Out of 20 pts.

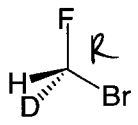
Key

Problem Set #4, 5.12 Spring 2003
Due Monday, March 10, 4pm

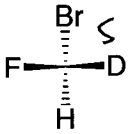
4pts.

1. a) Label each pair as **enantiomers**, **diastereomers**, or **same molecule.**

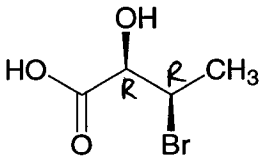
b) Label each stereocenter with its **R** or **S** configuration.



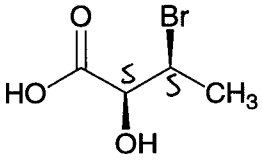
and



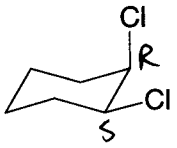
enantiomers



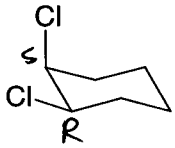
and



enantiomers

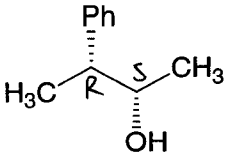


and

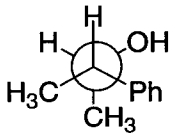


same molecule

⇌ ring flip



and

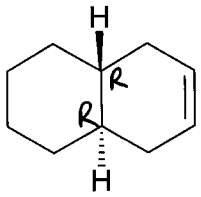


front = S
back = S

diastereomers

4 pts.

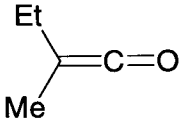
2. a) Label each molecule as **chiral** or **achiral**.
b) Label each stereocenter with its **R** or **S** configuration.
c) Label all of the **meso compounds**.



