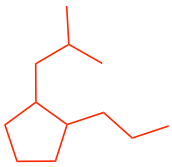
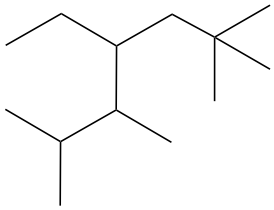
Chemistry 2511: Exam 1 (135 pts), Fall 2025

Name: Key

1. (12 pts) Provide the structure for the name given below and the IUPAC name of the structure given



1-isobutyl-2-propylcyclopentane

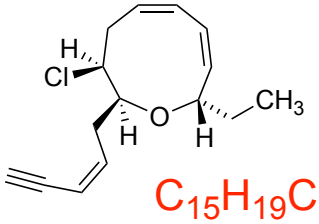


4-ethyl-2,2,5,6-tetramethylheptane

2. (16 pts) Answer the 5 questions (A-E) below on Brasilenyne which is an antifeedant isolated from the sea hare (*Aplysia brasiliana*).

A. List the 4 kinds of functional groups in the molecule (alkane is not one!)

1. ether
2. alkene
3. alkyne
4. alkyl halide



$C_{15}H_{19}ClO$

B. The Cl is (Circle one):

0° 1° **2°** 3° 4°

C. The hybridization of the carbon attached to the Cl is (circle one):

sp *sp*^{2} ***sp*^{3}** *sp*^{4} *dsp*^{2}

D. How many carbons are in the structure (Circle one):

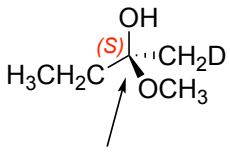
9 10 11 12 13 14

15 16 17 18 19 20

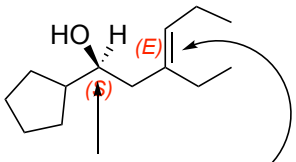
E. Because this is a 9-membered ring, all the double bond geometries could be *cis* or *trans*. Give the number of possible stereoisomers of this natural product.

$2^6 = 64$

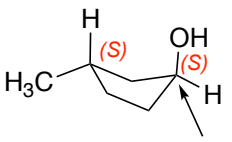
3 (15 pts) Assign the absolute stereochemical configuration (*R* or *S*) the indicated stereogenic centers or the alkene geometry (*E* or *Z*).



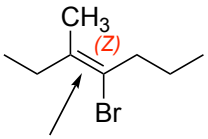
S



S *E*

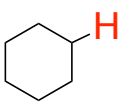


S

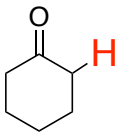


Z

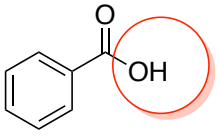
4 (18 pts) Estimate the pKa value for each of the following compounds. (You should draw in/circle the most acidic hydrogen)



