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| NAME | |
| SID | |
| GSI | |

CHEM 112B

Midterm 1

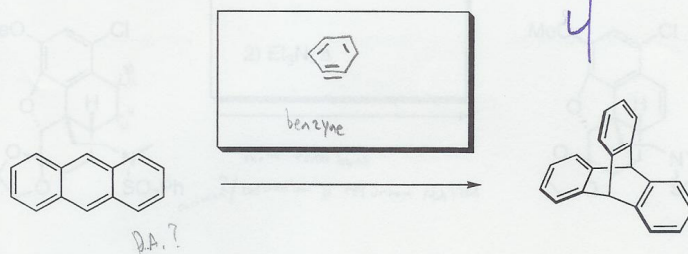
February 22, 2006

| Question | Points | Points obtained |
|----------|--------|-----------------|
| 1 | (20) | 13 |
| 2 | (15) | 9 |
| 3 | (10) | 10 |
| 4 | (15) | 14 |
| 5 | (20) | 16 |
| 6 | (20) | 7 |

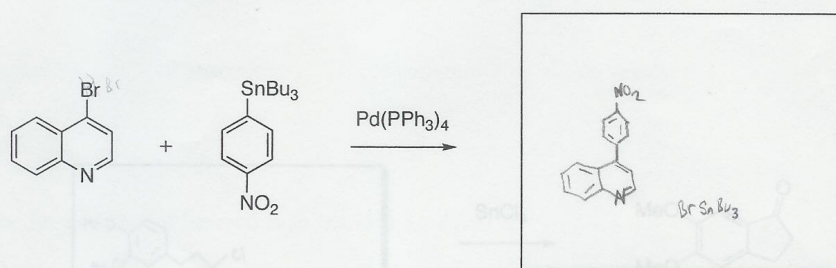
Score: 69 / 100

1) Fill in the missing starting materials, reagents or products:

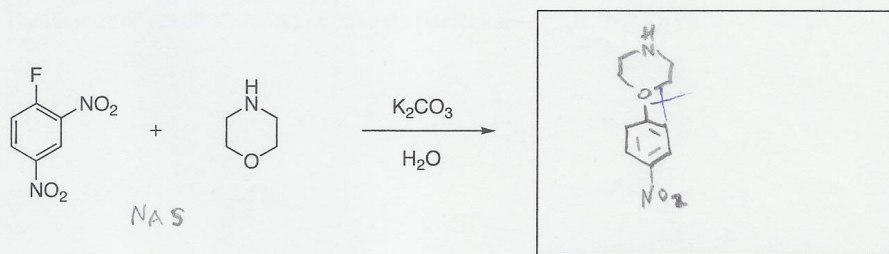
a)



b)



c)



9

d) The following questions deal with numbers. Encircle the correct value:

a) The empirical resonance energy of benzene is:

10 kcal/mol

15 kcal/mol

18 kcal/mol

20 kcal/mol

25 kcal/mol

30 kcal/mol

35 kcal/mol

40 kcal/mol

45 kcal/mol

50 kcal/mol

55 kcal/mol

60 kcal/mol

65 kcal/mol

70 kcal/mol

75 kcal/mol

80 kcal/mol

85 kcal/mol

90 kcal/mol

95 kcal/mol

100 kcal/mol

105 kcal/mol

110 kcal/mol

115 kcal/mol

120 kcal/mol

125 kcal/mol

130 kcal/mol

135 kcal/mol

140 kcal/mol

145 kcal/mol

150 kcal/mol

155 kcal/mol

160 kcal/mol

165 kcal/mol

170 kcal/mol

175 kcal/mol

180 kcal/mol

185 kcal/mol

190 kcal/mol

195 kcal/mol

200 kcal/mol

205 kcal/mol

210 kcal/mol

215 kcal/mol

220 kcal/mol

225 kcal/mol

230 kcal/mol

235 kcal/mol

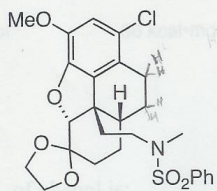
240 kcal/mol

245 kcal/mol

250 kcal/mol

255 kcal/mol

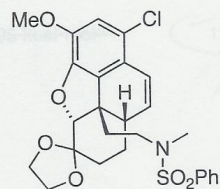
260 kcal/mol



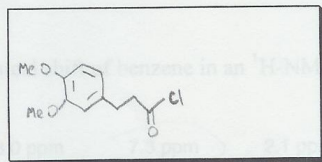
1) LiH

2) Et₃N, Δ

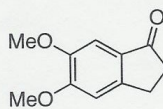
make double bond
conjugation? conjugation is resonance stabilized



e)



