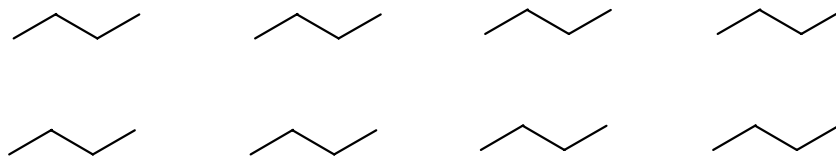
b) 3-methyl-1-cyclopentanol

← Stereogenic centers



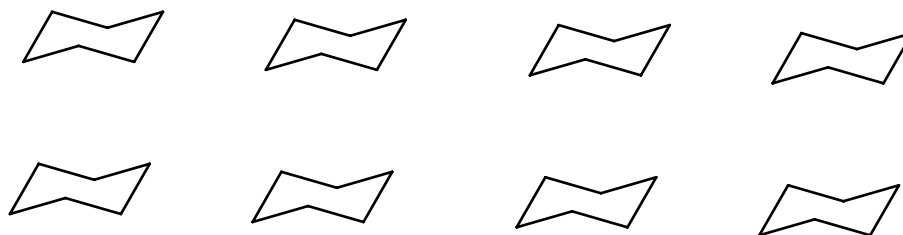
c) 2-butanol

← Stereogenic centers



d) 2,6-dichloro-1-cyclohexanol

← Stereogenic centers



Name _____

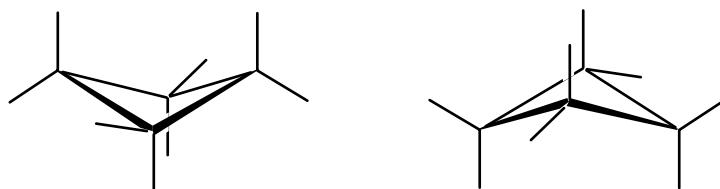
SISD _____

2) (16 points) Draw the following molecules in their lowest energy conformation. (templates provided for your convenience. Extra templates are on page 9. We will not give points for answers on page 9).

(a) (1*S*,3*R*,5*S*)-3-bromo-5-chloro-1-cyclohexanol (Circle the one template you want graded)



(b) (1*S*,2*R*)-1-chloro-2-methylbutane (Circle the one template you want graded)



(c) *cis*-4-methylcyclohexane-1-carboxylic acid (Circle the one template you want graded)



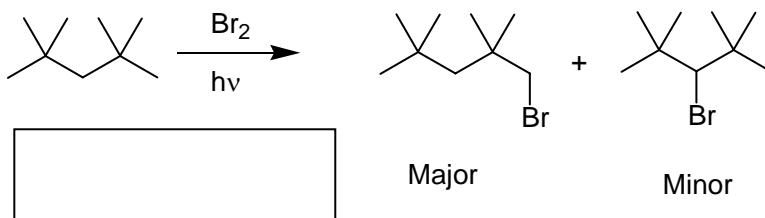
(d) *meso*-1,3-dichloro-1,3-difluoropropane (Circle the one template you want graded)



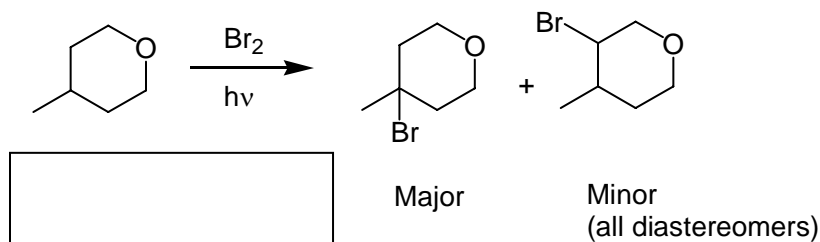
3) (15 points) Decide whether each of the following reactions is correct as drawn.

