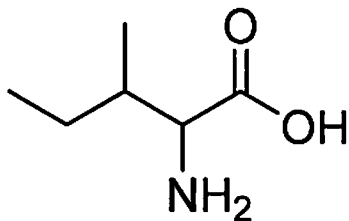


Name _____

1-10 are True / False (10pts)

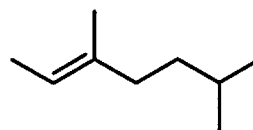
- 1) Enantiomers are non-superimposable mirror images.
- 2) Single bonds are typically shorter and stronger than double bonds.
- 3) S_N2 reactions are stereospecific (giving 100% inversion) because of *backside attack* of the nucleophile.
- 4) S_N1 and E1 reactions always involve a carbocation intermediate.
- 5) An *elimination* is a reaction where two atoms or groups are removed to produce a new π bond.
- 6) Iodide ion is a good leaving group in nucleophilic substitutions.
- 7) Cyclobutene and pent-1-ene are structural isomers.
- 8) An *electrophilic addition* is a reaction where a nucleophilic species replaces another group or atom in a molecule.
- 9) When two atoms (or groups) are added to the same face of a π bond it is called an Anti-Meghanmarkle addition.
- 10) (R) or (S) stereocenters are assigned according to the Cahn-Ingold-Prelog convention.

11) (5pts) For the branched amino acid *Isoleucine* shown below, determine:

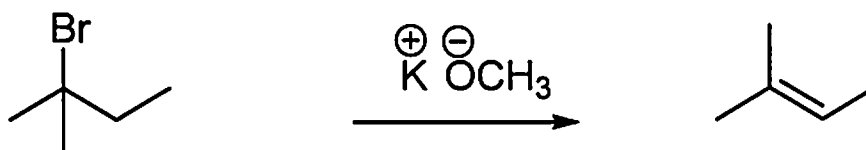


- The number of Carbons.
- The number of Hydrogens.
- The number of π bonds.
- The number of chiral centers.
- Based on your answer to (d) – how many different stereoisomers fit the above (imprecise) structural representation?

12) (3+4=7pts) Name these two compounds in IUPAC form.

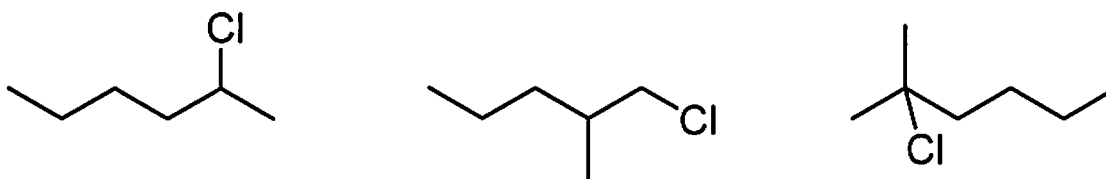


13) (3pts) i) Write a mechanism (*i.e. curly arrows*) for this **E1** elimination.

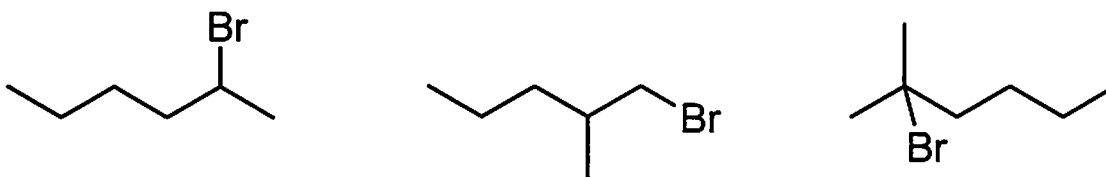


ii) (1pt) Draw a possible product that would be formed in this reaction, if it was a *substitution* (and not an *elimination*).

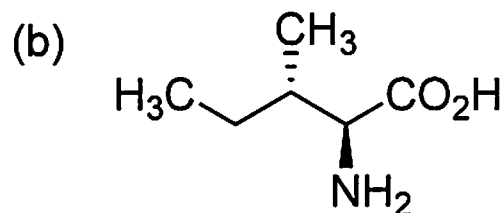
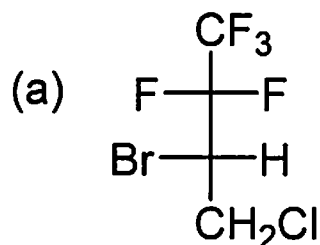
14) (1pt) Circle the molecule in this trio that would undergo $\text{S}_{\text{N}}1$ reaction with fastest rate.