SnCl₄



4

e) The number of possible isomers of dibromo nitrobenzene (C₆H₃Br₂NO₂) is:

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

4

2) The following questions deal with numbers. Encircle the correct value:

3) Circle the aromatic compounds below:

a) The empirical resonance energy of benzene is:

~~10 kcal·mol⁻¹~~

36 kcal·mol⁻¹

~~100 kcal·mol⁻¹~~

~~95 kcal·mol⁻¹~~

12 kcal·mol⁻¹

b) The pK_a of phenol is:

~~-3~~

17

10

35

4.6

25

c) The bond dissociation energy (BDE) of an allylic CH bond is:

85 kcal·mol⁻¹

~~12 kcal·mol⁻¹~~

36 kcal·mol⁻¹

55 kcal·mol⁻¹

~~105 kcal·mol⁻¹~~

d) The chemical shift of benzene in an ¹H-NMR spectrum is:

~~-3.0 ppm~~

7.3 ppm

2.1 ppm

9.2 ppm

5.6 ppm

1.8 ppm

e) The number of possible isomers of dibromo nitrobenzene (C₆H₃Br₂NO₂) is:

~~2~~

~~4~~

~~8~~

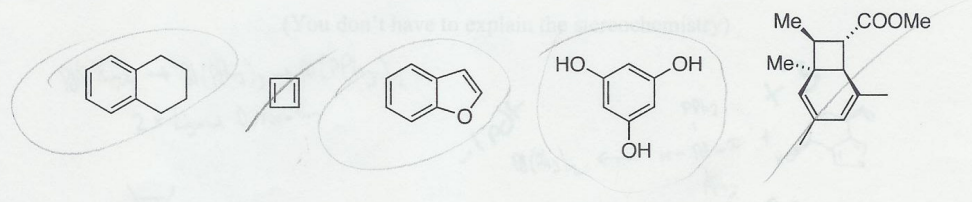
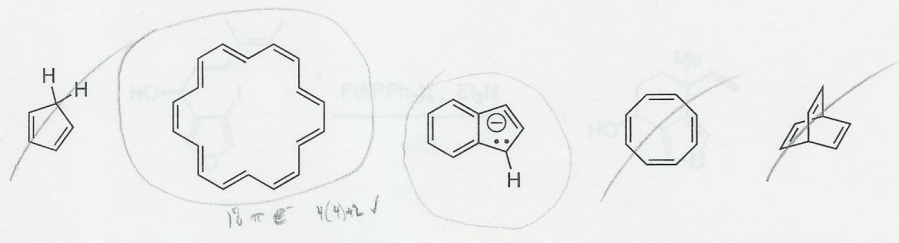
~~5~~

7

none of these

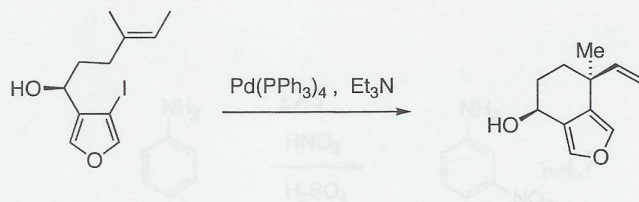


3) Circle the aromatic compounds below:

