CHEM 234 — the exam cover sheets look kind of like this — Ian R. Gould

PRINTED **FIRST** NAME _____ *PRINTED* **LAST** NAME _____ *ASU ID or Posting ID* _____

*Person on your **LEFT** (or **Aisle**)* _____ *Person on your **RIGHT** (or **Aisle**)* _____

- ***PRINT YOUR NAME ON EACH PAGE!***
- ***READ THE DIRECTIONS CAREFULLY!***
- ***USE BLANK PAGES AS SCRATCH PAPER***
  work on blank pages will not be graded...
- ***WRITE CLEARLY!***
- ***MOLECULAR MODELS ARE ALLOWED***
- ***DO NOT USE RED INK***
- ***DON'T CHEAT, USE COMMON SENSE!***

THIS IS A CHM 234
PRACTICE EXAM

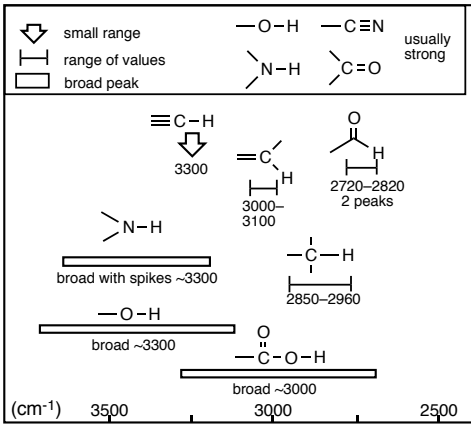
MIDTERM #3
PRACTICE TEST #1

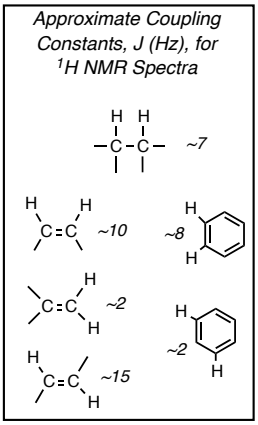
Extra Credit_____/5 **Total (incl Extra)_____/175+5**

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn

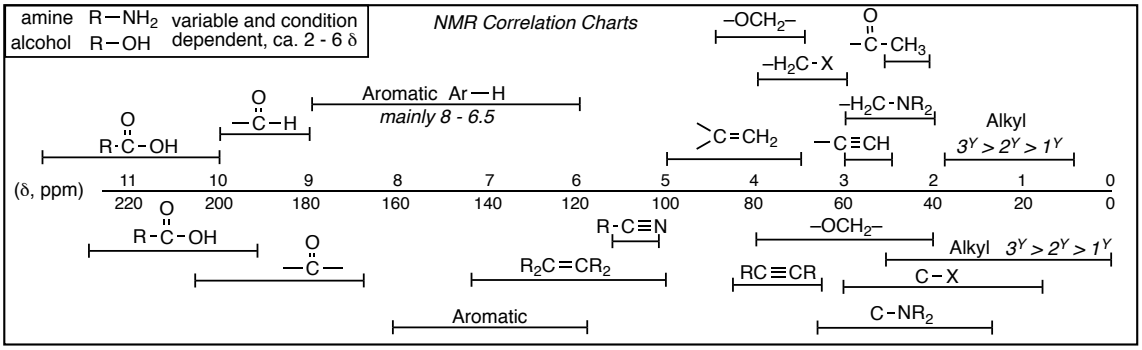
Interaction Energies, kcal/mol

Eclipsing		Gauche	
H/H	~1.0	Me/Me	~0.9
H/Me	~1.4	Et/Me	~0.95
Me/Me	~2.6	i-Pr/Me	~1.1
Me/Et	~2.9	t-Bu/Me	~2.7

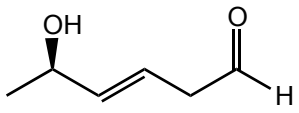




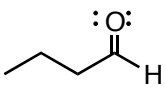
amine R—NH_2 variable and condition dependent, ca. 2 - 6 δ
alcohol R—OH

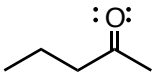


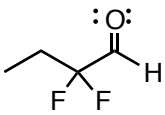
Question 1 Give the IUPAC name for the following compounds. Be sure to use cis/trans, E/Z or R/S where appropriate.



