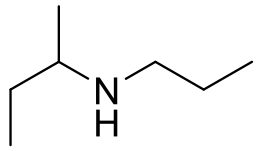
Organic chemistry (II) Online Exam 6/10 (Fri.)

Name: _____ ; Student ID number: _____ ; Score: _____/303

I. Multiple choice (8 points each, total 168 pt)

1) Name the following compound.



A) isobutylpropylamine

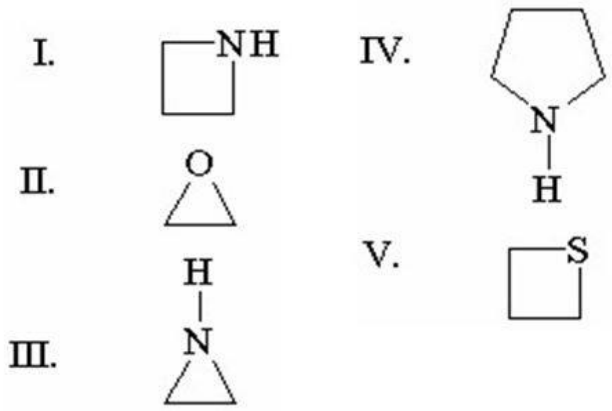
B) isopentylpropylamine

C) *n*-butylpropylamine

D) *tert*-butylpropylamine

E) *sec*-butylpropylamine

2) Which of the following is the structure for azetidine?



A) I

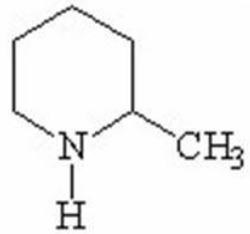
B) II

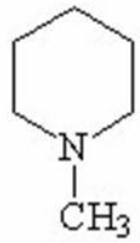
C) III

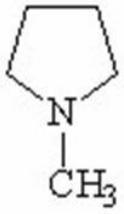
D) IV

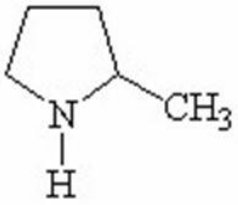
E) V

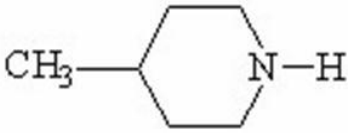
3) Which of the following is the structure for *N*-methylpiperidine?

I. 

II. 

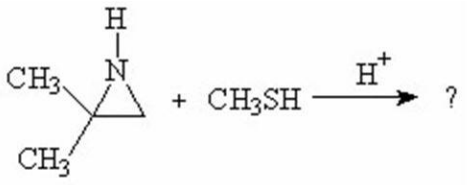
III. 

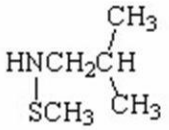
IV. 

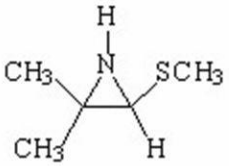
V. 

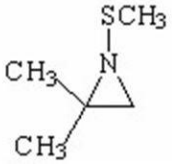
A) I
B) II
C) III
D) IV
E) V

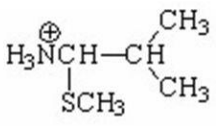
4) What is the major product of the following reaction?

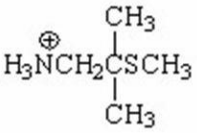


I. 

II. 

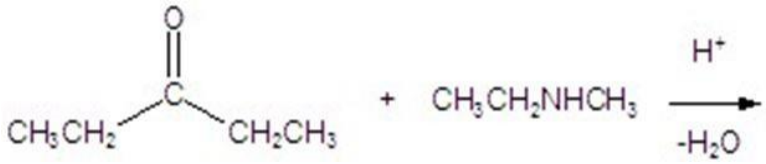
III. 

IV. 

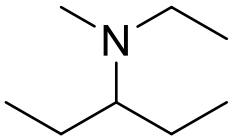
V. 

