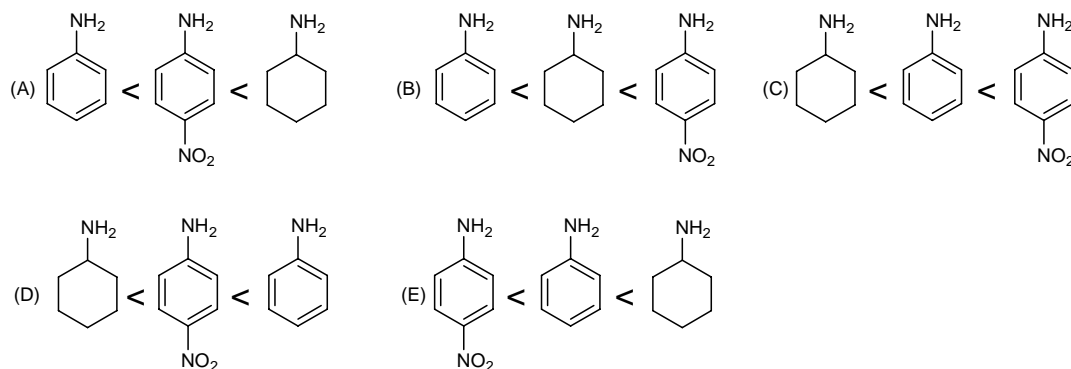
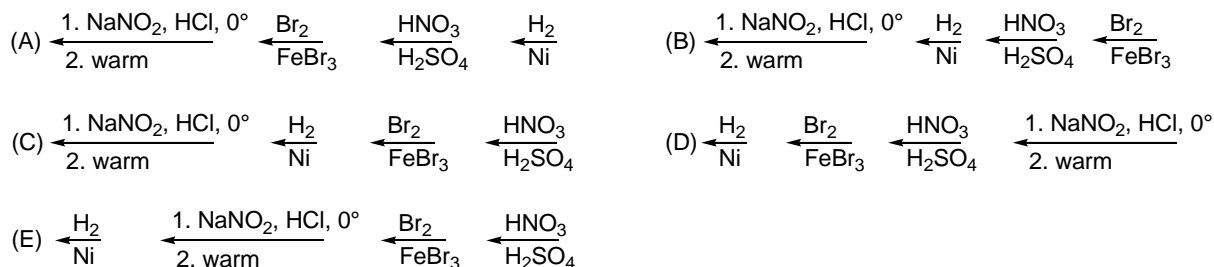
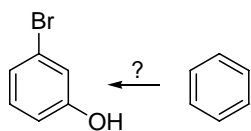


Multiple Choice Questions. 60 points Select the best answer to each of the questions.

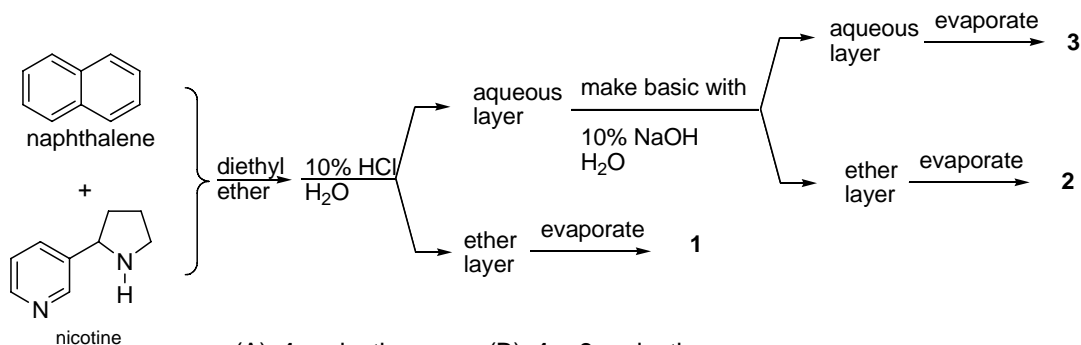
1. Choose the order that has the following amines arranged correctly with respect to increasing basicity (most basic on right).