- If the indicated product(s) is (are) formed in the indicated relative yields, write CORRECT in the box.
- If the indicated product(s) is (are) incorrect or the indicated relative yields are incorrect, CROSS OUT THE INCORRECT INFORMATION and draw the proper product(s) or the proper relative yields (major, minor).
- If no reaction occurs with the indicated reagents, write NO REACTION in the box.

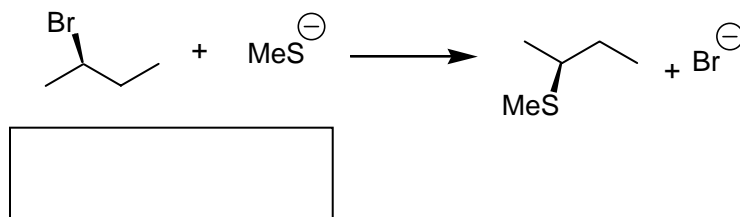
(a)



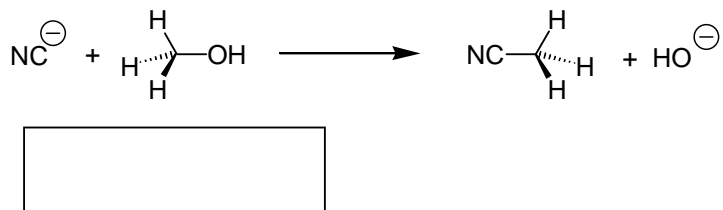
(b)



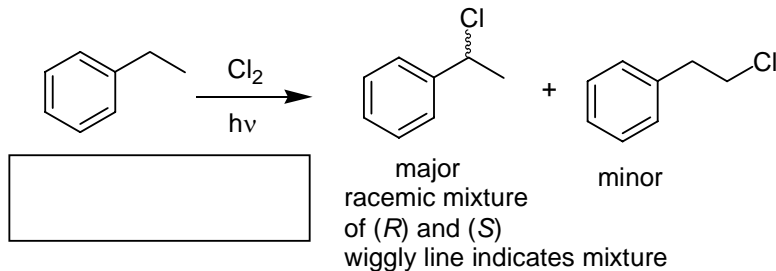
(c)



(d)

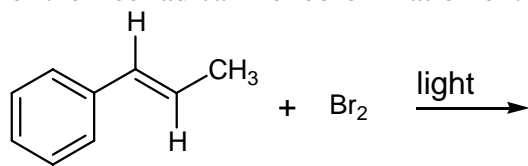


(e)




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4) (20 points) For the free radical monobromination of *trans*-1-phenylpropene

(a) Circle the hydrogen or hydrogens in the above drawing that would be most reactive toward $\text{Br}\cdot$

