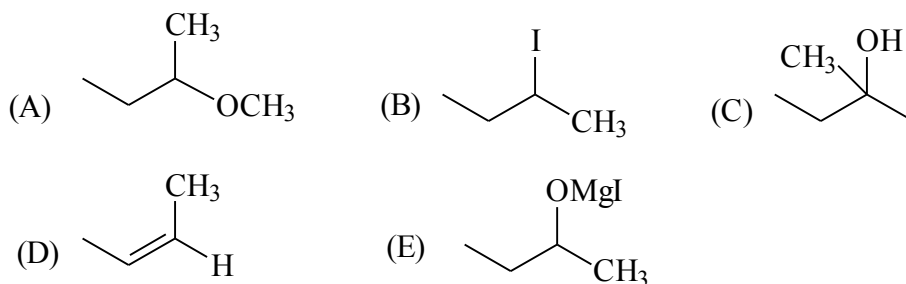
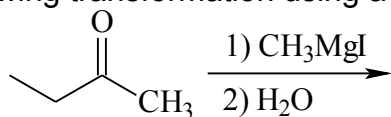
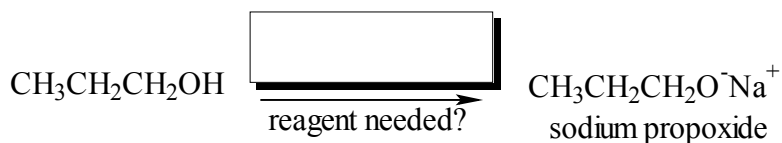


4. The following transformation using a Grignard reagent will yield:



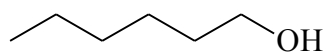
Typical example of negative attacking positive. (C).

5. Alkoxides are useful reagents in organic synthesis. Complete the following alkoxide formation by providing an appropriate reagent.

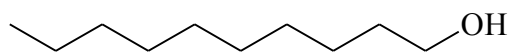


A stronger base than sodium propoxide, or use sodium metal.

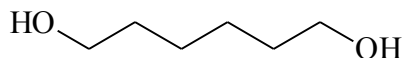
6. Which of the following compounds is expected to have the greatest solubility in water?



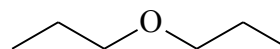
(A)



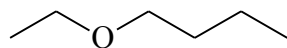
(B)



(C)



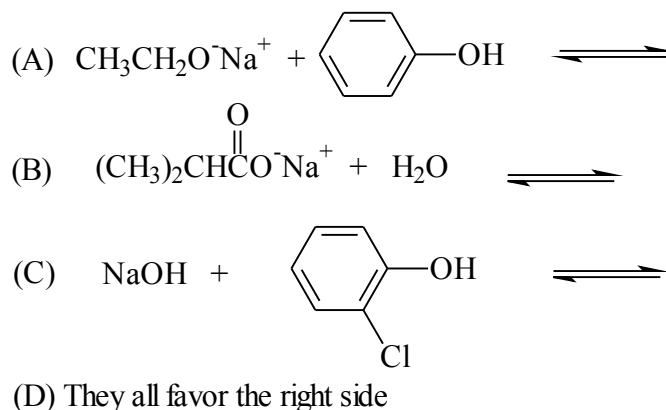
(D)



(E)

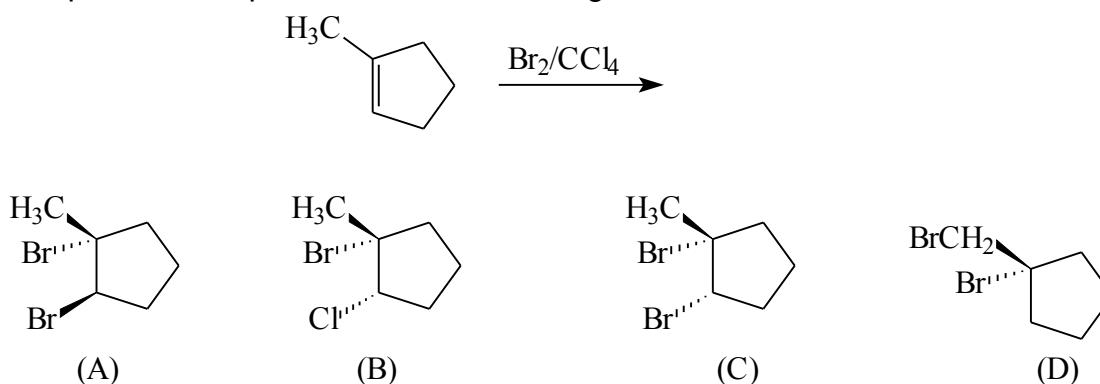
Solubility is increase by # of OH present due to increased hydrogen bonding ability. (C)

7. Which of the following acid-base reactions is expected to favor the reactant side (left side)?



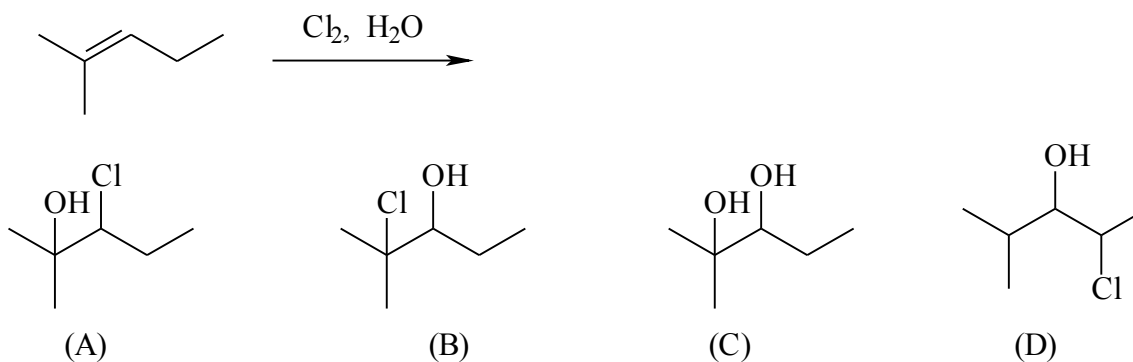
Draw the products for each typical acid-base reaction. Based on charge stability one can conclude the relative strength of bases. Strong bases and acids go to weak bases and acids. (B)