2. Choose the best reaction sequence that would give 3-bromophenol from benzene.



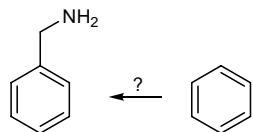
3. In the following extraction procedure choose the number where nicotine would be found.



- (A) 1 = nicotine (B) 1 + 3 = nicotine
 (C) 2 = nicotine (D) 2 + 3 = nicotine
 (E) 3 = nicotine

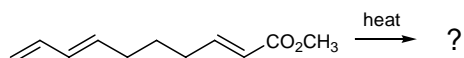
Source

4. Choose the best reaction sequence that would prepare benzyl amine from benzene.



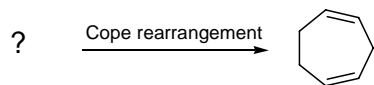
- (A) $\xleftarrow[2. \text{H}_3\text{O}^{\oplus}]{1. \text{CO}_2}$ $\xleftarrow[\text{FeBr}_3]{\text{Br}_2}$ $\xleftarrow{\text{Mg}}$ $\xleftarrow{\text{SOCl}_2}$ $\xleftarrow{\text{NH}_3}$ $\xleftarrow[2. \text{H}_2\text{O}]{1. \text{LiAlH}_4}$ (B) $\xleftarrow[2. \text{H}_2\text{O}]{1. \text{LiAlH}_4}$ $\xleftarrow{\text{NH}_3}$ $\xleftarrow{\text{SOCl}_2}$ $\xleftarrow[2. \text{H}_3\text{O}^{\oplus}]{1. \text{CO}_2}$ $\xleftarrow{\text{Mg}}$ $\xleftarrow[\text{FeBr}_3]{\text{Br}_2}$
- (C) $\xleftarrow{\text{NH}_3}$ $\xleftarrow[2. \text{H}_2\text{O}]{1. \text{LiAlH}_4}$ $\xleftarrow{\text{SOCl}_2}$ $\xleftarrow{\text{Mg}}$ $\xleftarrow[\text{FeBr}_3]{\text{Br}_2}$ $\xleftarrow[2. \text{H}_3\text{O}^{\oplus}]{1. \text{CO}_2}$ (D) $\xleftarrow[2. \text{H}_2\text{O}]{1. \text{LiAlH}_4}$ $\xleftarrow{\text{NH}_3}$ $\xleftarrow{\text{SOCl}_2}$ $\xleftarrow{\text{Mg}}$ $\xleftarrow[\text{FeBr}_3]{\text{Br}_2}$ $\xleftarrow[2. \text{H}_3\text{O}^{\oplus}]{1. \text{CO}_2}$
- (E) $\xleftarrow{\text{NH}_3}$ $\xleftarrow[\text{FeBr}_3]{\text{Br}_2}$ $\xleftarrow{\text{SOCl}_2}$ $\xleftarrow{\text{Mg}}$ $\xleftarrow[2. \text{H}_2\text{O}]{1. \text{LiAlH}_4}$ $\xleftarrow[2. \text{H}_3\text{O}^{\oplus}]{1. \text{CO}_2}$

5. Predict the major product of the following Diels-Alder reaction.



- (A)
- (B)
- (C)
- (D)
- (E)

6. Choose the reactant that would give the following Cope rearranged product.



- (A)
- (B)
- (C)
- (D)
- (E)

7. Below are the molecular orbitals for butadiene and ethylene. Choose the highest occupied molecular orbital of butadiene and the lowest unoccupied orbital of ethylene.



A = 1 and 5

B = 2 and 5

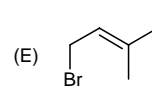
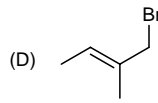
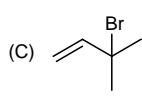
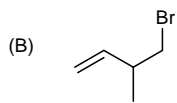
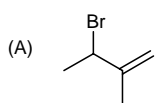
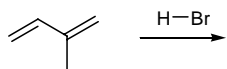
C = 3 and 5

