

## Dan THE Tutor's Chem 233 Review Session Part 1

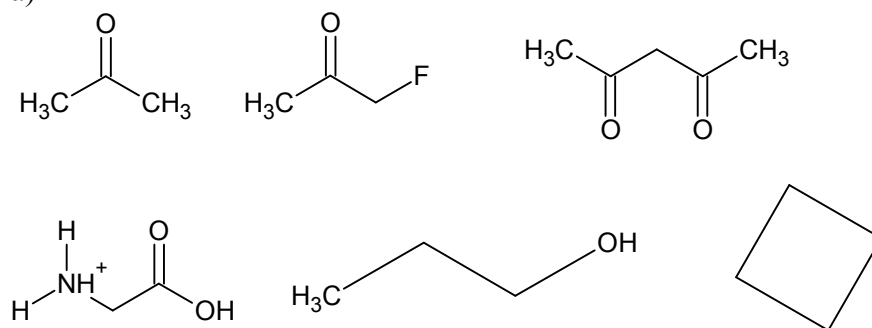
1.

Rank the boiling points of the following molecules from lowest to highest. State which of the intermolecular attraction forces is dominant (Van der Waal's, polar forces, hydrogen bonding, electrostatic).

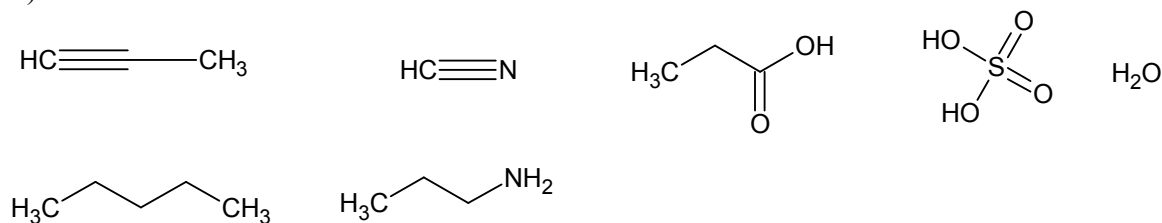
sodium methoxide, butane, isobutane, dimethyl ether, ethanol, methane, acetic acid.

2. Rank the Acidities of the following compounds from lowest to highest.

a)

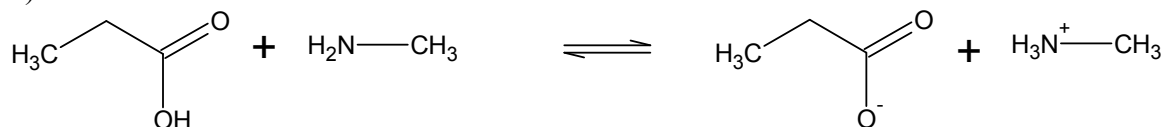


b)

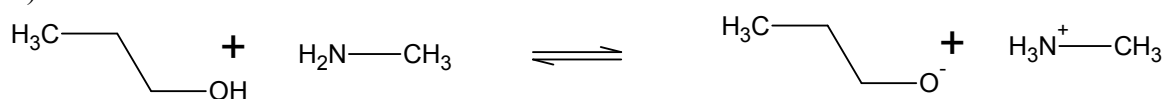


3. Determine whether the products or reagents are favoured in the following chemical reactions.

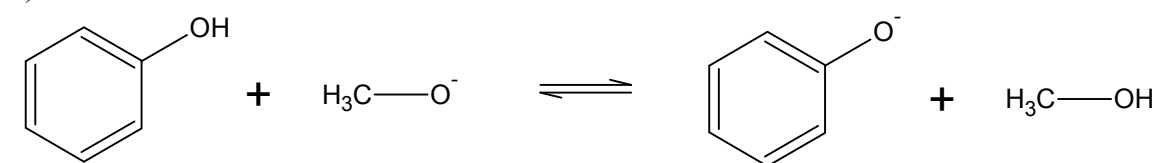
a)