8. Which product is expected from the following reaction?



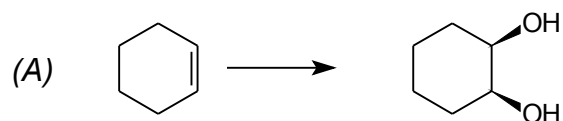
Addition of halogen to $\text{C}=\text{C}$ has anti chemistry due to formation of bromonium intermediate. (A)

9. Predict the major organic product expected from the following reaction:

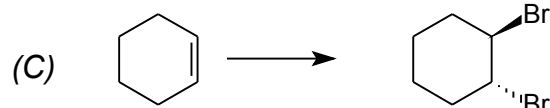
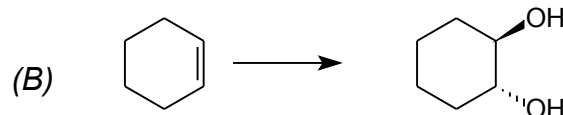


Similar to 8, but water attacks chloronium ion, leading to (A)

10. Which reagent would allow the formation of each desired product?



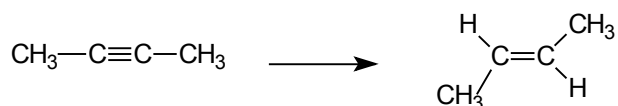
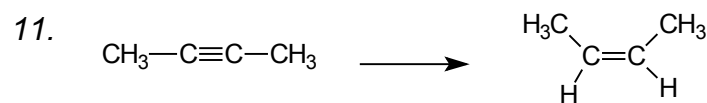
- 1) H₂O, NaOH
- 2) KMnO₄/NaOH
- 3) OsO₄/H₂O₂
- 4) O₃, then (CH₃)₂S
- 5) H₂O, H₂SO₄
- 6) i) CH₃CO₂OH, then ii) H₃O⁺
- 7) 2 HBr
- 8) Br₂
- 9) Br₂/H₂O



(A): *syn* dihydroxylation can be done with 2) or 3)

(B) *anti* dihydroxylation is done by forming cyclohexene epoxide, followed by ring opening with acidic water to *anti* stereochemistry. 6)

(C) 8) allows *anti* addition of bromine to the double bond.



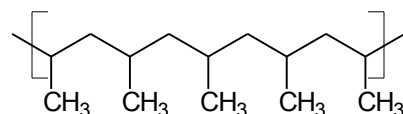
- 1) H₂/Pt
- 2) H₂O, H⁺
- 3) H₂/Pd/Quinoline
- 4) Na/NH₃(liq)
- 5) i) HCl, ii) H₂/Pt, iii) NaOCH₃

Cis addition of H₂ is done by poisoned catalyst. 3)

Trans addition can be achieved by Na reduction in liquid ammonia. 4)

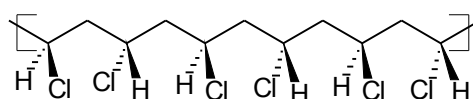
5) would give a mixture of both products.

12. Which monomer can be used to prepare the following polymer:



The monomer is propylene unit.

13. What type of tacticity does the following PVC polymer have?



Syndiotactic.

End of Part 1

Part 2:

1. Explain why ethylene glycol is a good coolant in the summer for our cars, while water alone is not. (explain from the chemistry point of view)

A much higher B.P. than 100°C is needed. Ethylene glycol has two OH's that increases its bp dramatically. (look it up and see how high that is)

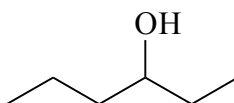
1A. Explain why a cycloheptene (very unstable though) can be made but cycloheptyne has never been made.

Triple bond carbons are sp hybridized, or linear. A small ring would not have enough carbons to allow for flexible arrangement, ie strain is too high.

2. Explain why the H's in ethyne are considerably more acidic than those in ethane. Illustrate your point with chemical equations.

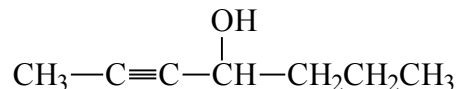
The terminal H on triple bonded carbon is more acidic because its conjugated base, the acetylenide ion has a negative charge (e's) in the sp orbital. The more s character the closer to the nucleus. Therefore the negative charge in acetylenide is more stable— weaker base—strong conjugated acid (which is ethyne)

3. Starting from organic compounds with 4 or less carbons and any other inorganic reagents, synthesize the following molecule. Indicate clearly what reagents are needed in each step. (Hint: try retrosynthetic analysis)



Many ways of doing this. To form carbon carbon bond, one often needs carbon negative—organometallic reagents. Use Grignard and add it to aldehyde or ketone as appropriate.

4. Show how you would synthesize the following compound, beginning with acetylene and any other necessary reagents.



Similar to the above analysis. The anion has negative charge on the triple bonded carbon.