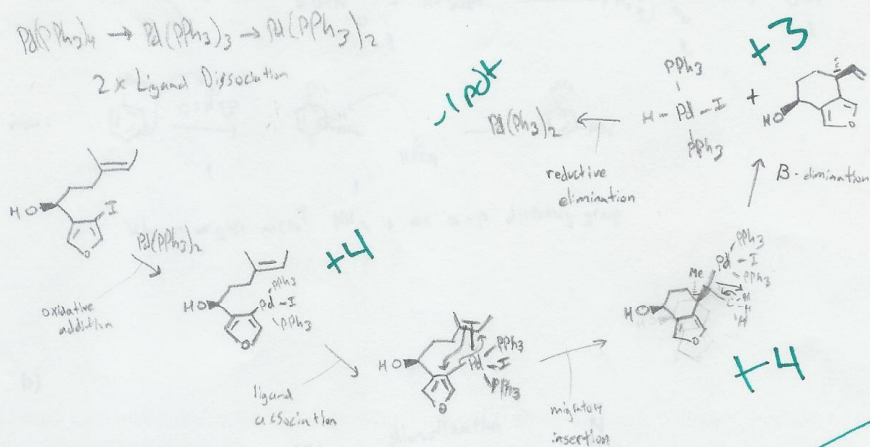


Handwritten signature and score: 10

4) Provide a detailed mechanism for the following reaction:

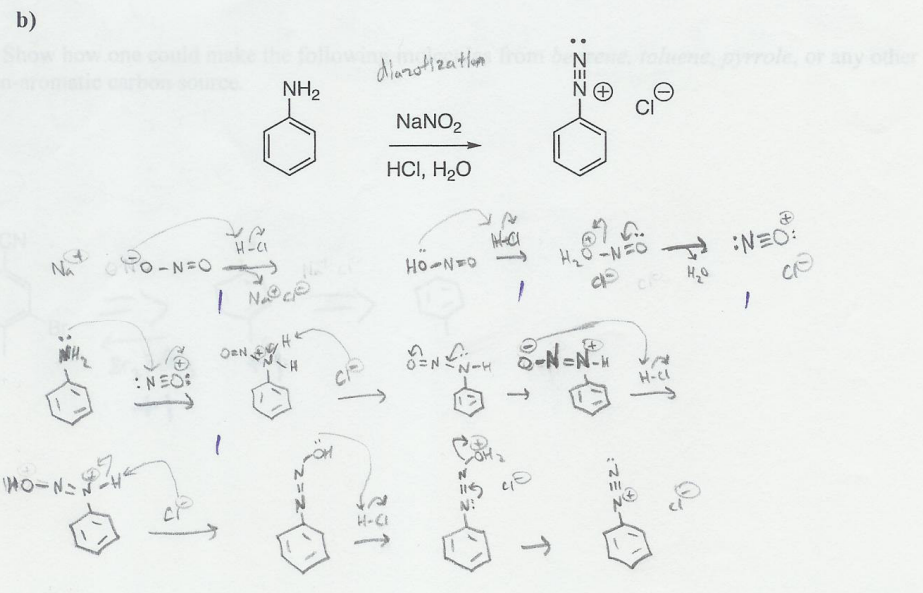
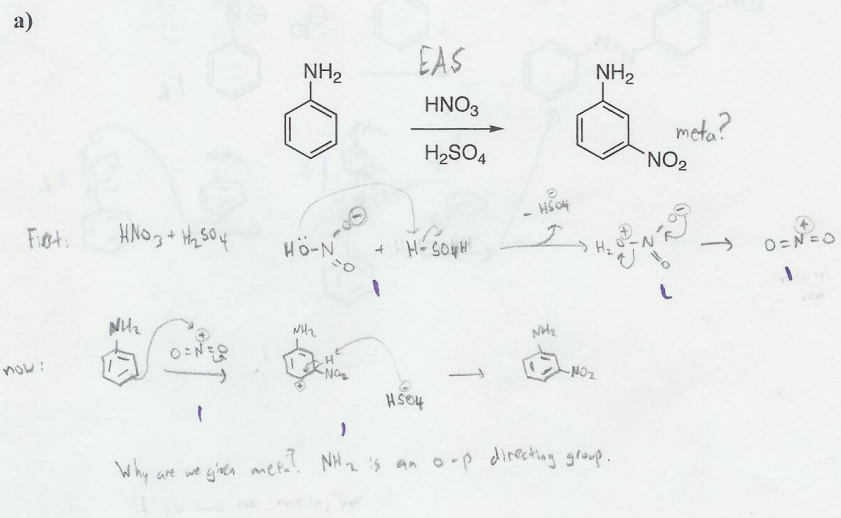