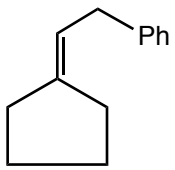
Question 2 Rank in order of increasing equilibrium constant for formation of an acetal with a brief explanation. Draw the expected acetal for one of the reactions (only), it does not matter which one.

A  MeOH ⇌ H^+ (cat.)

B  MeOH ⇌ H^+ (cat.)

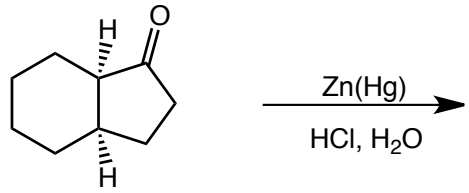
C  MeOH ⇌ H^+ (cat.)

Question 3 Give the alkyl bromide and the carbonyl compound you would use to synthesize the following alkene in a Wittig synthesis and show all steps and reagents/conditions

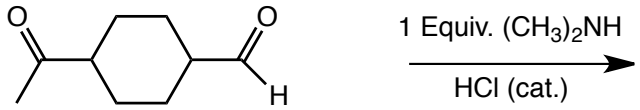


Question 4 For each reaction
a) Provide the missing **reagents/conditions or major organic products as appropriate,** pay attention to stereochemistry including racemic mixtures unless specified
b) Unless otherwise indicated.....
State whether the OVERALL reaction is Addition, Elimination, Substitution or Rearrangement
State whether the reaction is oxidation, reduction or neither
Briefly explain whether the a solution of the product would be optically active or not

a)

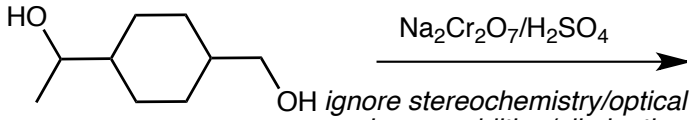


b)



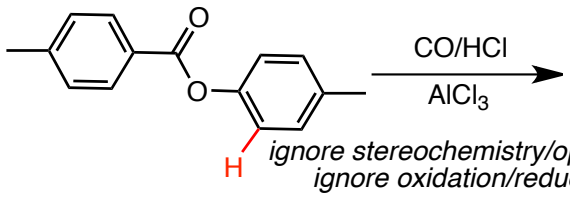
ignore stereochemistry/optical activity
ignore oxidation/reduction
ignore addition/elimination etc

c)



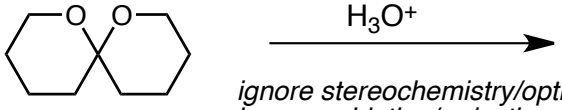
ignore stereochemistry/optical activity
ignore addition/elimination etc.

d)



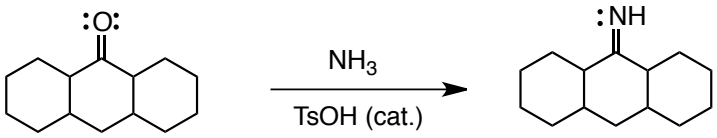
ignore stereochemistry/optical activity
ignore oxidation/reduction etc.

e)



ignore stereochemistry/optical activity
ignore oxidation/reduction
ignore addition/elimination etc

Question 5 Draw the complete arrow pushing mechanism for the following reaction. Indicate the Lewis acid/base at each step, and if they are also Brønsted acids bases. Add non-bonding electrons as necessary. Draw the **ALL important** resonance structure of the intermediates

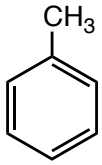


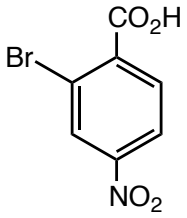
Question 6 Rank the following in terms of increasing rate of reaction with PhMgBr. Give a BRIEF explanation and NAME the three functional groups

___ < ___ < ___

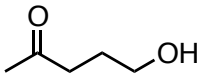
Question 7 Show how you would make the target molecules from the provided starting structures. Show all intermediate structures, do not show any mechanisms

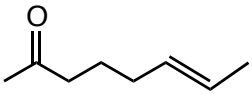
a)





