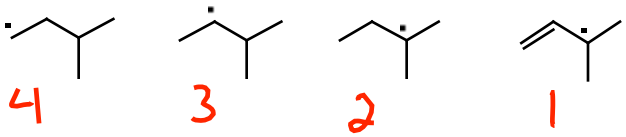
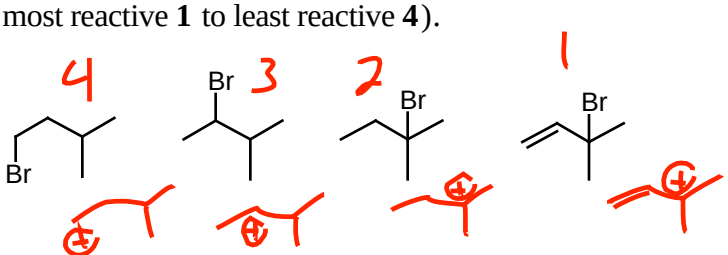
JASPERSE CHEM 350 TEST 2 VERSION 3
Ch. 4 The Study of Chemical Reactions
Ch. 5 Sterochemistry
Ch. 6 Alkyl Halides: Nucleophilic Substitution and Elimination

1.____/4	6.____/9	11.____/6	16.____/4
2.____/4	7.____/4	12. Removed	17.____/6
3.____/4	8.____/6	13.____/6	18.____/16
4.____/4	9.____/10	14.____/6	Total____/100
5.____/3	10.____/6	15.____/2	

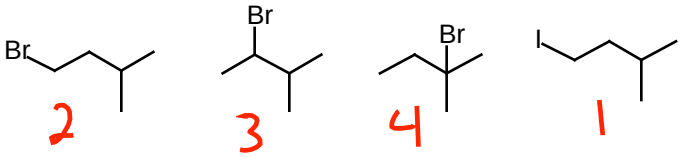
1. List the following radicals in order of increasing stability (from most stable **1** to least stable **4**)



2. List the following alkyl halides in order of decreasing reactivity toward S_N1/E1 reactions (from most reactive **1** to least reactive **4**).



3. List the following alkyl halides in order of decreasing reactivity toward S_N2 reactions (from most reactive **1** to least reactive **4**).



4. Rank the bond strength of the following (from strongest **1** to weakest **4**).

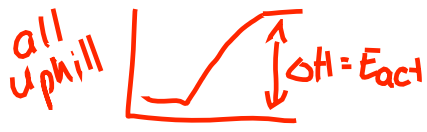
H-Br	H-Cl	H-F	H-I
3	2	1	4

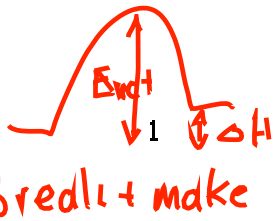
5a. Put a **1** by the reaction for which $\Delta H^\circ = E_{act}$. (E_{act} = activation energy)
b. Put a **2** by the reaction for which $E_{act} = 0$.
c. Put a **3** by the reaction for which $E_{act} > \Delta H^\circ$.

(1) Br-Br → Br• + Br•

(3) H_3C-H + Br• → H_3C• + H-Br

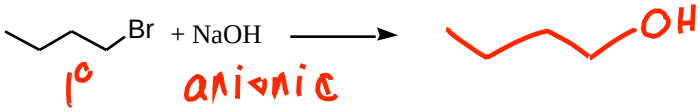
(2) H_3C• + •CH_3 → H_3C-CH_3



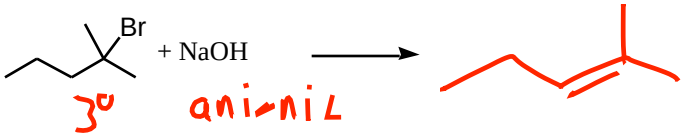


6. Predict the major organic product for each of the following reactions. (Minor products or inorganic side products need not be drawn.)

radical

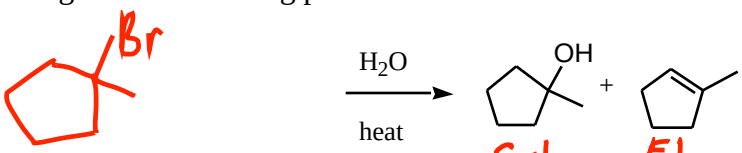


S_N2



E2

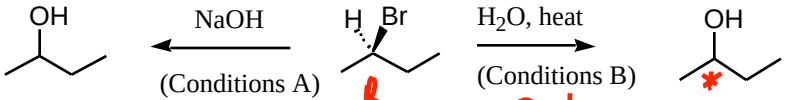
7. Show the Starting Alkyl Bromide which gave the following products.