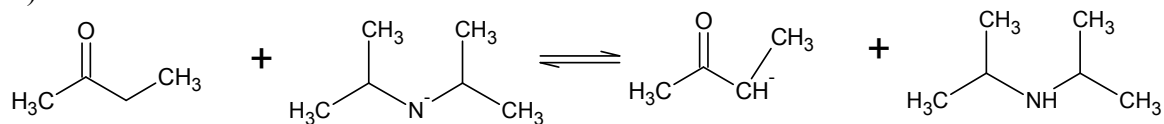
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c)



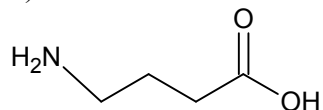
d)



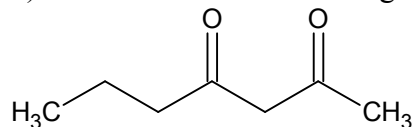
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4.

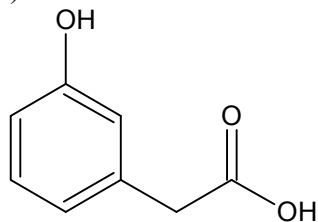
a) What will the overall charge of the following molecule be at pH 1, pH 7, pH 12.



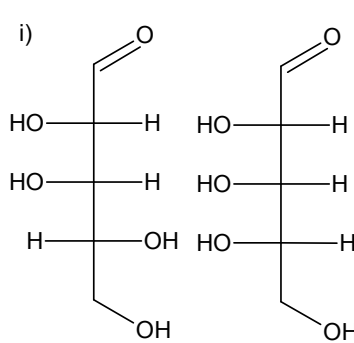
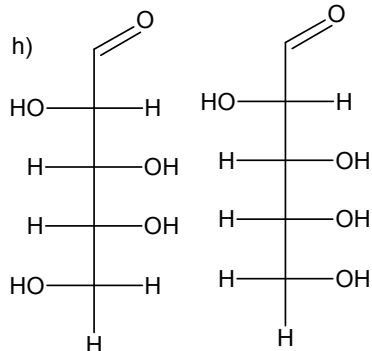
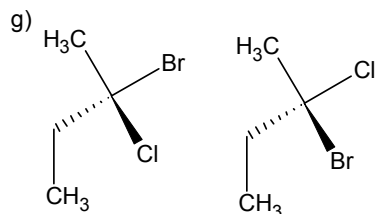
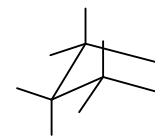
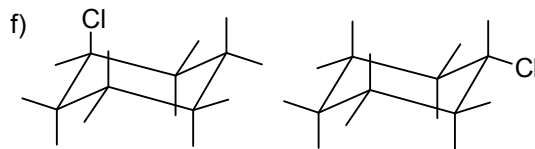
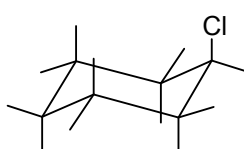
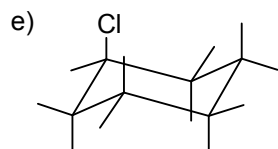
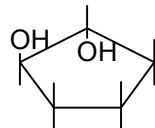
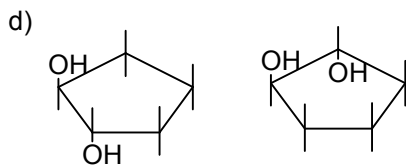
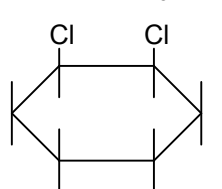
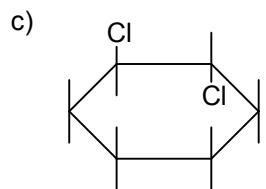
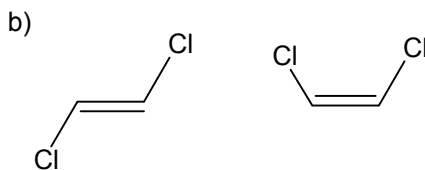
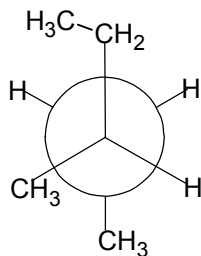
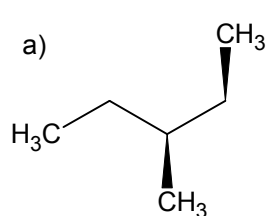
b) What will the overall charge of the following molecule be at pH 7, pH 12.