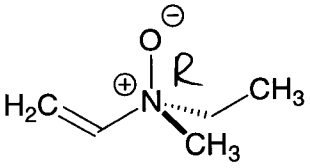
chiral

achiral

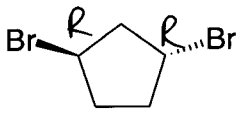
achiral
meso



achiral

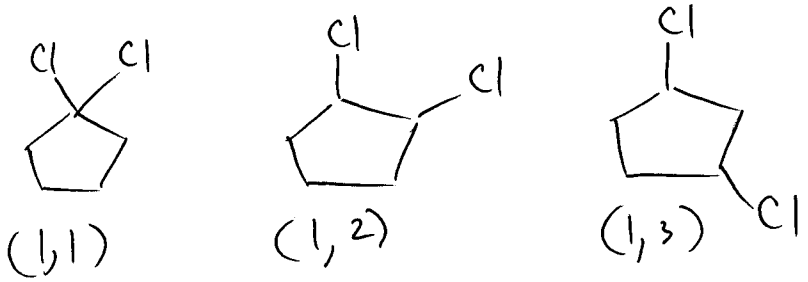


chiral

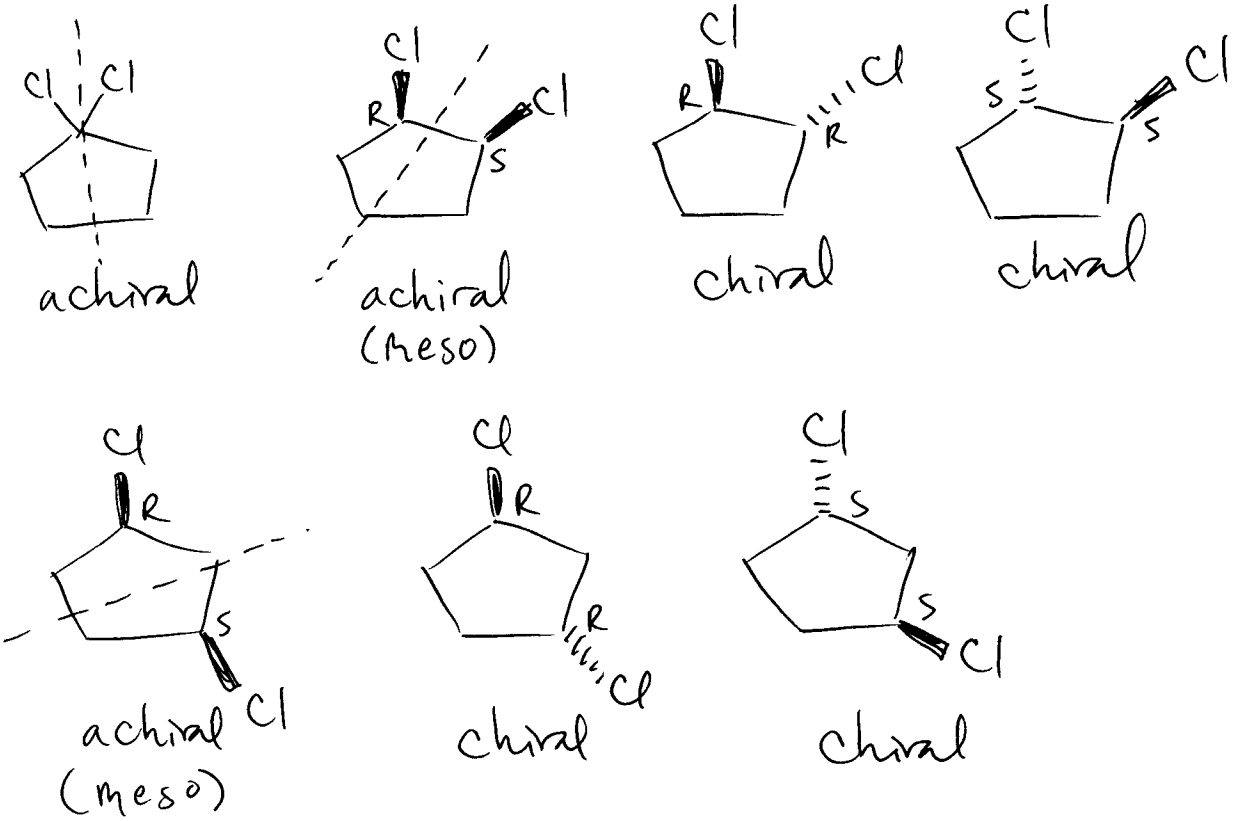


chiral

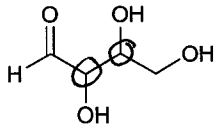
4 pts. **3. a)** There are three different constitutional isomers of dichlorocyclopentane. Draw them.



b) There are seven different stereoisomers of dichlorocyclopentane. Draw all of them.
c) Label each stereocenter as **R** or **S**.
d) Label each structure as **chiral** or **achiral**.
e) Label any meso compounds.



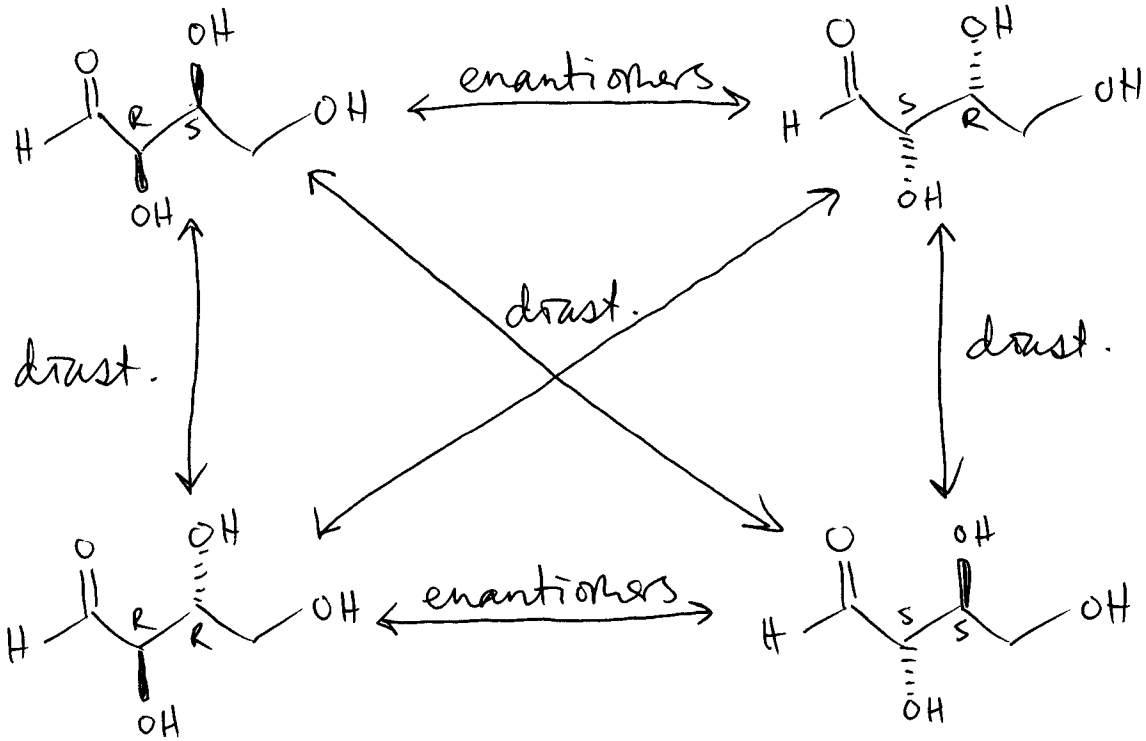
3 pts · **4.** The following molecule **A** is drawn in such a way that the 3-D structure is ambiguous.
a) Circle the atoms that are stereocenters.