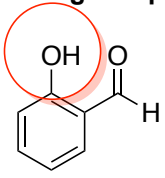
50



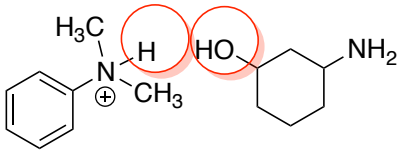
20



5



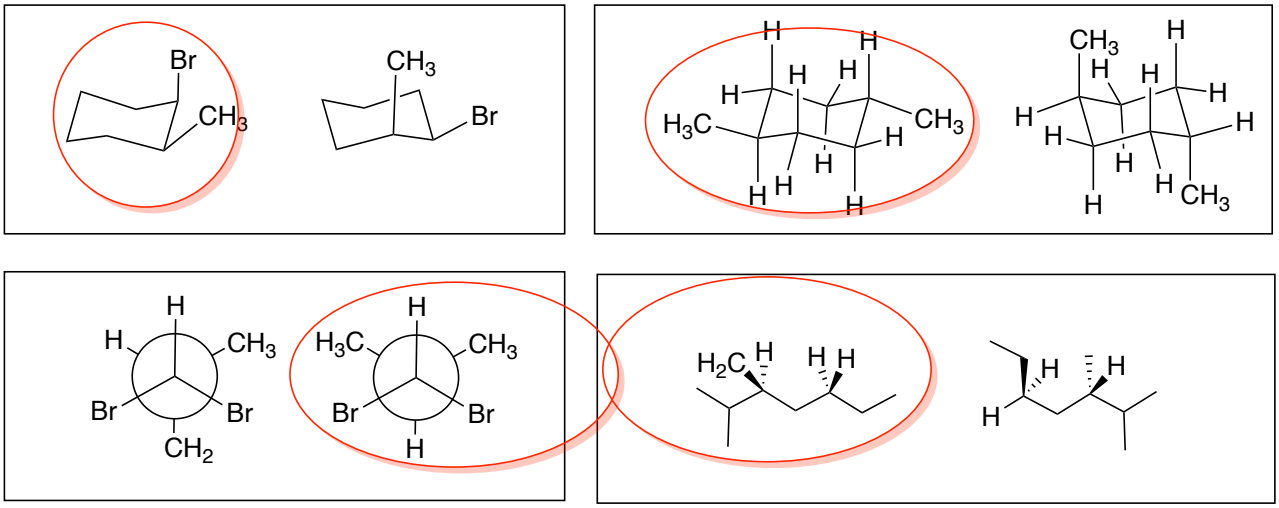
10



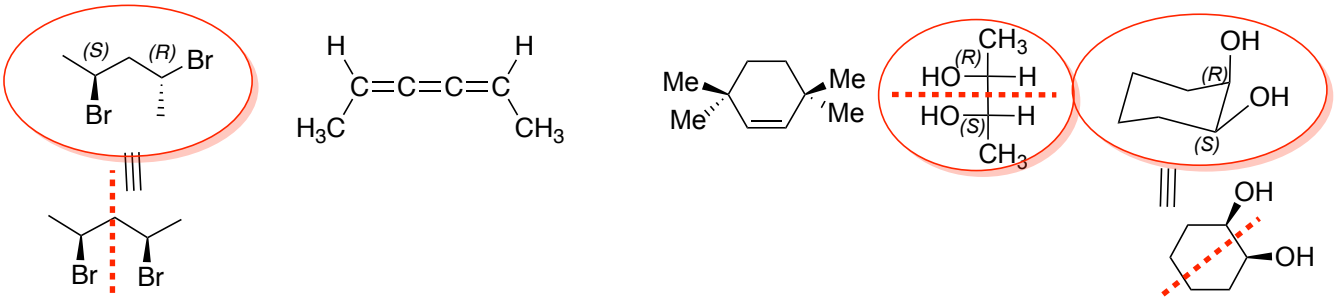
10 16

61

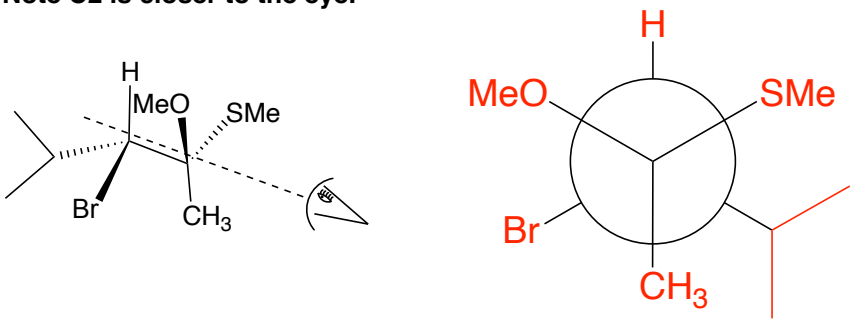
5. (8 pts) For each box of compounds, circle the compound that has the lowest energy conformation.



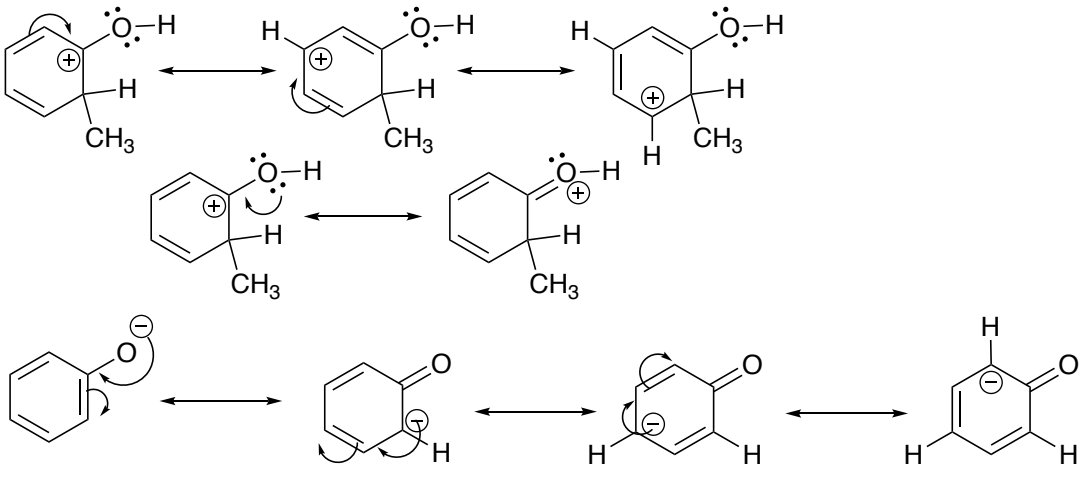
6. (10 pts) Circle the 3 compounds below that are considered meso stereoisomers.