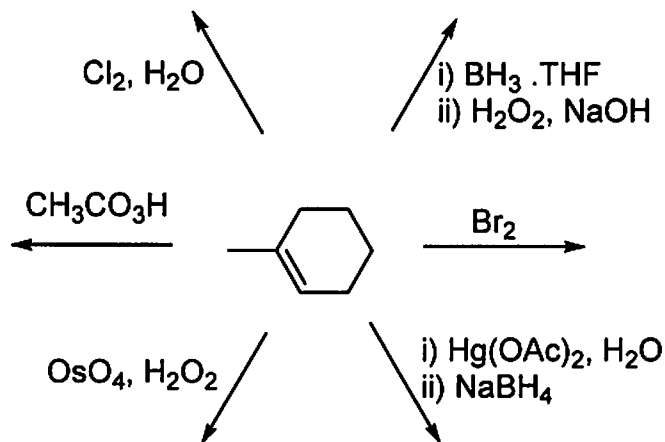
15) (1pt) Circle the molecule in this trio that would undergo $\text{S}_{\text{N}}2$ reaction with the fastest rate.



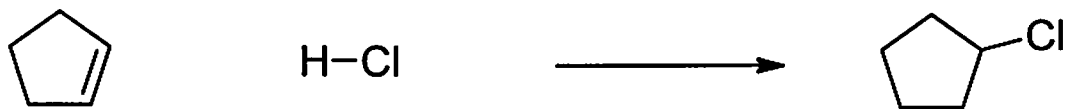
16) (6pts) Assign (R) or (S) to every chiral center in the following molecules.



17) (12pts) Give the products formed in the following transformations of the below cyclic alkene, *paying attention to stereo- and regio-chemistry where relevant.*



18) (4pts) Draw the mechanism (i.e. *using curly arrows*) for this electrophilic addition of hydrogen chloride to cyclopentene.



****Up to TWO BONUS POINTS****

Normal 6 sided dice are *chiral*. Atlantic City casinos only use the R enantiomeric form of dice at their craps tables (“craps” is a dice throwing gambling activity).

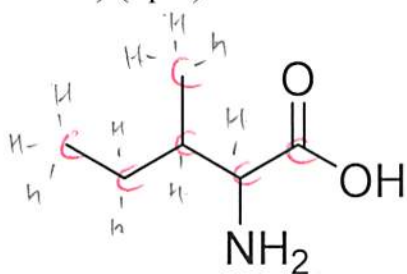
You can actually apply your chirality assigning skills to tell which is which. So for the two dice below, indicate which is (R) and which is (S), and explain how you arrived at the assignment.



Name SYN GALONG*1-10 are True / False (10pts)*

- 1) Enantiomers are non-superimposable mirror images. T
- 2) Single bonds are typically shorter and stronger than double bonds. false
- 3) S_N2 reactions are stereospecific (giving 100% inversion) because of *backside attack* of the nucleophile. T
- 4) S_N1 and E1 reactions always involve a carbocation intermediate. T
- 5) An *elimination* is a reaction where two atoms or groups are removed to produce a new π bond. T
- 6) Iodide ion is a good leaving group in nucleophilic substitutions. T
- 7) Cyclobutene and pent-1-ene are structural isomers. false
- 8) An *electrophilic addition* is a reaction where a nucleophilic species replaces another group or atom in a molecule. false
- 9) When two atoms (or groups) are added to the same face of a π bond it is called an *Anti-Meghanmarkle* addition. false
- 10) (R) or (S) stereocenters are assigned according to the Cahn-Ingold-Prelog convention. T

11) (5pts) For the branched amino acid *Isoleucine* shown below, determine:



- a) The number of Carbons. **6**
- b) The number of Hydrogens. **13**
- c) The number of π bonds. **1**
- d) The number of chiral centers. **2**
- e) Based on your answer to (d) – how many different stereoisomers fit the above (imprecise) structural representation?