S_N1 E1

8. Show an alkyl bromide and some nucleophile that you could use to make the following. (I don't care whether you specify a nucleophile just as the anion Z^- or as NaZ with a metal counterion.)

9. Optically active (R)-2-bromobutane can be converted to 2-butanol under either conditions A or conditions B. Describe the stereochemistry of the product solutions for the two different conditions.



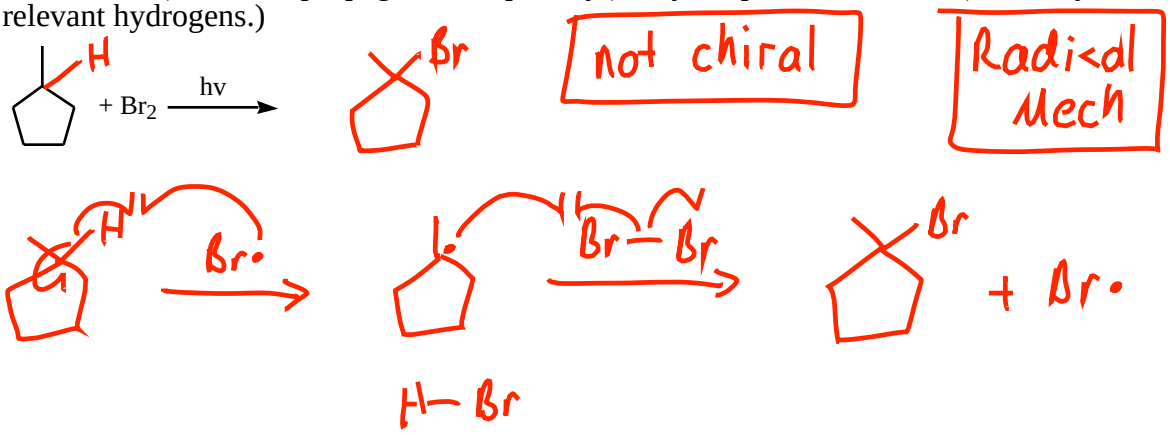
S_N2 S_N1

a. Alcohol is Chiral or Achiral?
b. Optically Active or Not?
c. (R), (S), or both?
d. Reaction occured by Inversion, Retention, or Racemization?
e. What happens to the rates if you double the concentrations of all reactants?

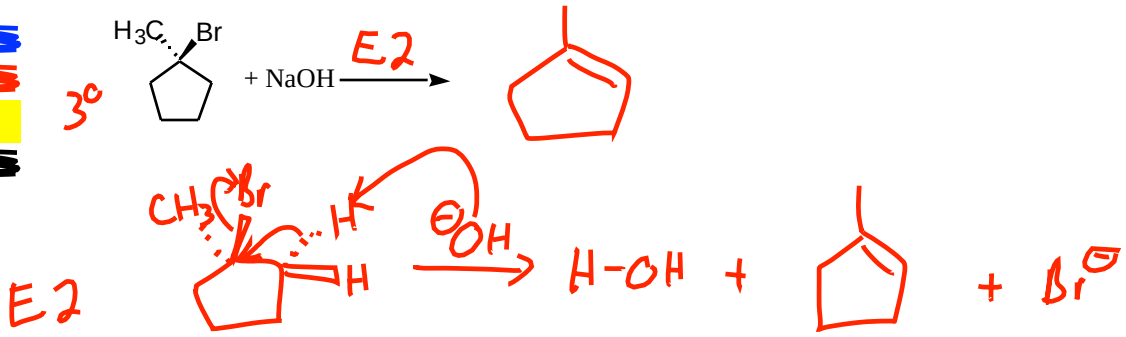
Conditions A S_N2
chiral
Yes (inversion)
S
Inversion
×4