D = 4 and 6

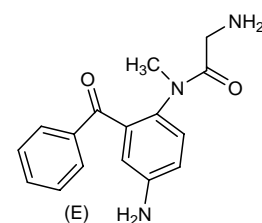
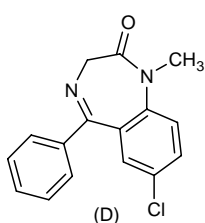
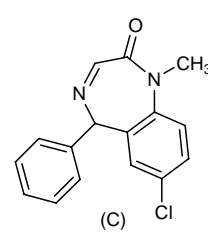
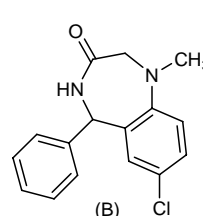
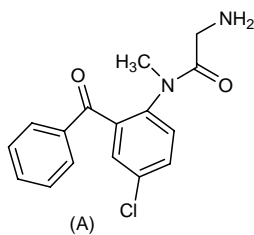
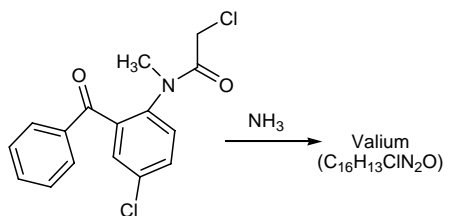
E = 2 and 6

Source

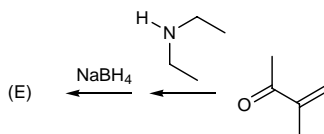
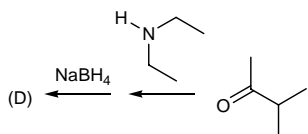
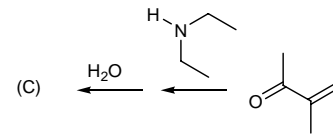
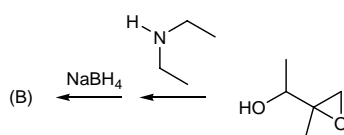
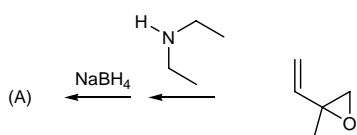
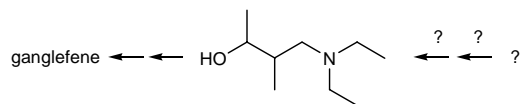
8. Choose the major product of 1,4-addition of H-Br to 2-methyl-1,3-butadiene.



9. The last step in the synthesis of Valium® is treatment of the following aromatic compound with NH₃. Choose the correct structure of Valium®.

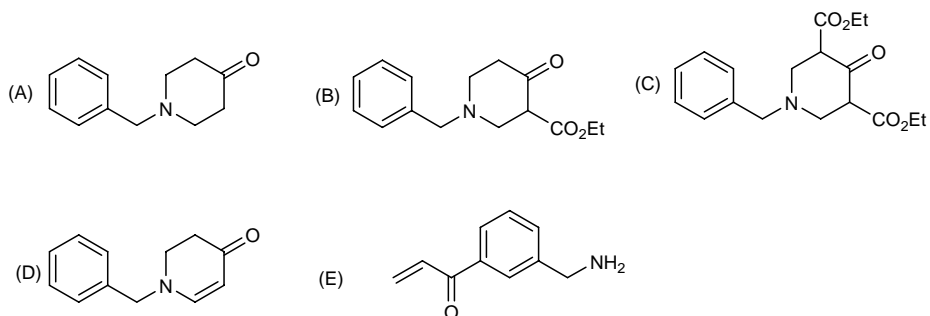
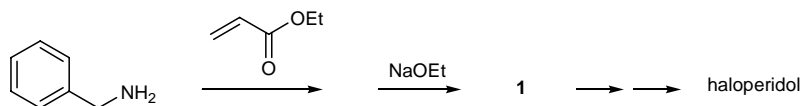


10. Choose the reaction sequence that would lead to a key intermediate in the synthesis of the coronary vasodilator gangliefene.