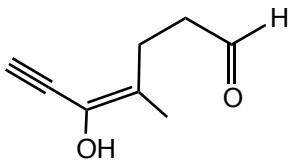
b)



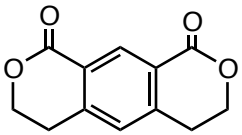


START OF PRACTICE TEST #2

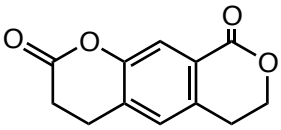
Question 1 Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



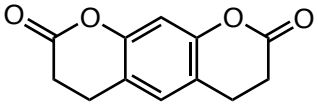
Question 2 Rank the following in terms of increasing rate of electrophilic aromatic substitution, e.g., reaction with HNO_3/H_2SO_4. Give a BRIEF explanation



A



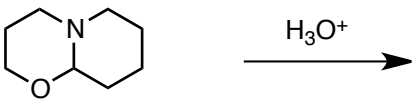
B



C

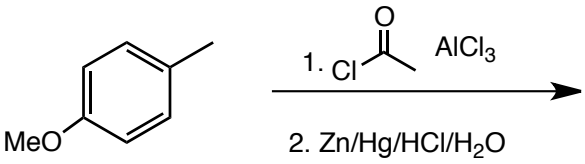
___ < ___ < ___

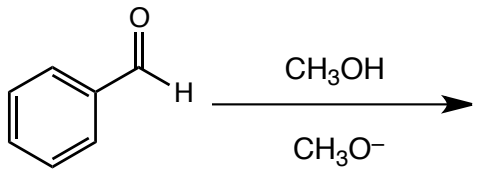
Question 3 Give the product of complet acid catalyzed hydrolysis of the following structure

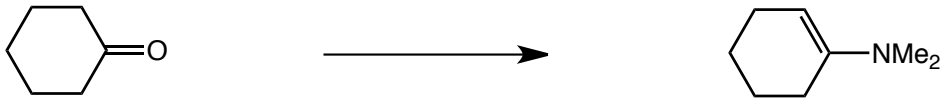


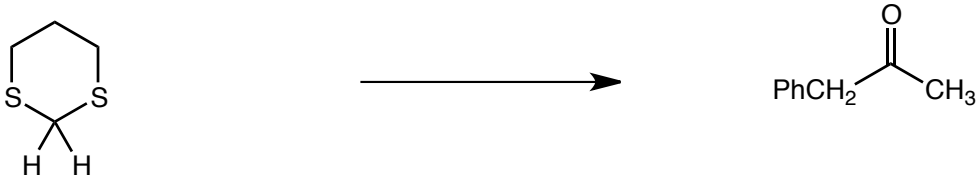
Question 4 For each reaction
a) Provide the missing **reagents/conditions or major organic products as appropriate,** pay attention to stereochemistry including racemic mixtures unless specified

a) 

b) 

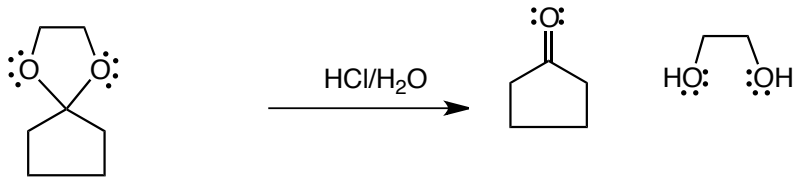
c) 

d) 

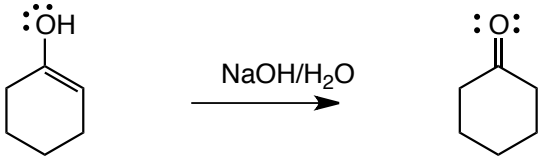
e) 

Question 5 Give a full curved arrow-pushing mechanism for the following reactions, show where every proton goes to and comes from (no $+H^+/-H^+$) and indicate the Lewis and Bronsted acids/bases at each intermolecular step, include important resonance contributors for all intermediates, give the number of steps in your mechanism.

a)

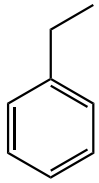


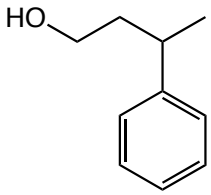
b)



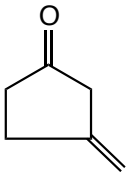
Question 6. Show how you would synthesize the target componds on the right from the starting compounds on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.