A) I
B) II
C) III
D) IV
E) V

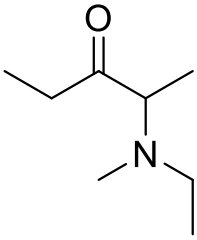
5) Give the major product for the following reaction.



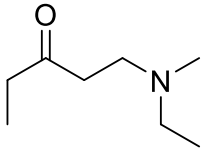
A)



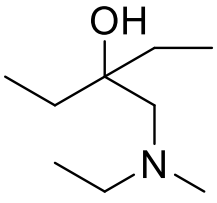
B)



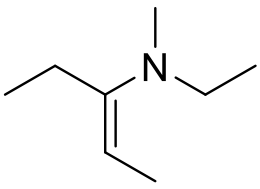
C)



D)



E)



6) Which of the following lists the correct order of reactivity of the substrates in electrophilic aromatic substitution reactions?

A) thiophene > pyrrole > furan > benzene

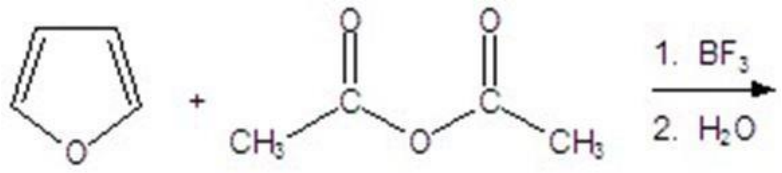
B) benzene > furan > thiophene > pyrrole

C) furan > pyrrole > benzene > thiophene

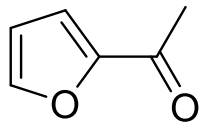
D) benzene > pyrrole > thiophene > furan

E) pyrrole > furan > thiophene > benzene

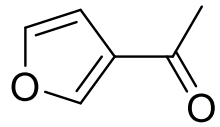
7) Give the major product for the following reaction.



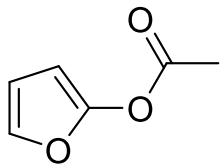
A)



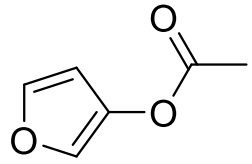
B)



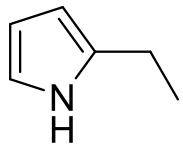
C)



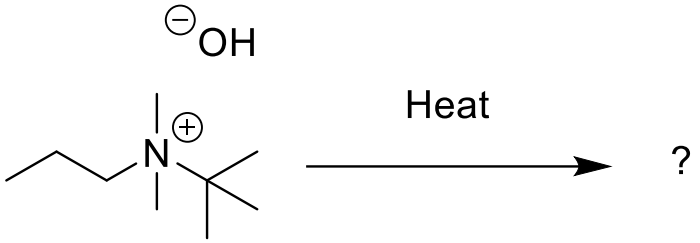
D)



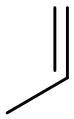
E)



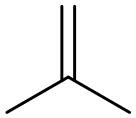
8) What is the major alkene formed in the following Hofmann elimination?



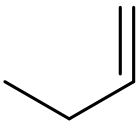
A)



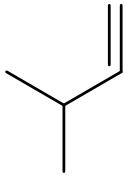
B)



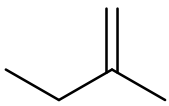
C)



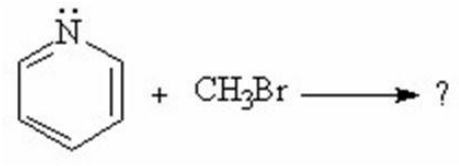
D)

