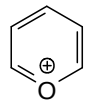
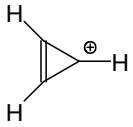
Problem Set 2 Chem 232

1. How many isomeric tribromobenzenes exist?
A. two B. three C. four D. five E. six

2. How many of the following are aromatic?


1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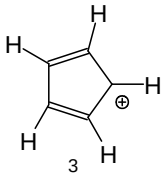
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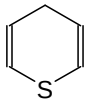
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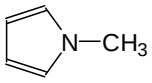
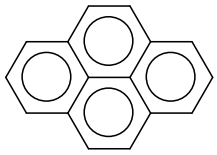
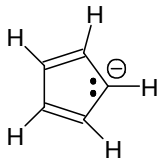

5

A. two B. three C. four D. five E. six

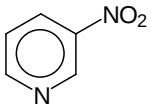
3. Both compounds below are aromatic. How does this finding relate to Huckel's rule?





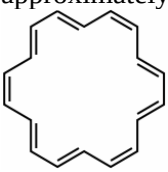
A. Huckel's rule would predict that both compounds are aromatic
B. Huckel's rule doesn't apply to either one, as one is polycyclic and the other charged
C. Huckel's rule only applies to monocyclic compounds, regardless of charge
D. Huckel's rule only applies to uncharged compounds
E. Huckel's rule only applies to benzene

4. What's the most appropriate name for the compound below?



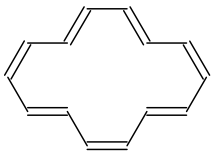
A. 3-aminopyridine B. nitro-3-pyridine C. 3-nitropyridine D. 4-nitropyridine
E. nitropyridine

5. The compound below is aromatic. How many signals do you expect for its proton NMR spectum, and approximately where?



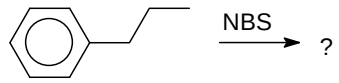
A. Only one signal in the aromatic region
B. One signal in the aromatic region, one highly upfield
C. Two signals in the aromatic region, one highly upfield
D. Three signals in the aromatic region, one highly upfield
E. Who knows, impossible to predict

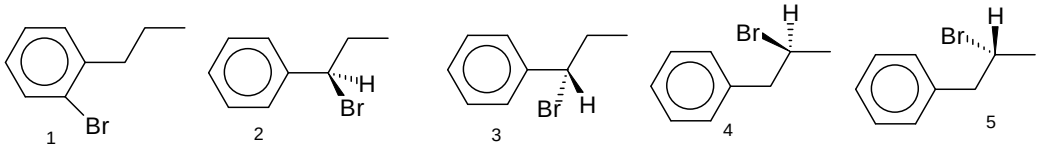
6. What can we say about the compound below?



A. It is [14]annulene, and aromatic
B. It is [13]annulene, and non-aromatic
C. It is [12] annulene, and aromatic
D. It is [14]annulene, and antiaromatic
E. It is [14]annulene, and non-aromatic

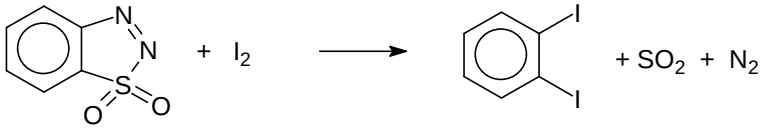
7. What product(s) would you expect for the reaction of propylbenzene and NBS?





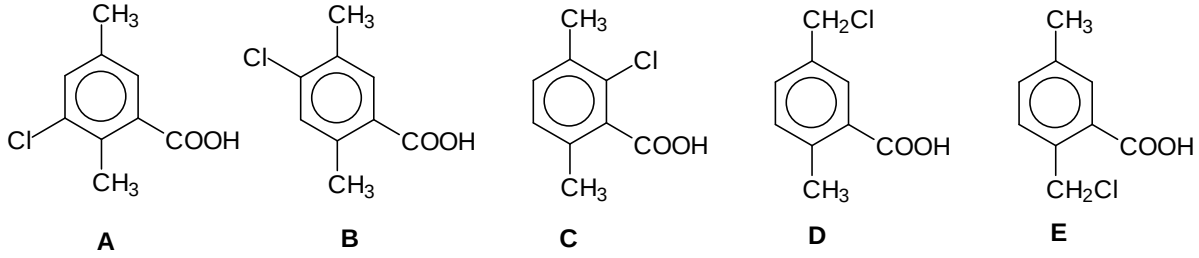
A. compound 1 B. Compound 2 C. compound 3 D. a mixture of 2 and 3
E. a mixture of 4 and 5