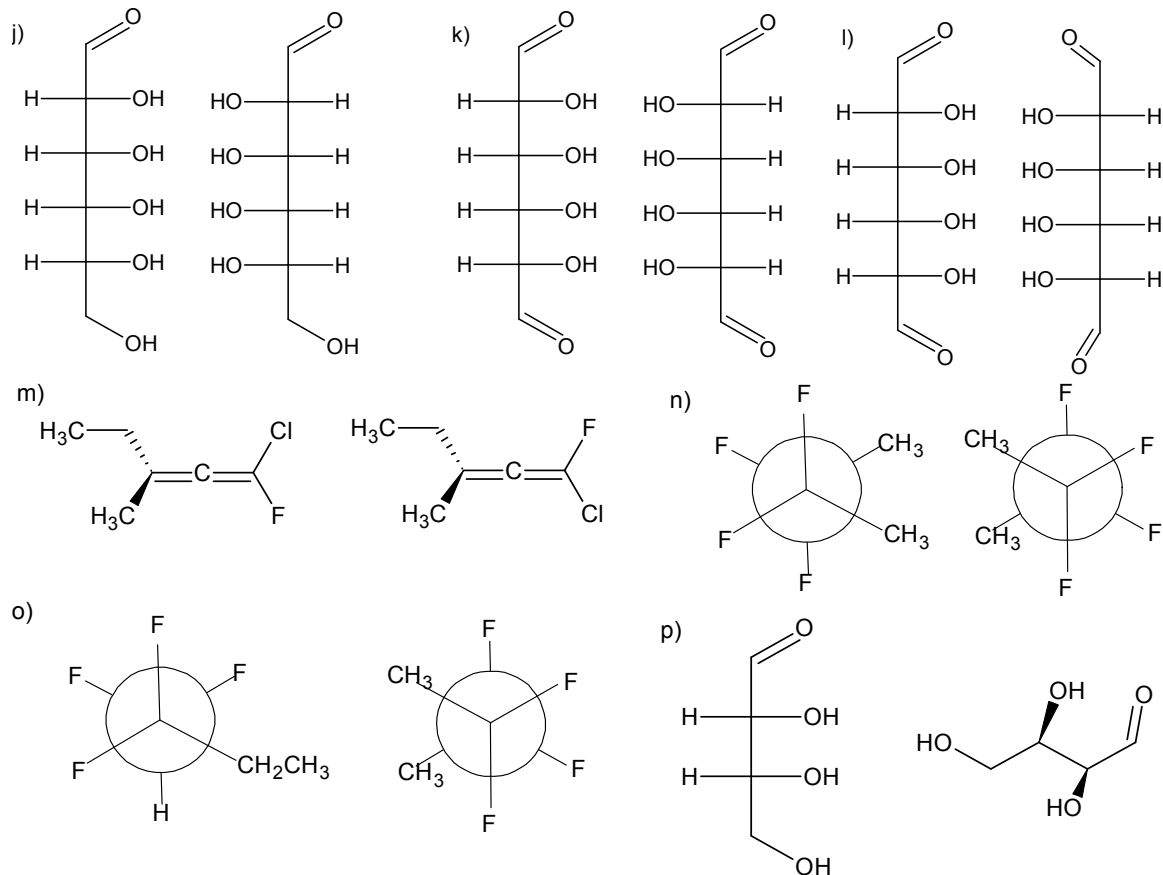
c) What will the overall charge of the following molecule be at pH 1, pH 7, pH 12.



