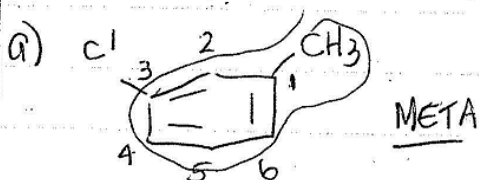
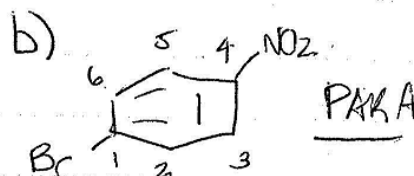


PROBLEM SET #11  
SOLUTIONS

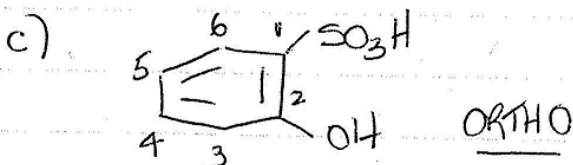
15.1 ORTHO: 1,2-SUBSTITUTION  
META: 1,3-SUBSTITUTION  
PARA: 1,4-SUBSTITUTION



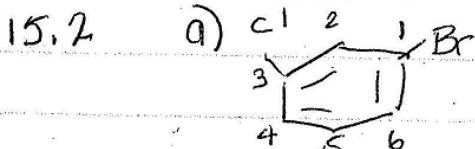
3-chlorotoluene  
1-chloro-3-methyl  
benzene



1-bromo-4-nitro  
benzene

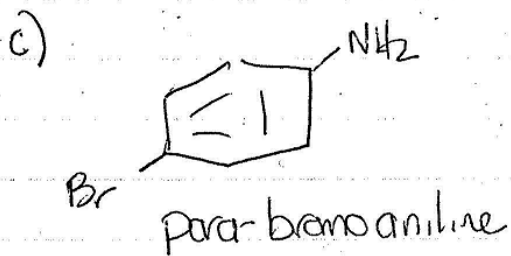
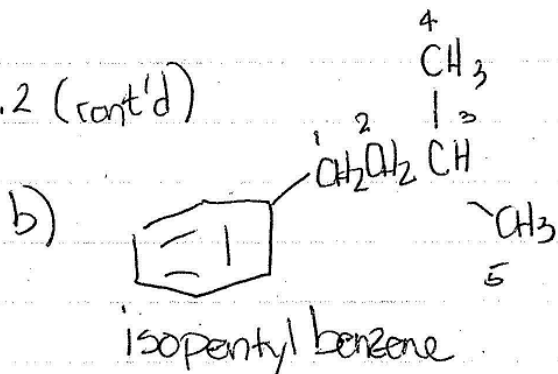


2-hydroxybenzene  
sulfonic acid

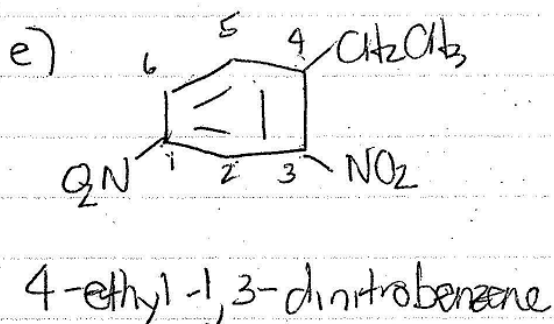
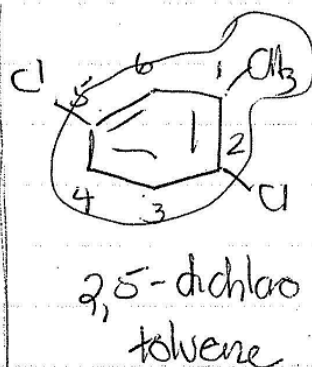
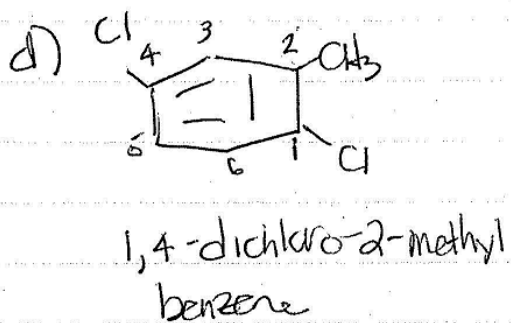


1-bromo-3-chlorobenzene  
meta-bromochlorobenzene

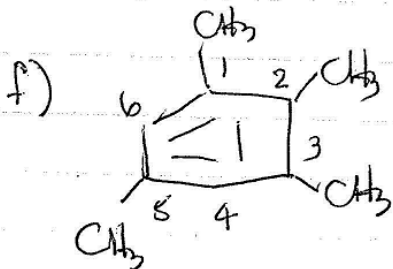
15.2 (cont'd)