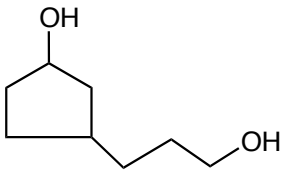
a)





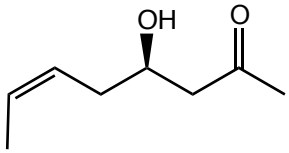
a)



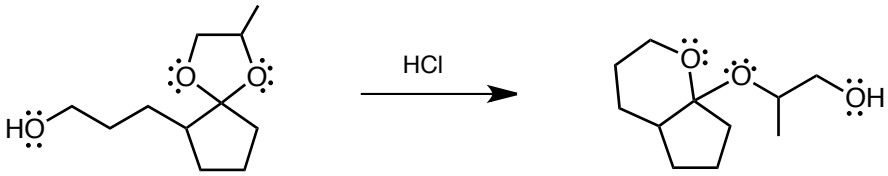


START OF PRACTICE TEST #3

Question 1 Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



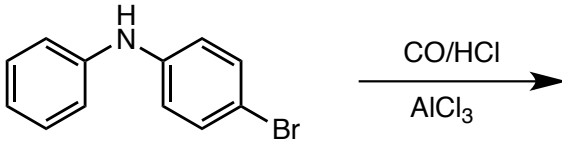
Question 2. Give a complete curved arrow pushing mechanism, and...
1) Indicate the Lewis acid/Lewis base (LA, LB) at each step as appropriate, and whether they are also Brønsted acids/bases (LA/BA, LB,BB), show where every proton comes from and goes to (no $+H^+/-H^+$)
2) GIVE THE NUMBER OF STEPS IN YOUR MECHANISM



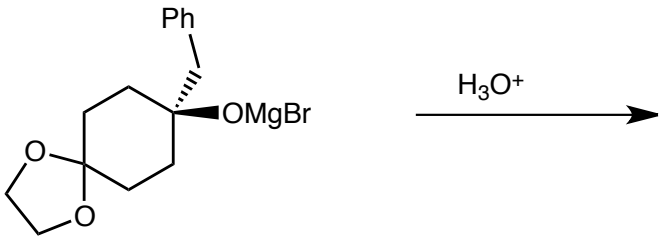
Question 3 For each reaction
1) Provide the missing **reagents/conditions or major organic products as appropriate**

a)

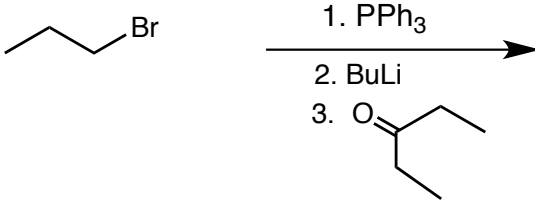
b)



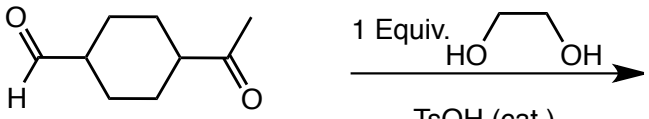
c)



d)

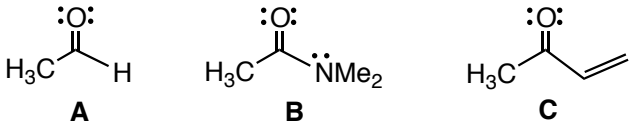


e)



ignore stereochemistry

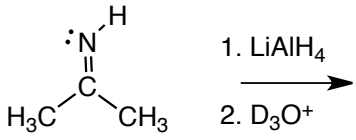
Question 4 Rank the following in terms of increasing frequency of carbonyl stretching vibration in an IR spectrum. To solve this problem you will ened to draw minor resonance contributors and remember that stronger bonds vibrate with higher frequency)



A **B** **C**

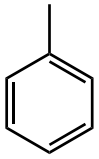
___ < ___ < ___

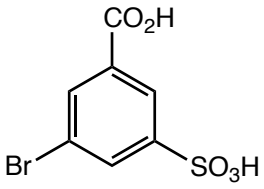
Question 5 Give the product of the following reaction. Remember that D represents deuterium, an isotope of hydrogen, that is used to keep track of where hydrogen atoms go in chemical reactions. We did not cover this reaction class, but you should be able to work it out based on what you know about the mechanisms of these reduction reactions



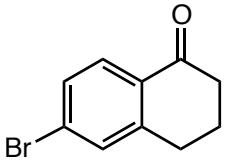
Question 6. Show how you would synthesize the target componds on the right from the starting compounds on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.