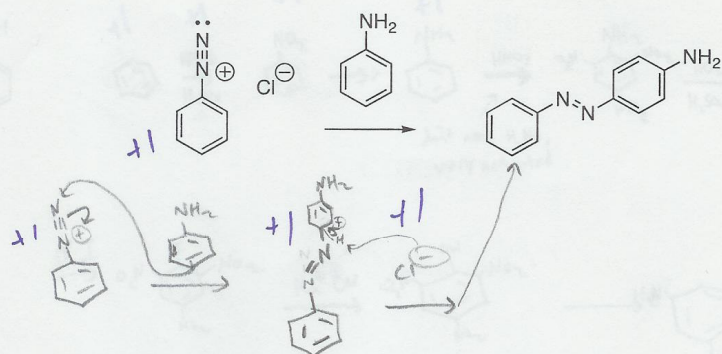
(You don't have to explain the stereochemistry)



14

5) Aniline reacts with either *nitric acid* and *nitrous acid* in very different ways. Show the *detailed* mechanism of the following reactions:

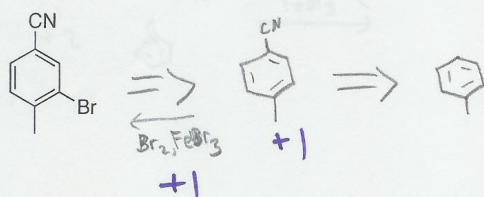


+4
c)

+2

6) Show how one could make the following molecules from *benzene*, *toluene*, *pyrrole*, or any other non-aromatic carbon source.

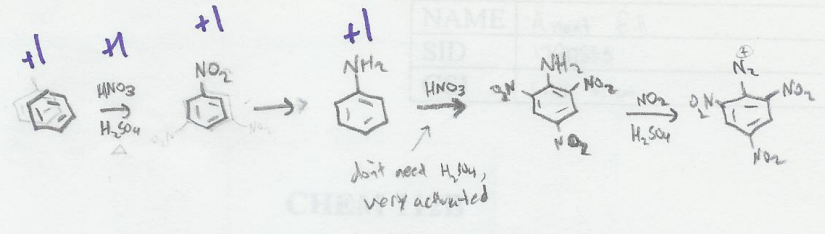
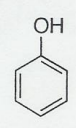
a)



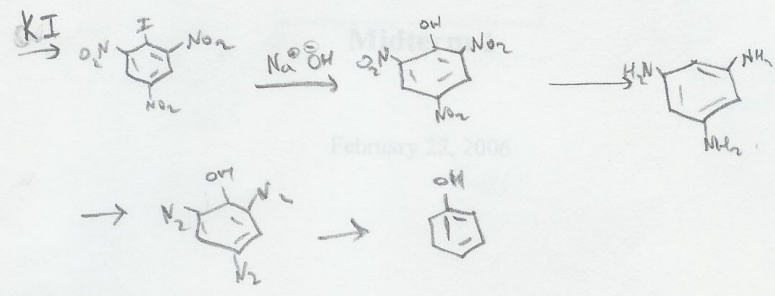
(6)

4

b) NAS?



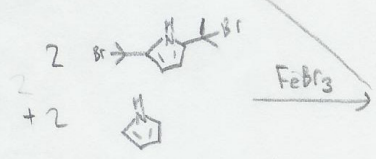
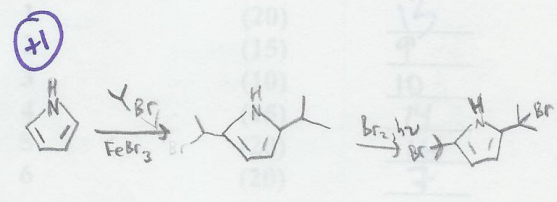
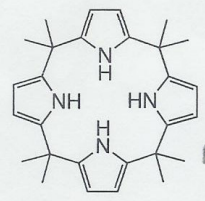
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1

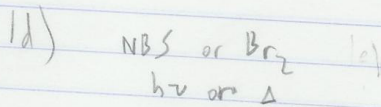
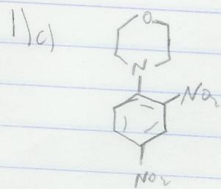
c) F.C Alkylation



Score: 69/100

5

80 min exam
 Corrections to Problems answered wrong
 Chem 112 B Midterm I



2) a) 36 2c) none

5) a) we get meta because R-NH₂ is protonated first (C-2)