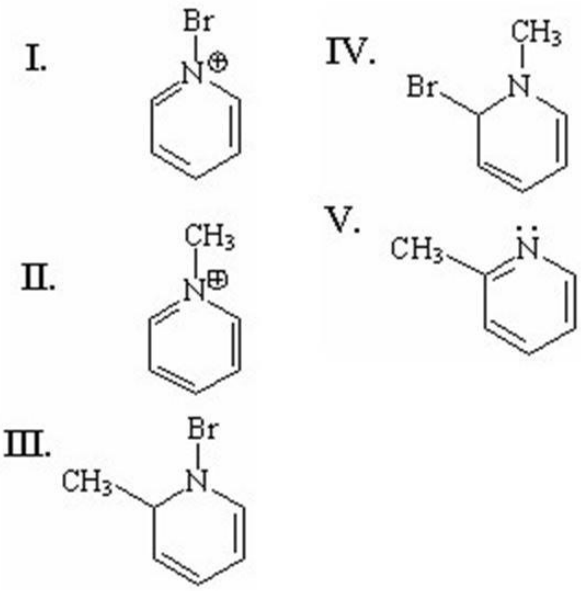


E)



9) What is the major product of the following reaction?



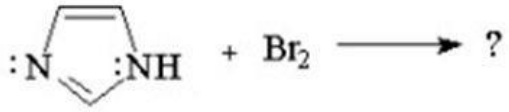


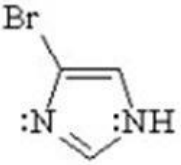
A) I
B) II
C) III
D) IV
E) V

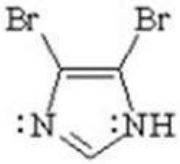
10) Which of the following chloropyridines readily undergo nucleophilic substitution upon treatment with NaCN?

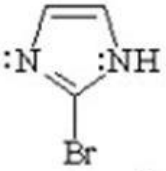
A) 2-chloropyridine
B) 3-chloropyridine
C) 4-chloropyridine
D) both A and B
E) both A and C

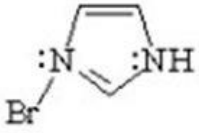
11) What is the major product of the following reaction?

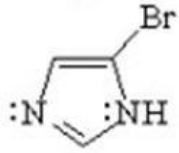


I. 

IV. 

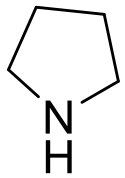
II. 

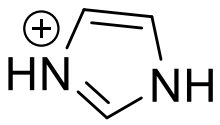
V. 

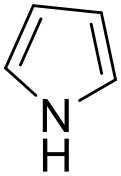
III. 

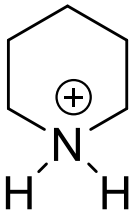
A) I
B) II
C) III
D) IV
E) V

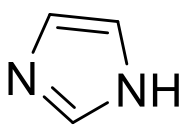
12) Which of the following heterocyclics has the lowest pKa value?

I 

IV 

II 

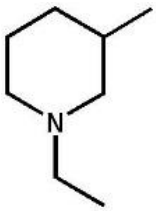
V 

III 

A) I
B) II
C) III
D) IV
E) V

13) The lone pair in pyridine is present in a
A) s-orbital.
B) p-orbital.
C) sp^2-orbital.
D) sp-orbital.
E) sp^3-orbital.

14) What is the correct name for the following compound?



A) *N*-ethyl-1-methylpiperidine

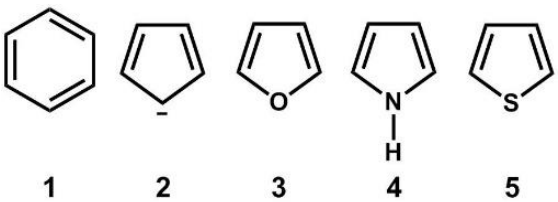
B) *N*-ethyl-3-methylpiperidine

C) *N*-ethyl-1-methylpyrrolidine

D) *N*-ethyl-3-methylpyrrolidine

E) *N*-ethyl-3-methylazetidine

15) What is the correct order of decreasing delocalization energies of the following aromatic rings?



A) 1 > 2 > 3 > 4 > 5

B) 2 > 1 > 3 > 5 > 4

C) 4 > 3 > 5 > 2 > 1

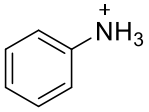
D) 1 > 2 > 5 > 4 > 3

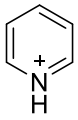
E) 1 > 5 > 3 > 4 > 2

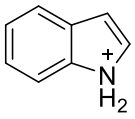
16) Which of the following has the lowest pK_a?