4-amino-1-bromobenzene  
4-bromoaniline



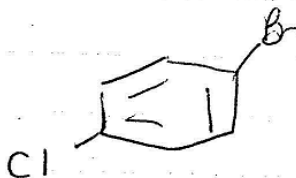
## 15.2 (cont'd)



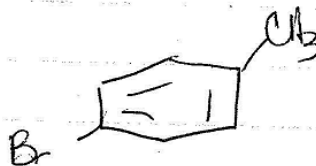
1,2,3,5-tetramethylbenzene  
2,3,5-trimethyltoluene

## 15.3

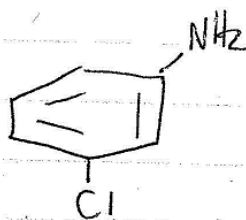
a) p-bromochlorobenzene



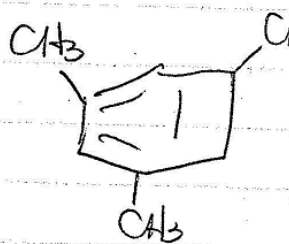
b) p-bromotoluene



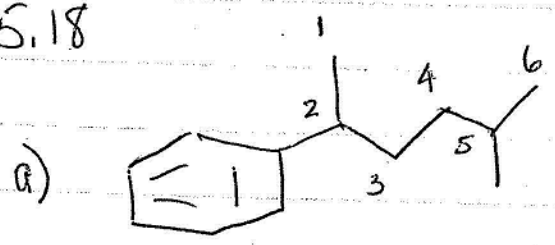
c) m-chloroaniline



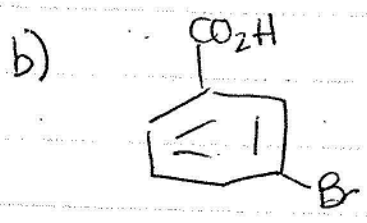
d) 1-chloro-3,5-dimethylbenzene



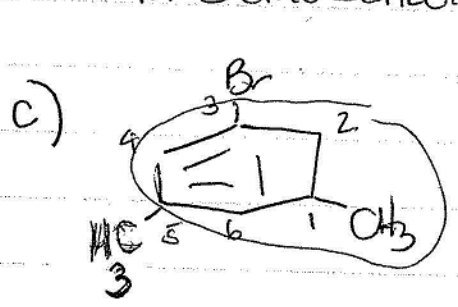
15.18



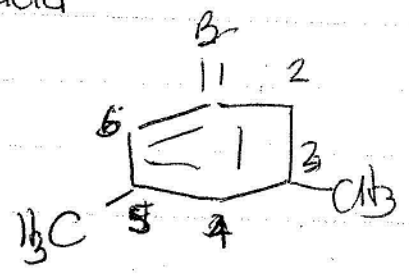
5-methyl-2-phenylhexane



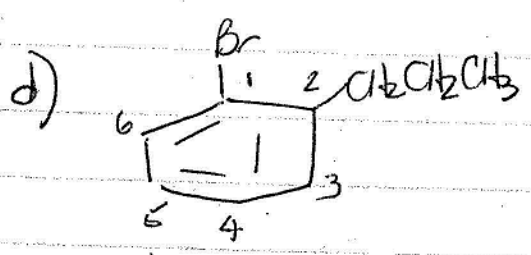
3-bromobenzoic acid  
m-bromobenzoic acid



3-bromo-5-methyltoluene

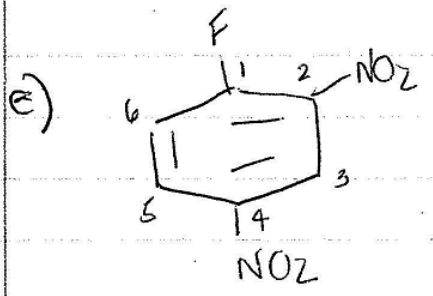


1-bromo-3,5-dimethylbenzene

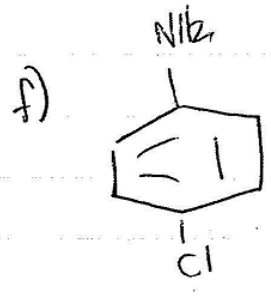


1-bromo-2-propylbenzene

15.18 (cont'd)