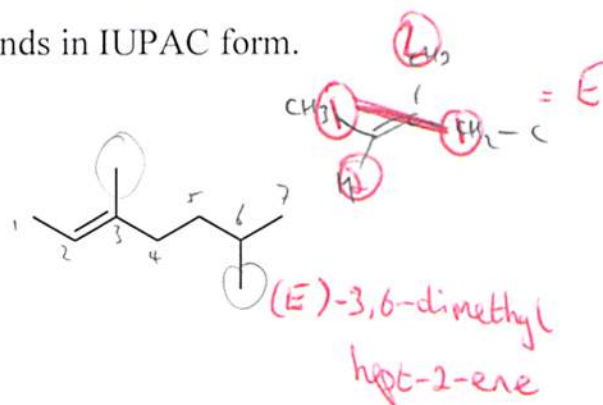
$$2^2 = 4$$

12) (3+4=7pts) Name these two compounds in IUPAC form.

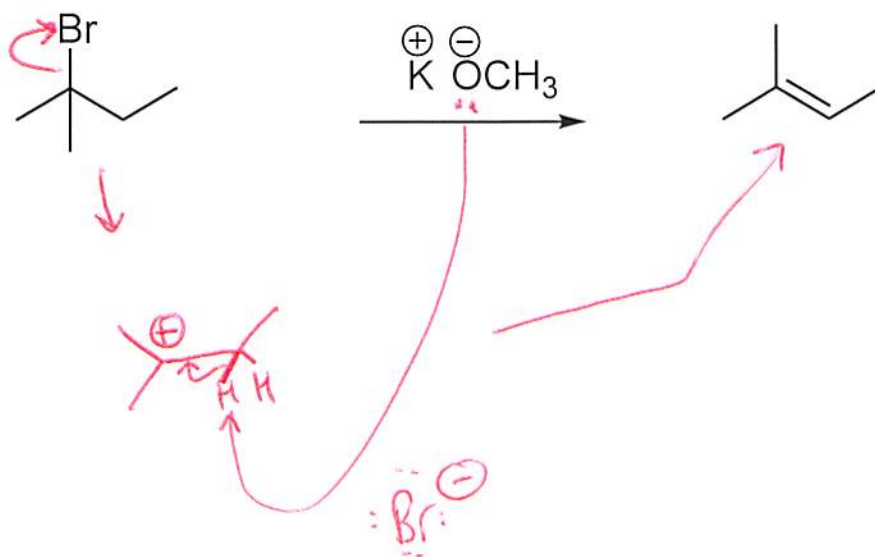


Trans-1,2-dichloro cyclopropane

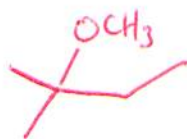
[+1 if you add (1S,2S)]



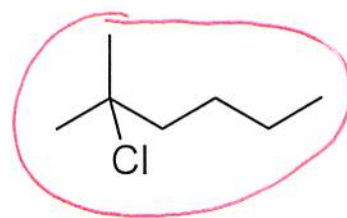
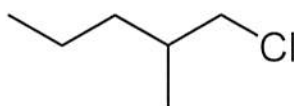
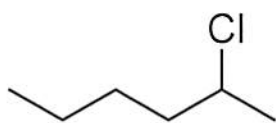
13) (3pts) i) Write a mechanism (i.e. curly arrows) for this E1 elimination.



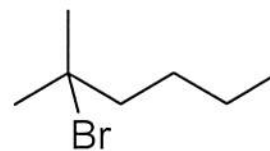
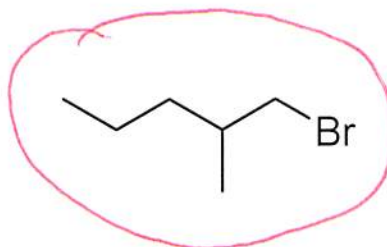
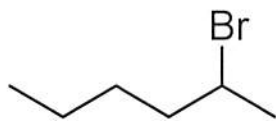
ii) (1pt) Draw a possible product that would be formed in this reaction, if it was a substitution (and not an elimination).