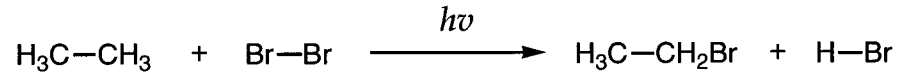
b) Based on the number of atoms you circled in part **a**, what is the maximum number of stereoisomers possible for **A**?

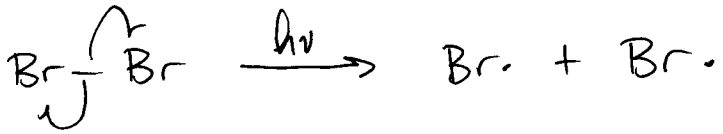
$n = 2$ $\quad 2^n = 2^2 = 4$ max.

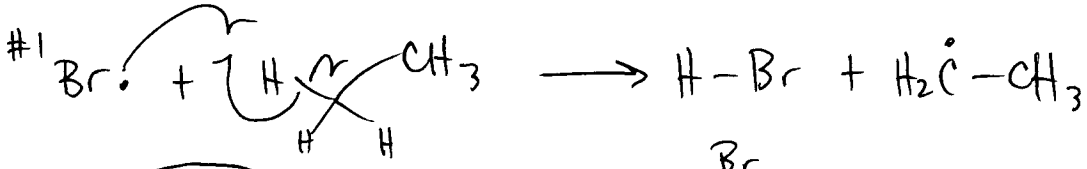
c) Draw all of the possible stereoisomers of **A** and label their stereoisomeric relationships (diastereomers, enantiomers).
d) Label each stereocenter with its **R** or **S** configuration.

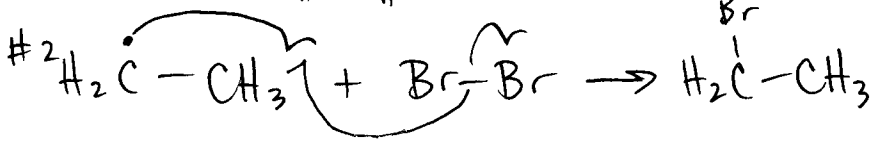


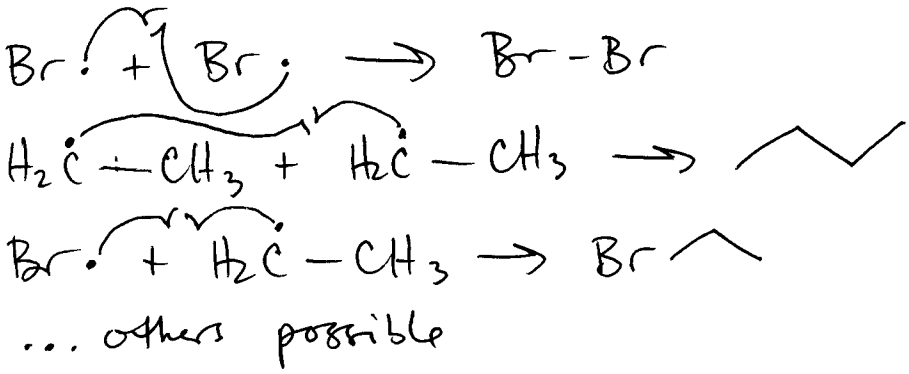
4 pts. **5. a)** Provide a **complete detailed** mechanism for the following reaction (including initiation, propagation, and termination steps).
Remember to use fishhook arrows!



initiation: 

propagation: #1 

#2 

termination: 

b) Using the BDE table on p. 134 in Wade, calculate ΔH for each of the propagation steps.