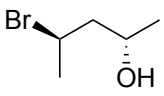
7. (12 pts) Complete the Newman projection along the C2–C3 bond for the structure given below. Note C2 is closer to the eye.

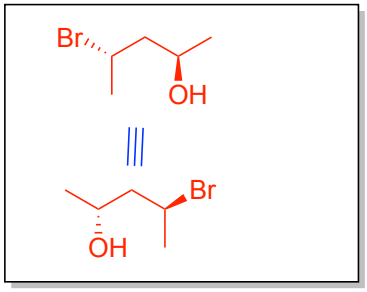


8. (18 pts) Using curly arrows, draw the resonance structures of the following compounds to show distribution of charge. Note correct use of curly arrows are required and will constitute the vast majority of points.

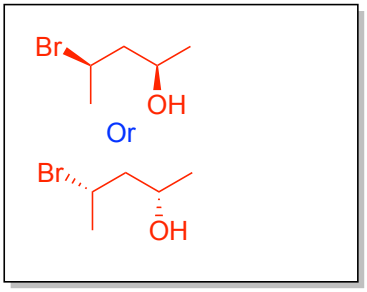


9. (9 pts) Using the following compound to draw isomers with the given criteria.

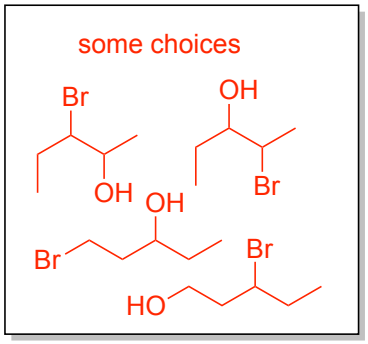




The enantiomer. Call this compound A



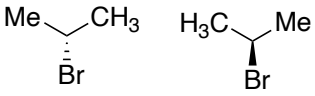
A compound that is a diastereomer of Compound A. Call this Compound B



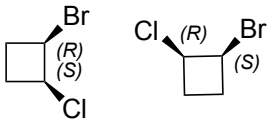
A compound that is a constitutional isomer of compounds A and B.

10. (27 pts) For each pair of compounds, label the pair as:

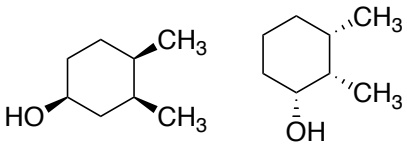
unrelated (unrel.)
identical molecules (Ident.)
constitutional isomers (const.)
enantiomers (enant.)
diastereomers (diast.)



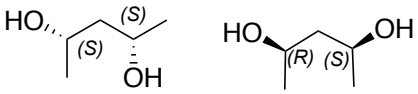
identical



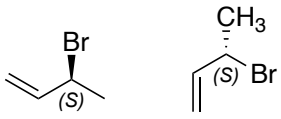
enantiomers



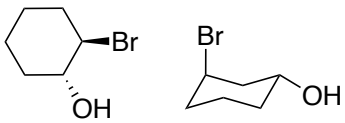
constitutional isomers



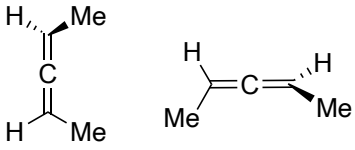
diastereomers



identical



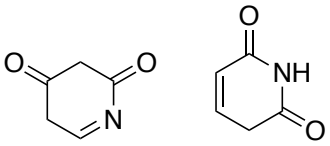
constitutional isomers



identical

(1*R*,2*R*)-1,2-dimethylcyclohexane
vs.
(1*S*,2*S*)-1,2-dimethylcyclopentane

unrelated



constitutional isomers

36