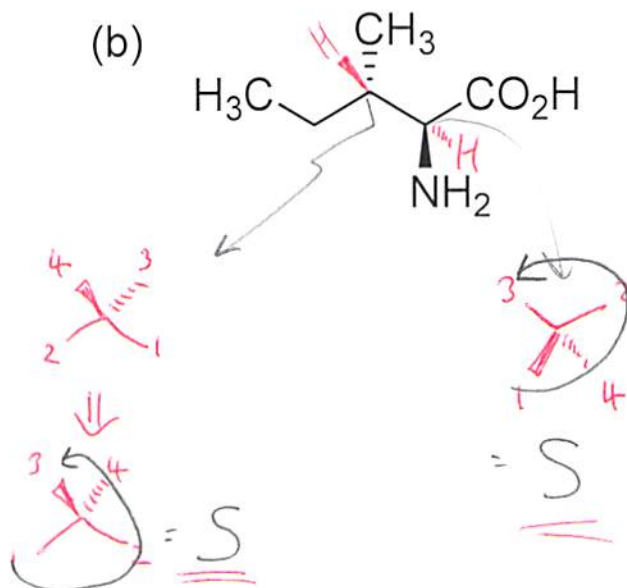
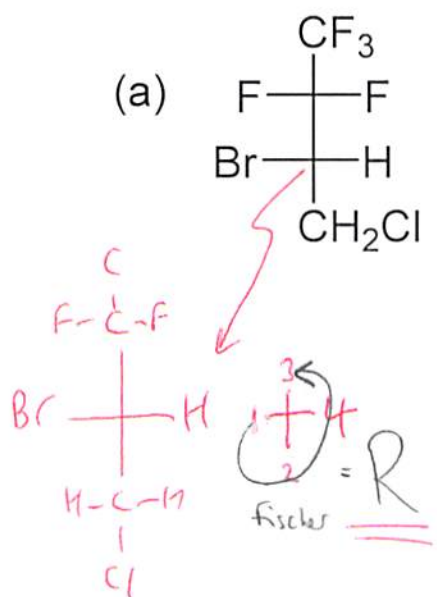
14) (1pt) Circle the molecule in this trio that would undergo $\text{S}_{\text{N}}1$ reaction with fastest rate.



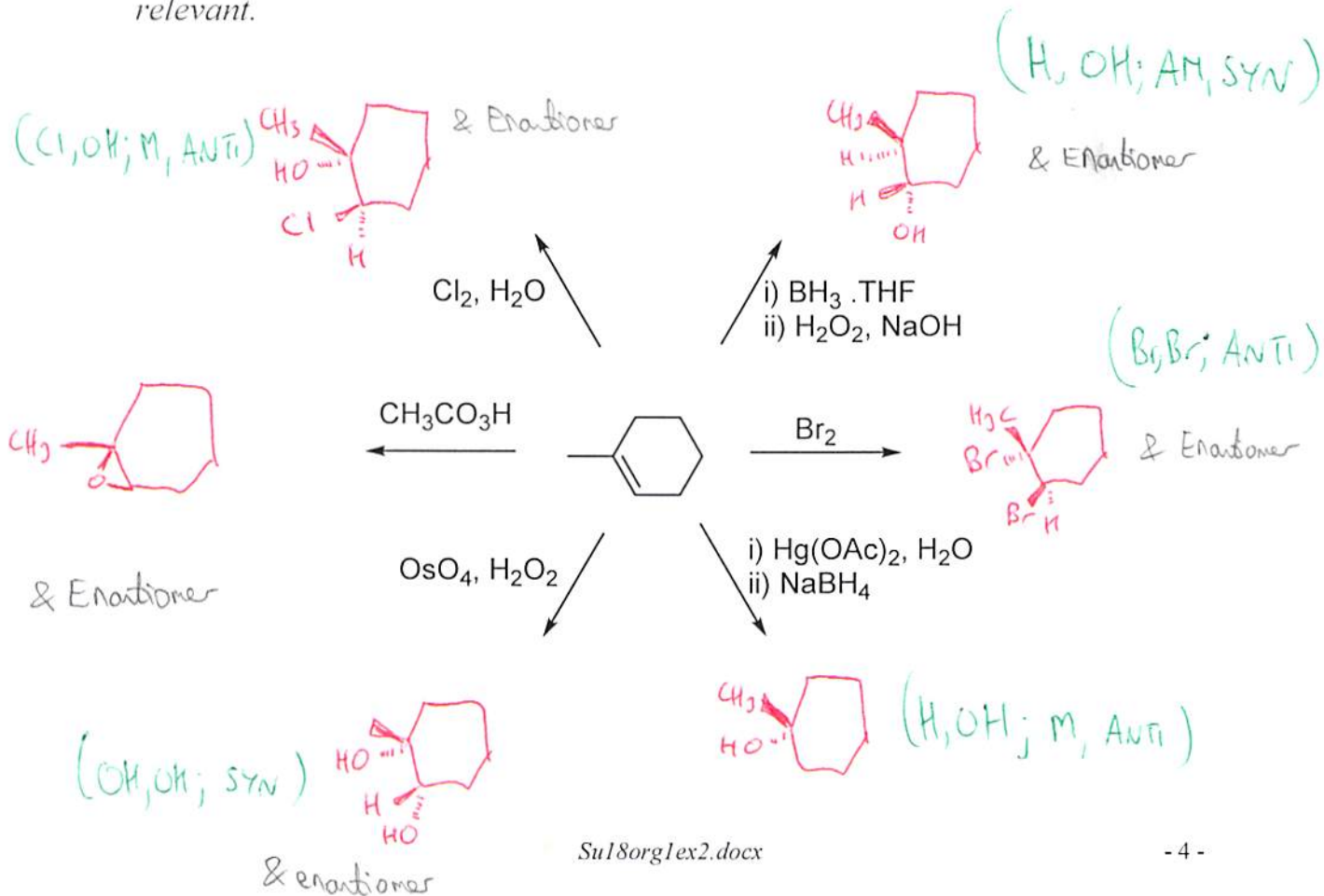
15) (1pt) Circle the molecule in this trio that would undergo $\text{S}_{\text{N}}2$ reaction with the fastest rate.