A) CH_3NH_2

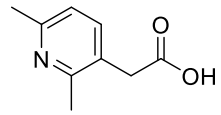
B) $CH_3CH_2CH_2NH_3$

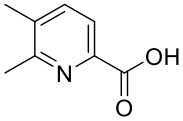
C) 

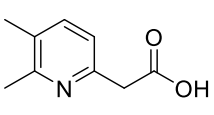
D) 

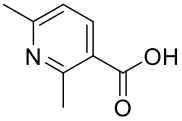
E) 

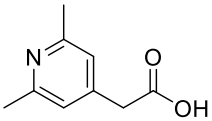
17) Which of the following compounds is easier to decarboxylate?

(A) 

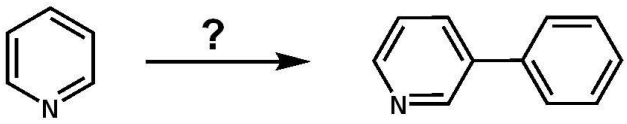
(B) 

(C) 

(D) 

(E) 

18) Which set of reagents will accomplish the following synthesis?



A) 1. $Br_2/FeBr_3$; 2. PhLi

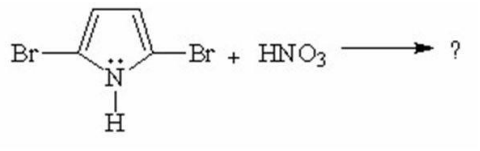
B) 1. HBr; 2. Ph_2CuLi

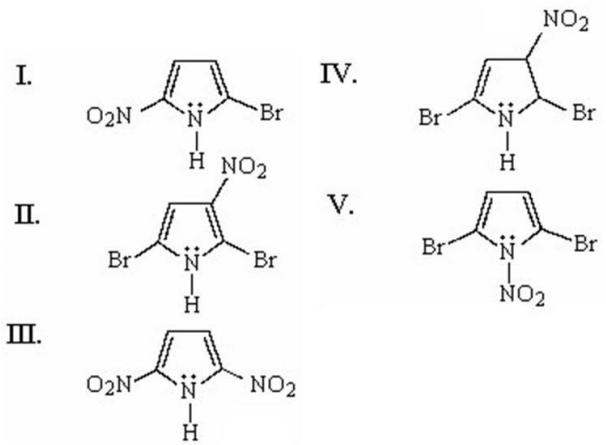
C) 1. Br_2, heat; 2. PhLi

D) 1. $Br_2/FeBr_3$; 2. Ph_2CuLi

E) Ph-Br/$FeBr_3$

19) What is the major product of the following reaction?





A) I

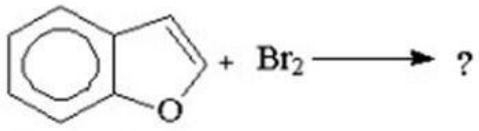
B) II

C) III

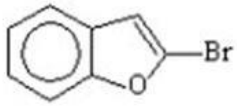
D) IV

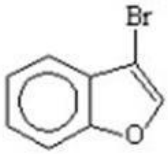
E) V

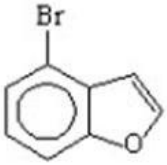
20) What is the major product of the following reaction?

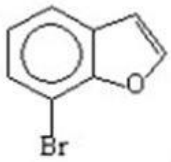


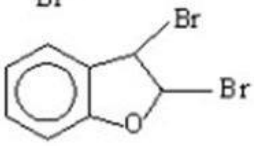
Benzofuran

I. 

II. 

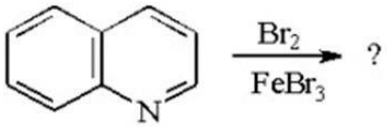
III. 

IV. 

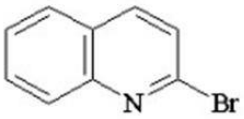
V. 