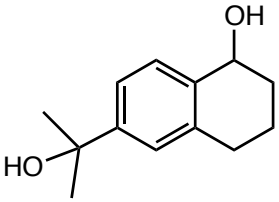
a)





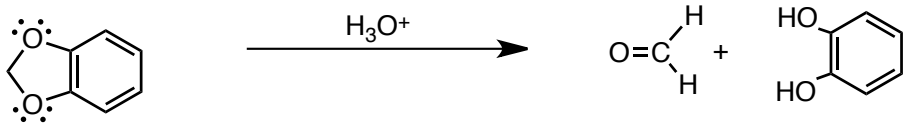
b)





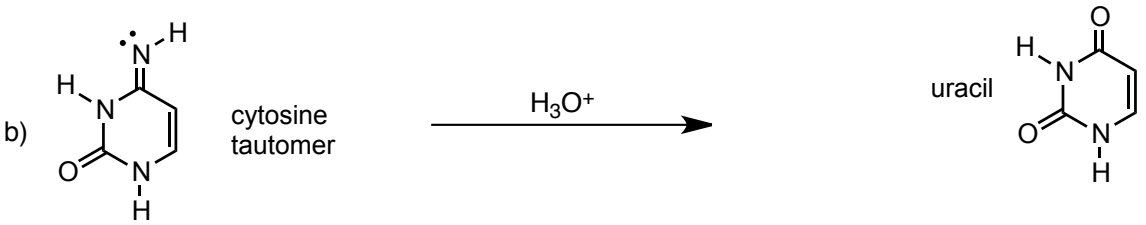
Question 7 Give a full curved arrow-pushing mechanism for the following reactions, show where every proton goes to and comes from (no $+H^+/-H^+$) and indicate the Lewis and Bronsted acids/bases at each intermolecular step, include important resonance contributors for all intermediates, give the number of steps in your mechanism.

a)



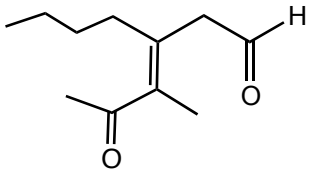
cytosine is one of the pyrimidine bases in DNA, it can be converted into uracil. if this happens this can be a damage mechanism that could lead to mutation. Assume that this reaction occurs via the usual acid catalyzed mechanisms that we study in class, give a mechanism for formation of uracil from teh provided tautomer of cytosine

b)

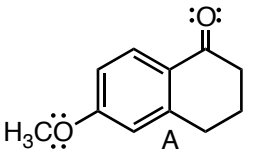


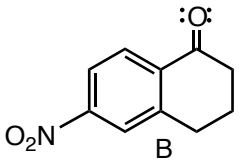
START OF PRACTICE TEST #4

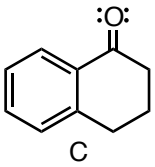
Question 1 Give the IUPAC name for the following compound. Be sure to use cis/trans, E/Z or R/S where appropriate.



Question 2 Rank the following in order of increasing equilibrium constant for formation of a hydrate. Give a BRIEF explanation

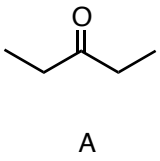


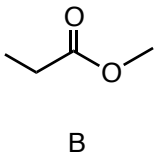


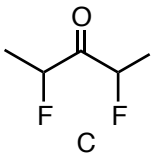


___ < ___ < ___

Question 3. Rank in order of increasing rate of reaction with $^{-}$CN, give a BRIEF explanation