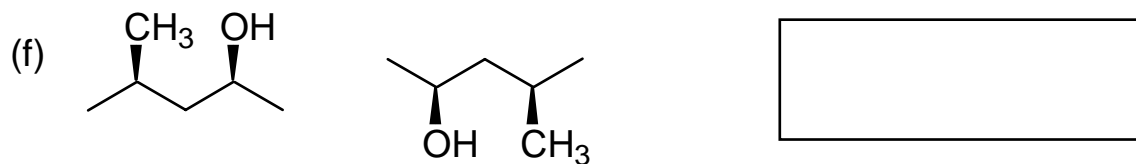
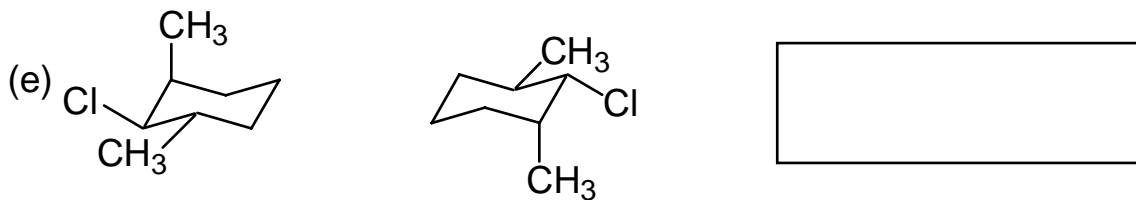
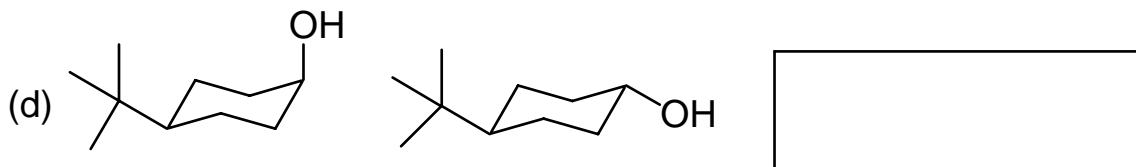
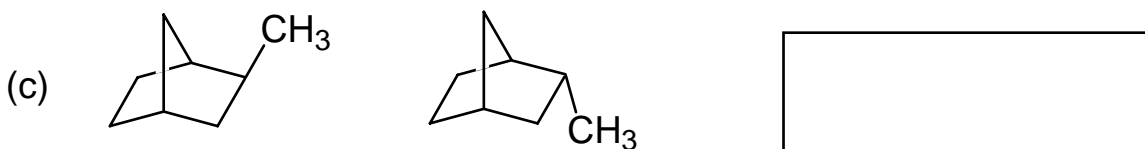
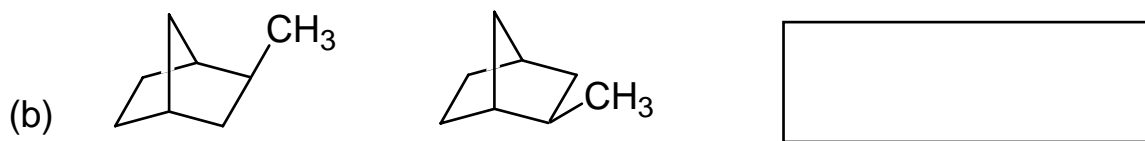
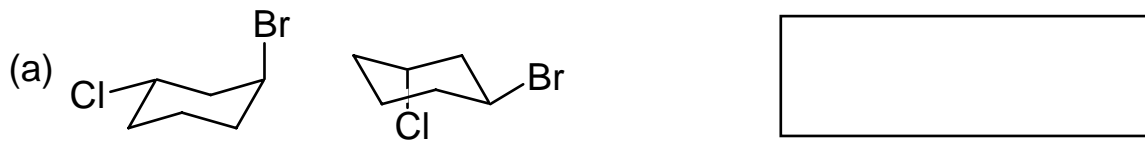
(b) Draw the structures of all the major organic products from this free radical reaction. For any stereogenic center, indicate its three-dimensional shape using wedge/dash notation and give it the appropriate R or S label.

(c) Write a mechanism for the free radical bromination of *trans*-3-phenylpropene consistent with your answers in parts (a) and (b). You should label each step as Initiation, Propagation or Termination. Show only 1 termination step. For each step, show the flow of individual electrons using a single barbed arrow, . Arrow tails start at the source of the electron and the head (or barb) points to the destination of the electron. Show all contributing resonance structures for radical intermediates. (Use the back of THIS PAGE if you need more space.)

Name _____

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5) (12 points) For each pair of structures, indicate in the box if they are the SAME molecule, CONFORMATIONAL ISOMERS, ENANTIOMERS or DIASTEREOMERS.