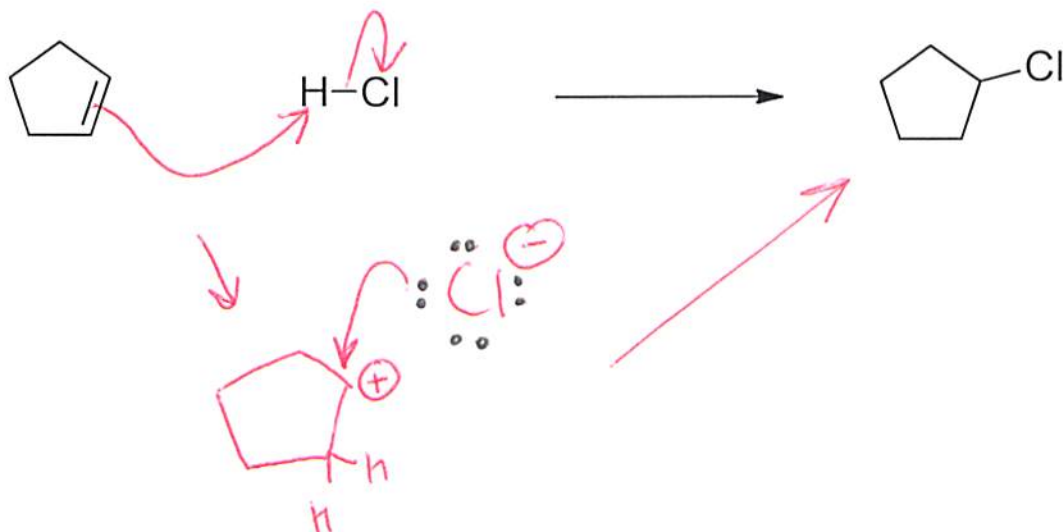
16) (6pts) Assign (R) or (S) to every chiral center in the following molecules.



17) (12pts) Give the products formed in the following transformations of the below cyclic alkene, paying attention to stereo- and regio-chemistry where relevant.



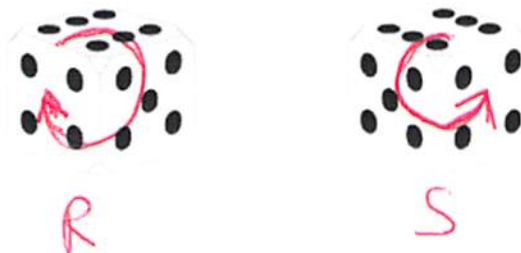
18) (4pts) Draw the mechanism (i.e. *using curly arrows*) for this electrophilic addition of hydrogen chloride to cyclopentene.



****Up to TWO BONUS POINTS****

Normal 6 sided dice are *chiral*. Atlantic City casinos only use the R enantiomeric form of dice at their craps tables (craps is a dice throwing gambling activity).

You can actually apply your chirality assigning skills to tell which is which. So for the two dice below, indicate which is (R) and which is (S), and explain how you arrived at the assignment.



Treat the numbers as 'priorities', eg 6 = highest, 1 = lowest. Then with the lowest priority pointing away from you, draw an arrow from 6 → 5 → 4, & clockwise = R.