8. What can we say about the following reaction?

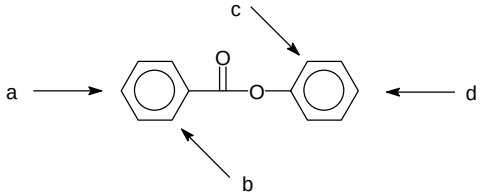


A. It appears to proceed via a Wheland intermediate
B. It appears to proceed via a Meisenheimer complex
C. It appears to proceed via a benzyne intermediate
D. It likely involves a reverse Diels-Alder cycloaddition
E. This is likely an addition-elimination mechanism

9. The chlorination of 2,5-dimethylbenzoic acid with iron powder as a catalyst generates one major product. Which one?

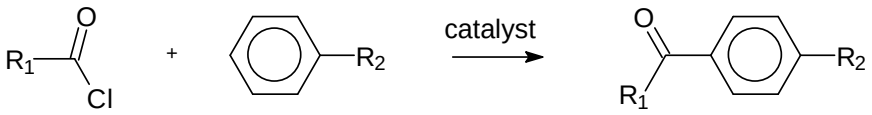


10. In which position(s) would the bromination phenyl benzoate be expected to occur?



A. position a B. position b C. position c D. position d E. in both positions c and d

11. The Friedel-Crafts acylation of substituted benzenes with acid halides constitutes an important source of ketones, but not all of the combinations below may be feasible. How many of them are?



1. $R_1 = CH_3$, $R_2 = H$ 2. R_1 = phenyl, $R_2 = NH_2$ 3. $R_1 = H$, $R_2 = H$

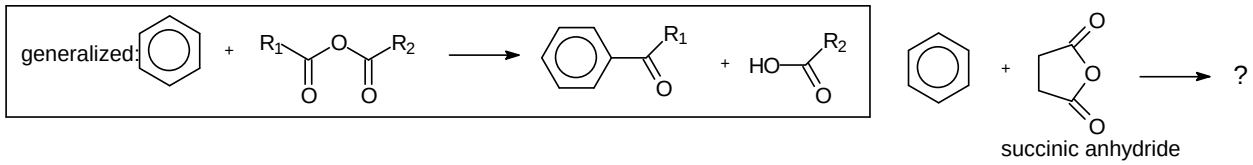
4. $R_1 = C_2H_5$, $R_2 = NO_2$ 5. $R_1 = CH_3$, $R_2 = COOH$

A. one only B. two C. three D. four E. all

12. m-Aminobenzoic acid can be prepared from toluene, by nitration, oxidation with $KMnO_4$, and reduction with Sn/HCl (but not necessarily in this order). Which order is correct?

A. nitration-oxidation-reduction B. oxidation-nitration-reduction C. reduction-nitration-oxidation
D. oxidation-reduction-nitration E. nitration-reduction-oxidation

13. Friedel Crafts acylations also can be carried out with acid anydrides, rather than acid halides. The generalized equation is shown below. Can you apply it to a specific case, the reaction of benzene with succinic anhydride? Draw the product(s) and select the best answer:

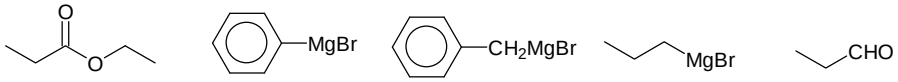


A. There are two products, both of which contain benzene rings
B. There are two products, an ketone and a carboxylic acid
C. There is only one product, which is a carboxylic acid
D. There is only one product, which is a ketone
E. There is only one product, which is both a ketone and and a carboxylic acid

14. Chroroform reacts with three moles of benzene to generate triphenylmethane in the presence of aluminum chloride. What type of reaction is this?

A. A nucleophilic aromatic stubstitution following an addition-elimination sequence
B. A Friedel Crafts acylation
C. A Friedel Crafts alkylation
D. A radical chain substitution
E. A nucleophilic aromatic stubstitution following a benzyne mechanism

15. Assume you need 1,1-diphenylpropene. You decide to prepare it by first generating a suitable tertiary alcohol using a Grignard reaction, then dehydrating the alcohol with sulfuric acid to the final product. Which chemicals might be used?

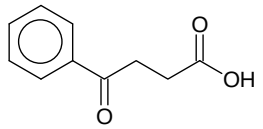


ethylpropanoate | phenylmagnesium bromide | benzylmagnesium bromide | 1-propylmagnesium bromide | propanal

A. ethylpropanoate and propanal
B. phenylmagnesium bromide and propanal
C. benzylmagnesium bromide and ethylpropanoate
D. benzylmagnesium bromide, 1-propylmagnesium bromide and propanal
E. phenylmagnesium bromide and ethylpropanoate

Key pr232_2:

1. B (the 1,2,3 1,2, 4 and 1,3,5 isomers)
2. B (compounds 1, 2, and 5)
3. C (hint: redraw the first structure with localized double bonds, it is obvious that it would violate Huckel's rule if it applied to polycyclics)
4. C
5. B
6. A
7. D
8. C
9. A
10. E
11. A (3 won't work because formyl chloride is inaccessible)
12. B
13. E:



14. C
15. E