1-fluoro-2,4-dinitrobenzene

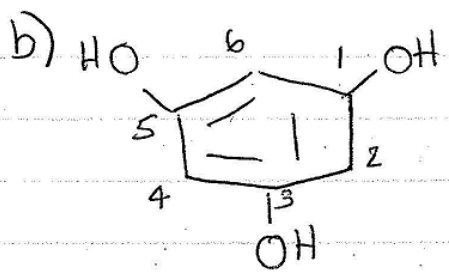
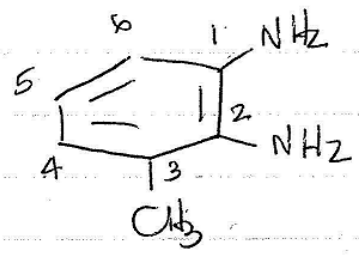


para-chloroaniline  
4-chloroaniline  
4-aminochlorobenzene

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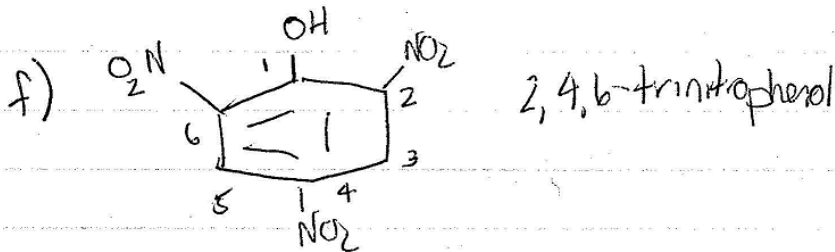
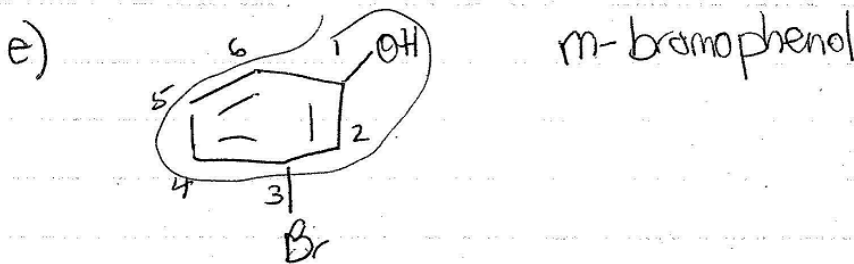
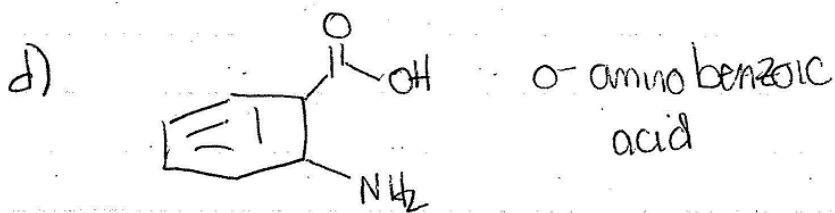
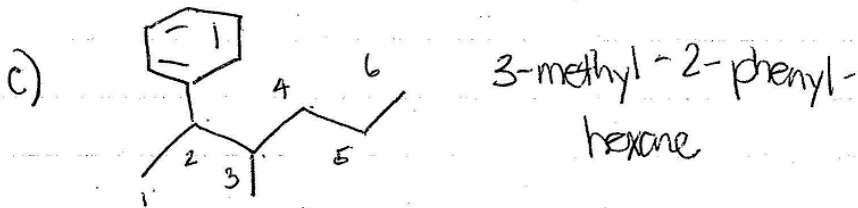
15.19

a) 3-methyl-1,2-benzenediamine

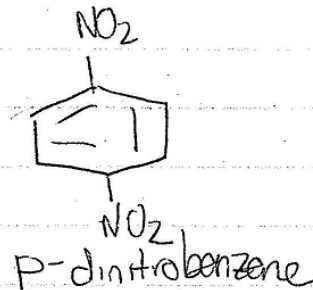
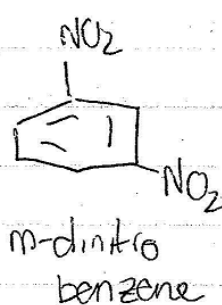
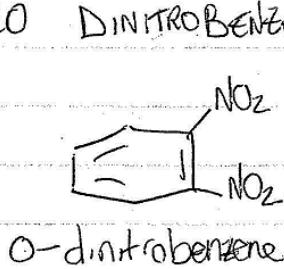


1,3,5-benzenetriol

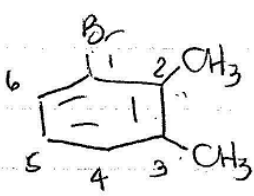
15.19 (cont'd)