#1
break Et–H + 98 kcal/mol
make H–Br − 88 kcal/mol

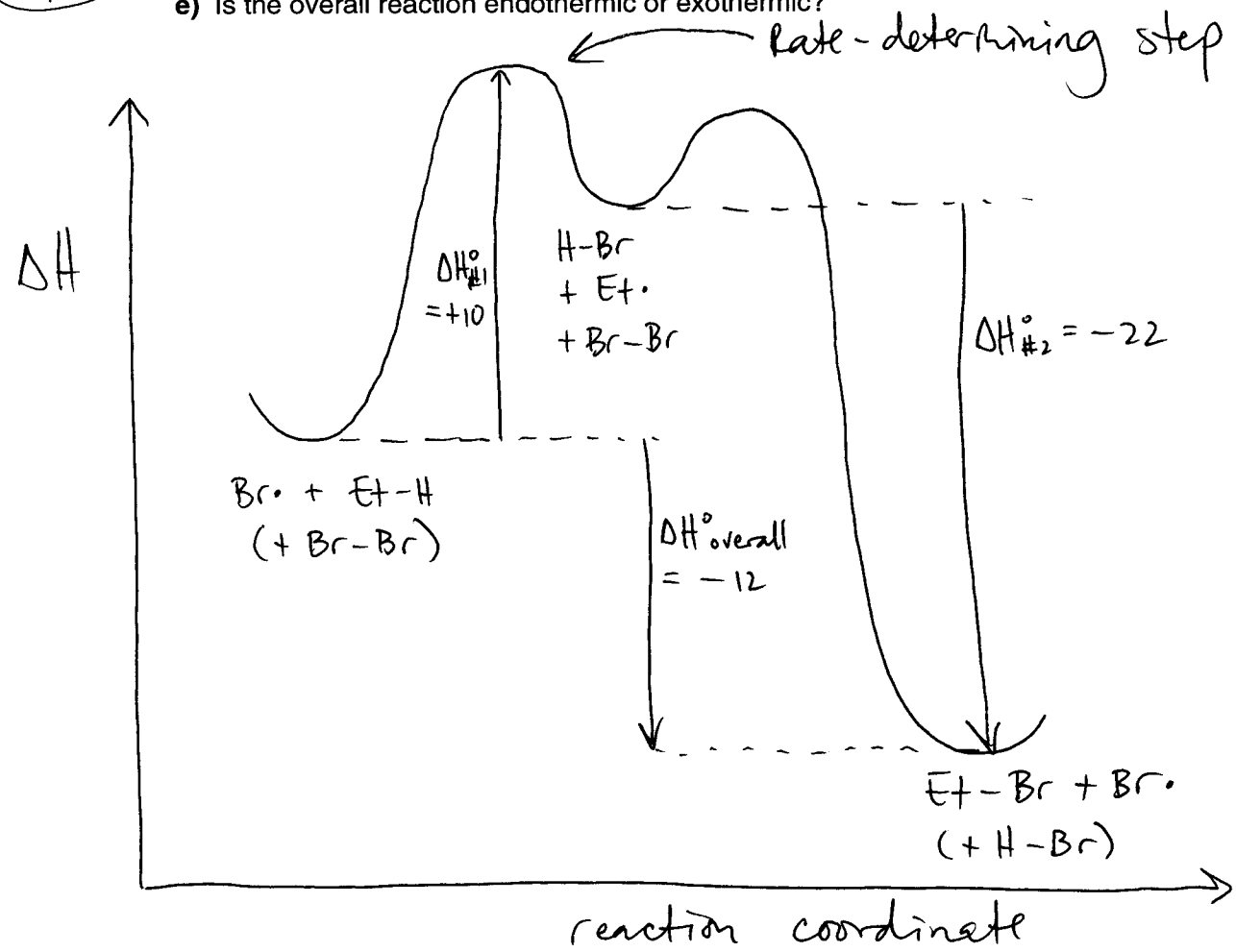
$\Delta H^\circ_{\#1} = +10$ kcal/mol

#2
break Br–Br + 46 kcal/mol
make Et–Br − 68 kcal/mol

$\Delta H^\circ_{\#2} = -22$ kcal/mol

1 pt.

c) Draw a reaction-energy diagram for the propagation steps from part **a.**
d) Label **ΔH°** for each step, **ΔH°$_{overall}$**, and the **rate-determining step**.
e) Is the overall reaction endothermic or exothermic?



The overall reaction is exothermic.
($\Delta H^\circ_{overall} = -12$ kcal/mol)