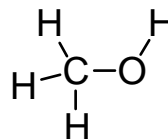
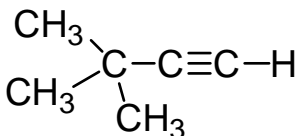
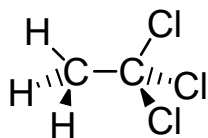
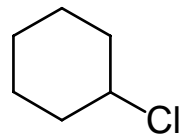
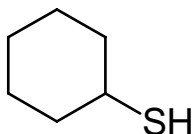
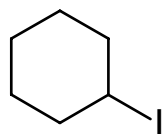
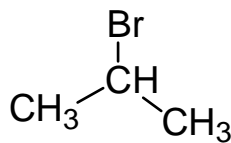
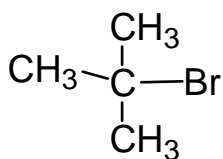
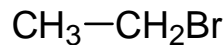


Name _____

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6) (9 points)

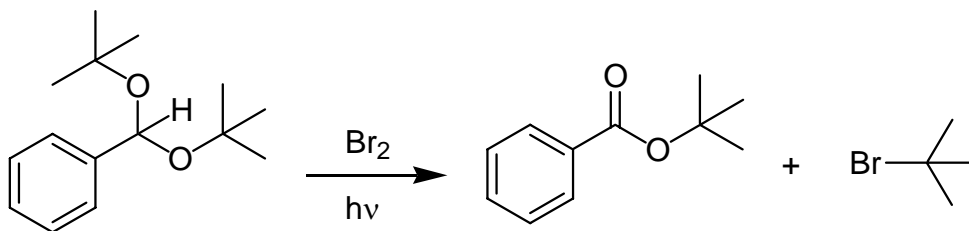
(a) CIRCLE the strongest single bond(s) in the following molecules.

(b) CIRCLE the molecule with the MOST REACTIVE LEAVING GROUP in the S_N2 reaction.
CROSS OUT the molecule with the LEAST REACTIVE LEAVING GROUP in the S_N2 reaction.(c) Circle the molecule that reacts FASTEST with NC^- . Cross out the molecule that reacts most SLOWLY with NC^- .

Name _____

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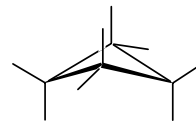
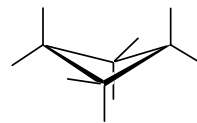
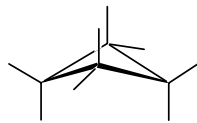
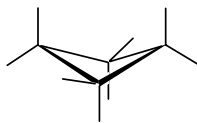
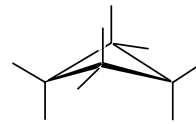
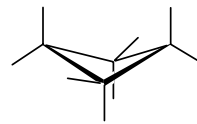
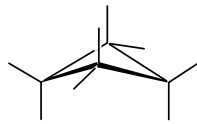
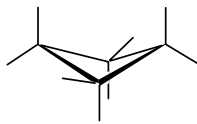
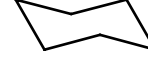
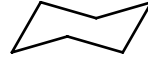
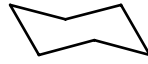
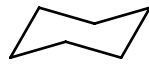
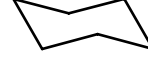
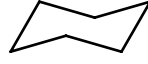
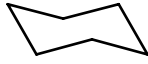
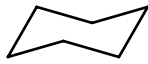
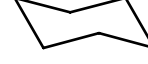
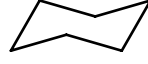
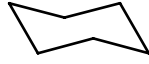
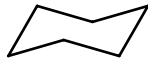
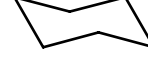
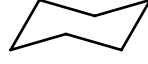
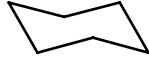
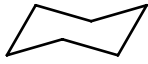
7) (12 points) Provide a step-by-step mechanism for the following reaction. Show the flow of electrons (bonding changes) using curved arrows (double-barbed for movements of electron pairs, single-barbed for movements of single electrons.) Show resonance structures of all intermediates (no need to show resonance structures for starting materials or products), initiation, propagation and 1 termination step.



Name _____

SISD _____

Spare templates



Name_____

SISD_____