5. Determine the relationship between the following pairs of molecules. Your choices are: constitutional isomers, enantiomers, diastereomers, identical, conformers.



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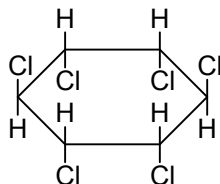


6.

a) Draw all the possible stereoisomers of dichlorocyclopropane. Indicate whether each is non-chiral or chiral. If any are meso, indicate so. Indicate whether any of the stereoisomers are enantiomers of each other.

b) How many stereoisomers of 1,2,4-trifluoro-cyclopentane are theoretically possible. In actual fact, how many are possible. Draw them all. Indicate whether each is non-chiral or chiral. If any are meso, indicate so. Indicate whether any of the stereoisomers are enantiomers of each other.

7. Lindane is a chloroalkane formerly used in the treatment of scabies. (Scabies is a rash caused by the mite *Sarcoptes scabiei* which usually enters the skin at the hands or other places of interpersonal contact – that's me being polite.) The structure of lindane is as follows:



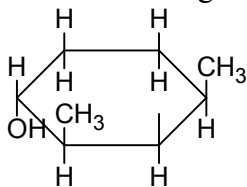
a) Is lindane chiral?

b) Draw lindane in its two respective chair conformations and circle the one that is more stable, if any.

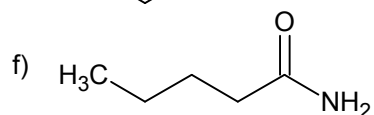
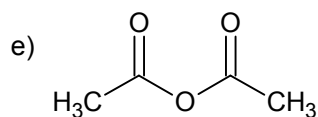
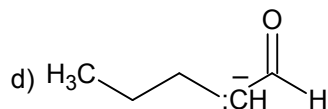
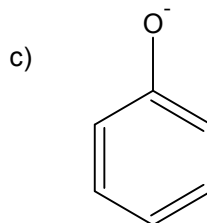
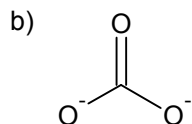
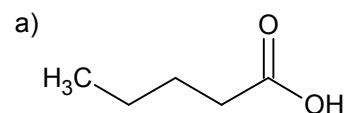
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8.

a) Draw the cyclohexane chair conformers of the following molecule and circle the more stable one:

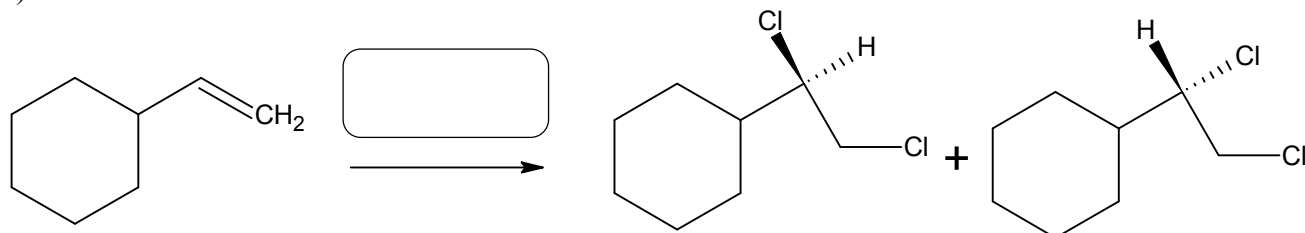


9. Draw all reasonable resonance structures of the following molecules.

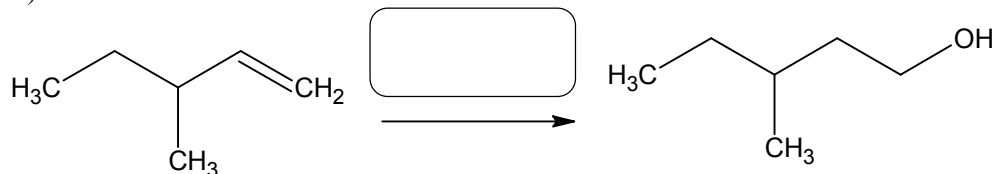


10. Fill in the blanks in the following chemical reactions. If there is no reaction simply state: “no reaction”.

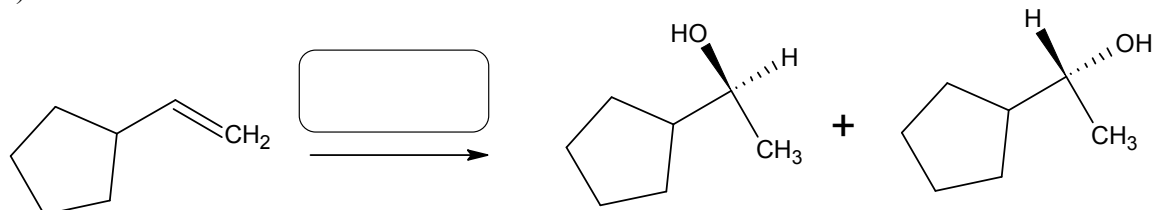
a)



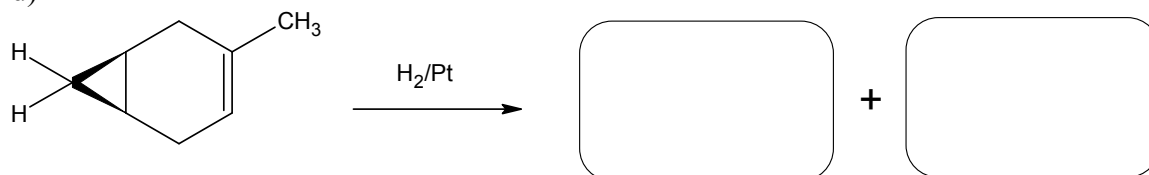
b)



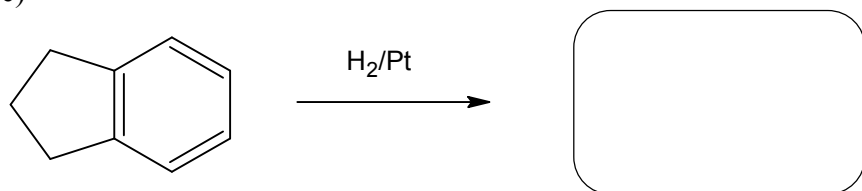
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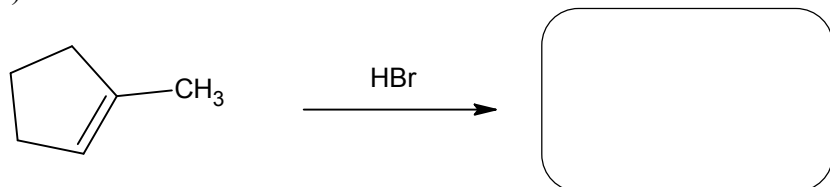
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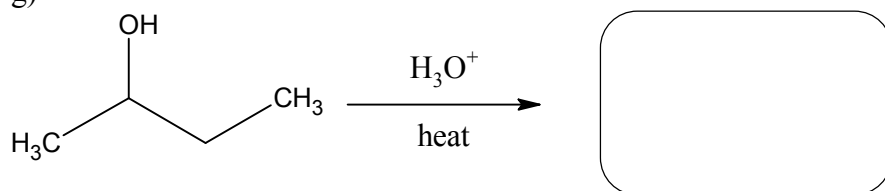
e)



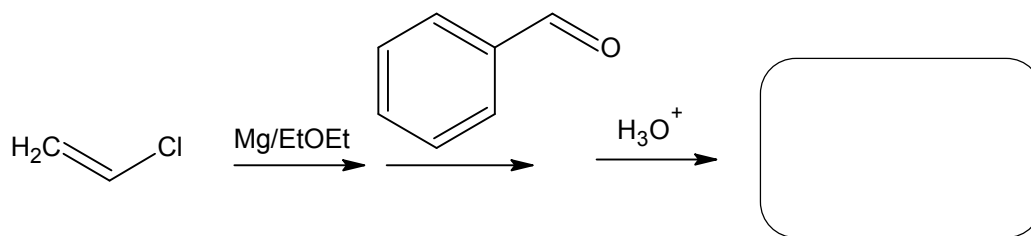
f)