Conditions B S_N1
chiral
No (racemization)
both R+S
Racemization
×2

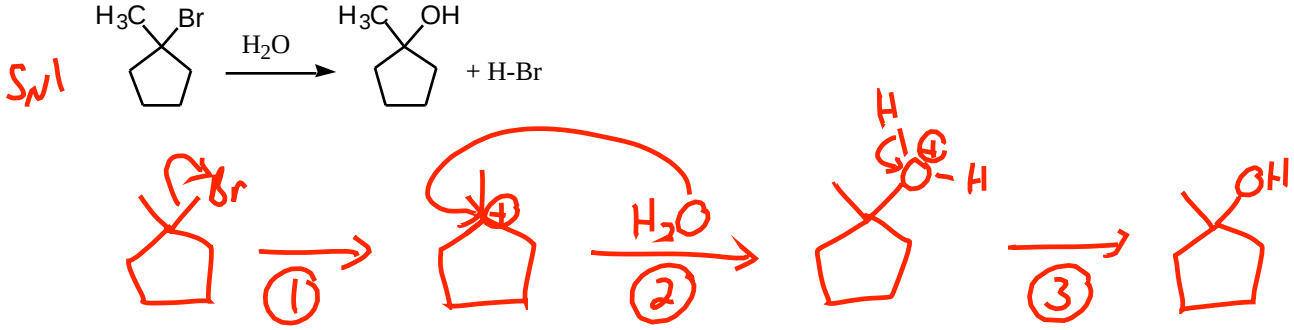
10. Draw the major product for the following reaction. Then draw the mechanism for its formation. (Draw the propagation steps only.) Is your product chiral? (You may need to add relevant hydrogens.)



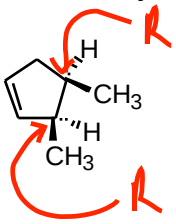
11. Draw the major product for the following reaction. Then draw the mechanism for its formation. (You may need to add relevant hydrogens.)

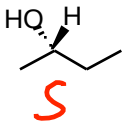


13. Draw the mechanism for the following reaction. (Don't worry about designating stereochem.)

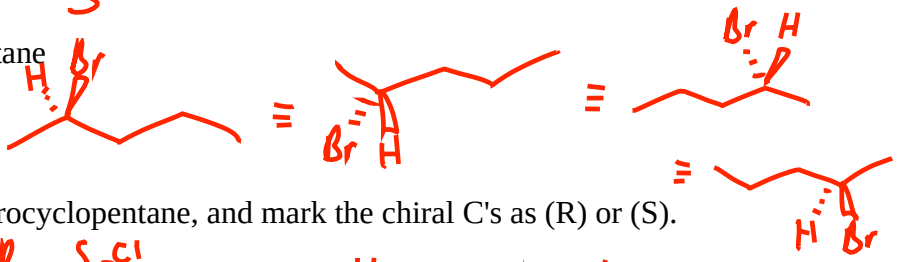


14. Classify each of the chiral carbons in the following structures as (R) or (S).





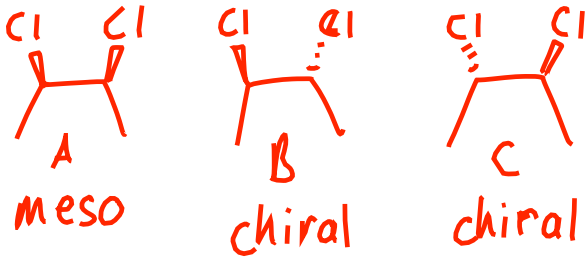
15. Draw (R)-2-bromopentane



16. Draw *meso*-1,3-dichlorocyclopentane, and mark the chiral C's as (R) or (S).

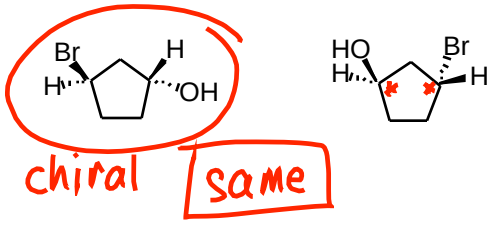
or other ways to draw cis

17. Draw all of the <u>different</u> isomers of 2,3-dichlorobutane, identify each as either chiral or meso, and classify the relationship between each two as enantiotopic or diastereotopic. (You may use Fischer projections or zig/zag/hash/wedge pictures, as you please. (If two are the same, cross one of them off your list.)



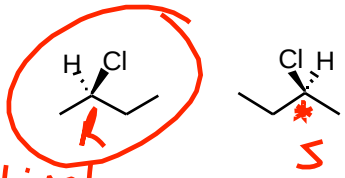
AB diast
AC diast
BC enant

18. Classify the pairs of molecules as diastereomers, enantiomers, or same. For the first molecule in each pair, circle it if it is chiral. For the second molecule in each pair, put a * next to each chiral C.



chiral same

achiral same



chiral Enant