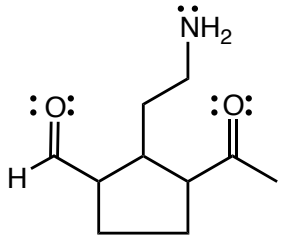




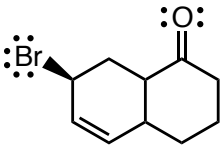


(fastest) ___ < ___ < ___ (slowest)

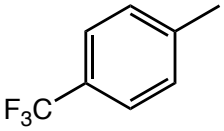
Question 4. For each reaction.
1) Provide the missing **reagents/conditions or major organic products as appropriate**
2) Pay attention to stereochemistry including racemic mixtures unless specified

a) 

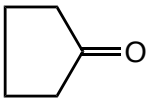
HCl (cat.) →

b) 

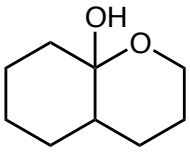
N_2H_4 / KOH/heat →

c) 

Br_2 / FeBr →

d) 

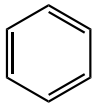
$(CH_3)_2NH$ / H^+ cat. →

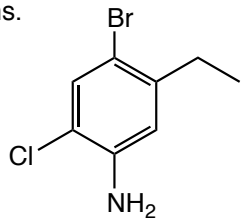
e) 

H_3O^+ →

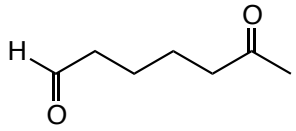
Question 5. Show how you would synthesize the target compound on the right from the starting compound on the left. Show reagents and conditions, and the structures of important intermediate compounds. Do not show any (arrow pushing) mechanisms.

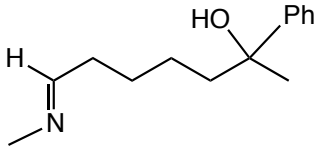
a)





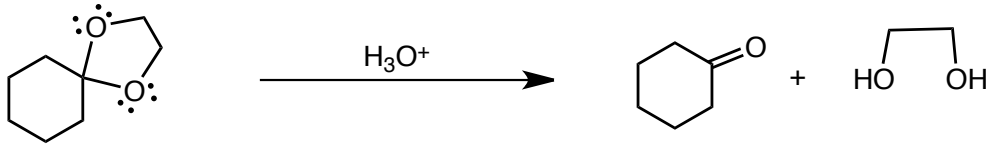
b)



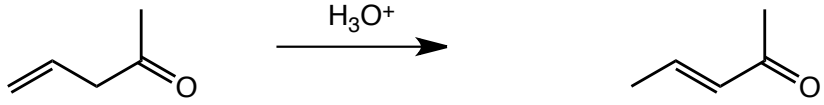


Question 6 Give a full curved arrow-pushing mechanism for the following reactions, show where every proton goes to and comes from (no $+H^+/-H^+$) and indicate the Lewis and Bronsted acids/bases at each intermolecular step, include important resonance contributors for all intermediates, give the number of steps in your mechanism.

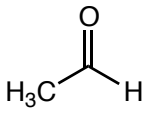
a)



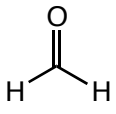
b)



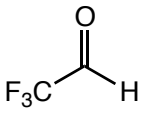
Question 7 Rank in order of increasing rate of reaction with a Grignard reagent, giove a brief explanation in terms of nucleophiles and electrophile stregth and tthe factors that control these in this context.



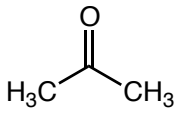
A



B



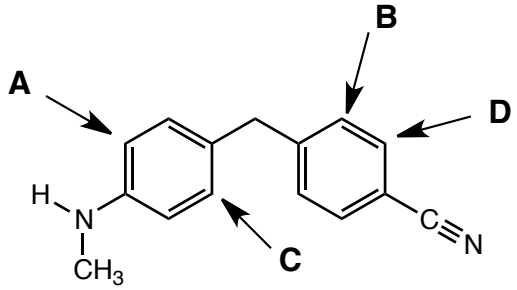
C



D

___ < ___ < ___ < ___

Question 8. Rank in order of increasing rate of electrophilic aromatic substitution at the carbons indicated by the arrows. Give a BRIEF explanation.



___ < ___ < ___ < ___

slowest fastest