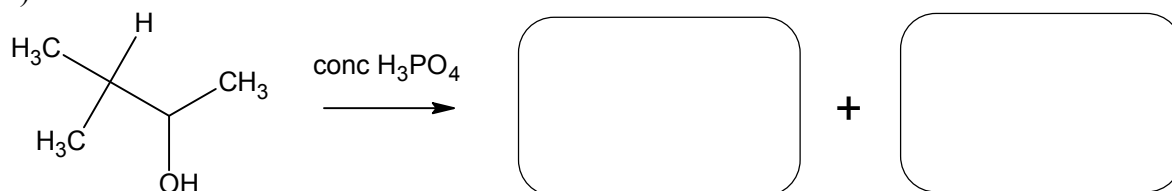
g)



h)



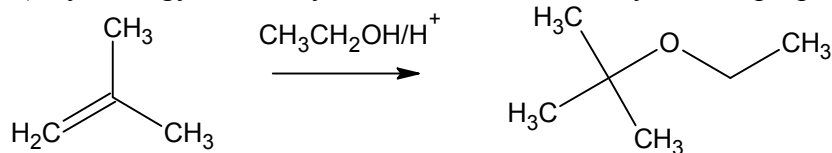
i)



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a) Show mechanistically why cis-2-butene reacts with  $\text{Br}_2$  to give two products whereas trans-2-butene gives only one product.

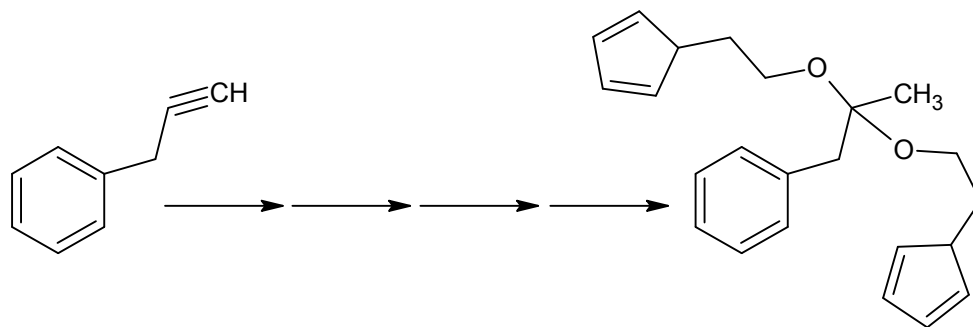
b) By analogy to what you know about alkene hydration, propose a mechanism for the following:



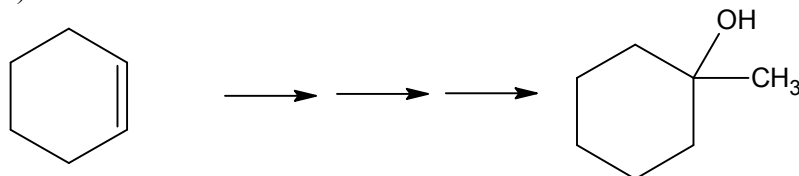
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12. Propose a synthesis for the following (uses reactions from other parts of the course than are covered today). You may use as many steps as you wish and any organic or inorganic reagents.

a)



b)



13. Determine the structures of the unknown compounds.

A solution of compound A,  $C_7H_{12}$ , will cause the disappearance of the brown coloration when  $Br_2$  solution is added dropwise. This reaction is determined to occur in a one to one molar ratio and produces an optically inactive mixture of B and C. Treatment of A with  $H_2O$  with and catalyst yields D which is not optically active and is resistant to the oxidizing effect of  $KMnO_4$ . However, catalytic hydrogenation of A yields ethylcyclopentane.