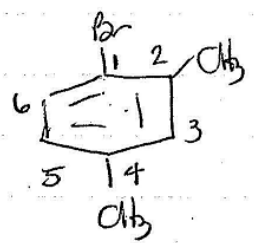
15.20 DINITROBENZENE



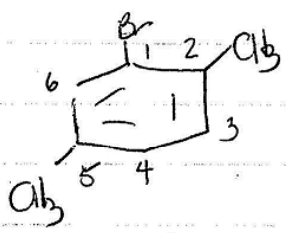
15.20 (cont'd)



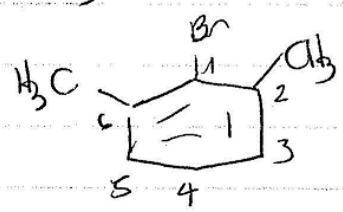
1-bromo-2,3-dimethyl benzene  
3-bromo-2-methyl toluene



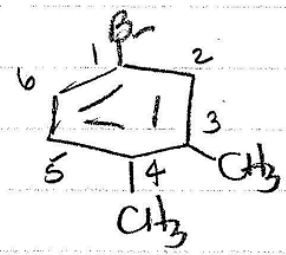
1-bromo-2,4-dimethyl benzene



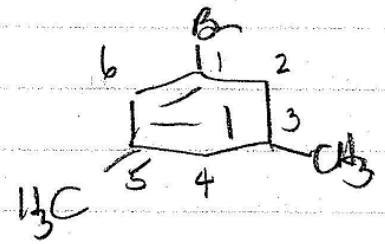
1-bromo-2,5-dimethyl benzene



1-bromo-2,6-dimethyl benzene

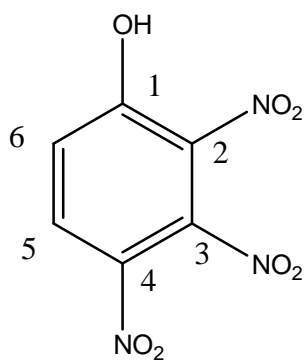


1-bromo-3,4-dimethyl benzene

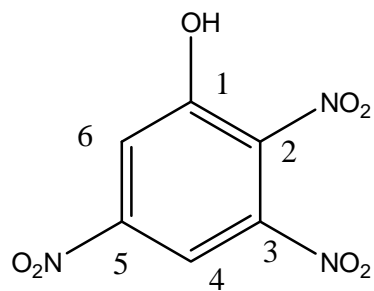


1-bromo-3,5-dimethyl benzene

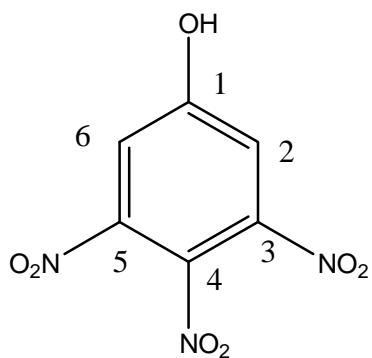
15.20 (cont'd)



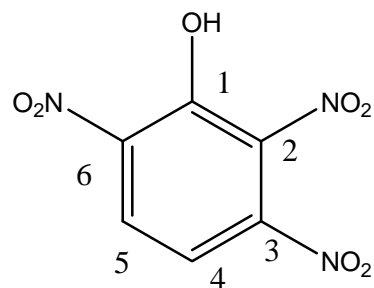
2,3,4-trinitrophenol



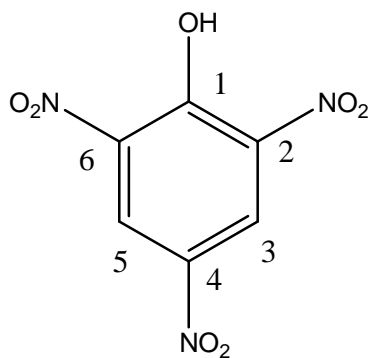
2,3,5-trinitrophenol



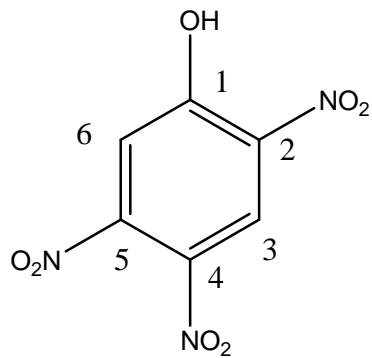
3,4,5-trinitrophenol



2,3,6-trinitrophenol



2,4,6-trinitrophenol



2,4,5-trinitrophenol



15.21  $C_7H_7Cl$