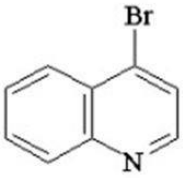
A) I
B) II
C) III
D) IV
E) V

21) What are the products of the following reaction?

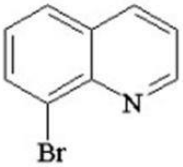


quinoline

I. 

III. 

II. 

IV. 

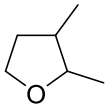
A) I and II
B) I and III
C) II and IV
D) II and III
E) III and IV

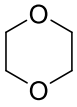
II. Provide suitable names, structure(s), reagent(s), or explanation(s) for the following questions. (total 135 points)

1. Provide suitable name for the following compound.(5 points each, total 20 pts)

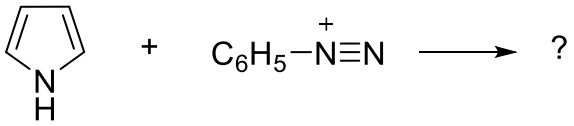
a) 

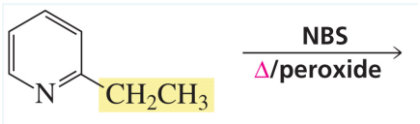
b) 

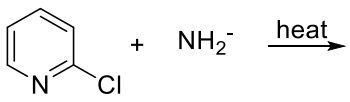
c) 

d) 

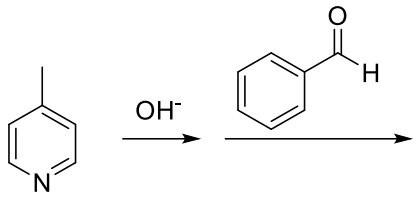
2. Provide the major organic product of the following reactions. (6 points each, total 30 pts)

a) 

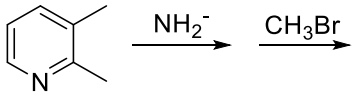
b) 

c) 

d)

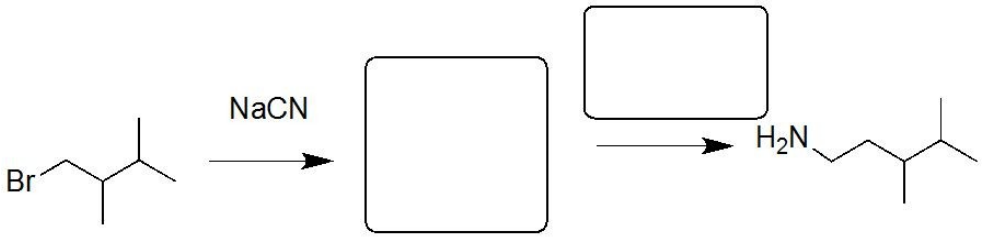


e)

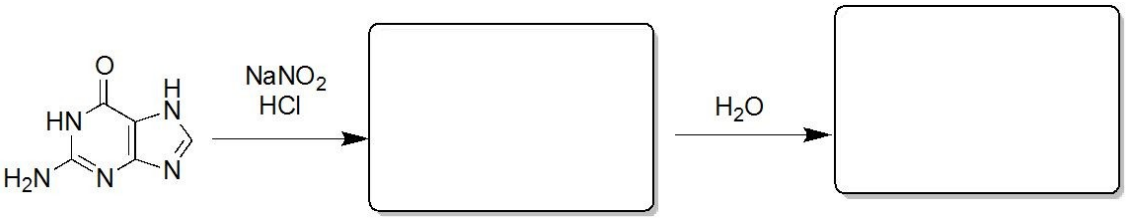


3. Provide suitable reagent or product (major product) in the empty box of the following reactions. (5 points each empty box, total 25 pts)

a)



b)



4. Do you expect pyridine to undergo nucleophilic substitution reactions? If yes, on what position would the substitution occur? Give an explanation and an example of the nucleophilic substitution of pyridine. (20 points)

5. Draw the structure of the aziridinium ion and explain why its pKa is lower than a typical secondary ammonium ion. (20 points)

6. Propose a mechanism for the following reaction: (20 pt)