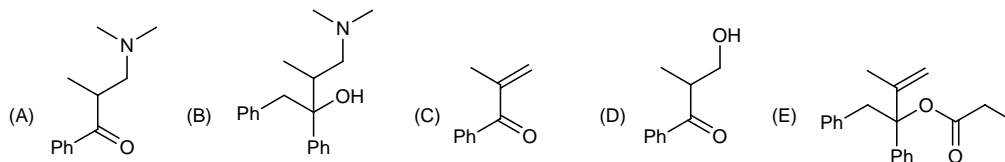
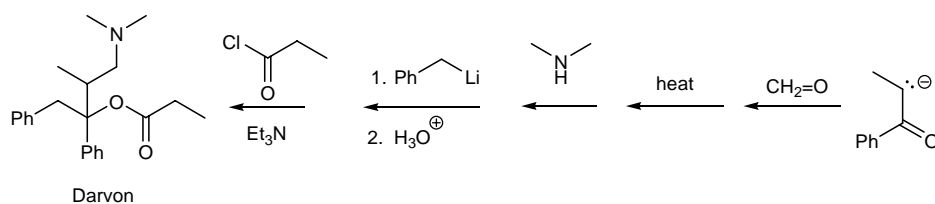


Source

11. Choose the correct structure for the product **1** involved in the following reaction sequence for the preparation of antipsychotic drug haloperidol.

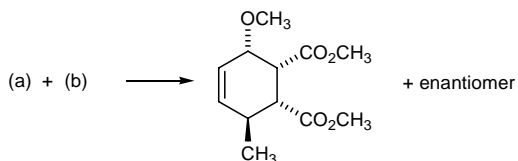


12. Choose the compound that is not an intermediate structure in the following synthesis of Darvon.



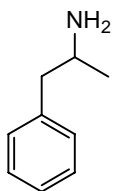
Short Answer Questions. 40 points.

13. Give the structure of the diene (a) and the dienophile (b) that would produce the following Diels-Alder product. (8 points)



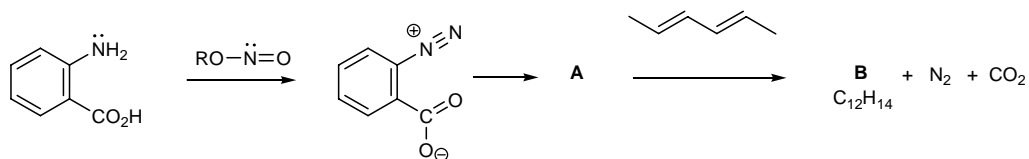
14. Give an acceptable structure for 1-aminomethylcyclohexanol. (4 points)

15. Give an acceptable name for the following amine. (4 points)

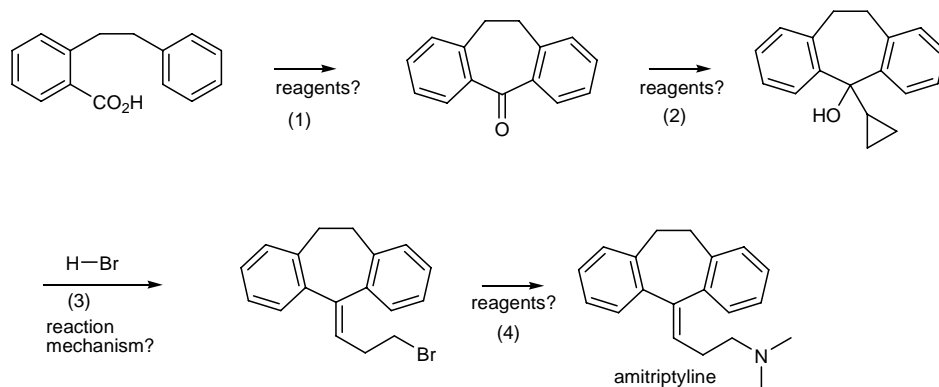


Source

16. Diazonium compounds can be prepared in non aqueous solutions using esters of nitric acid ($\text{RON}=\text{O}$). When the following diazonium ion is warmed in the presence of 2, 4-hexadiene compound an unstable intermediate **A** is produced followed by a reaction with 2, 4-hexadiene to give **B**. Give the structure of compound **A** and **B** clearly showing stereochemistry if present. (8 points)



Below is shown a synthesis of amitriptyline, an antidepressant known to inhibit the re-uptake of norepinephrine.



17. Give the best reagents for performing the transformations 1, 2, and 4. (9 points)
18. Using the curved arrow formalism for showing the bond making and bond breaking give a good reaction mechanism for transformation 3. (7 points)