

CHEM211 Problem Set
Functional Groups and Reaction Types

Draw molecules with the following functional groups:

1. cyclic alkene, quaternary carbon
Draw the product of an ADDITION reaction of your molecule with H_2 (H-H).
2. alkane, tertiary chloride
Draw the product of a SUBSTITUTION reaction of your molecule with NaI (NaCl is the other product).
3. acyclic terminal alkene
Draw the product of a REARRANGEMENT reaction of your molecule to form an isomeric alkene.
4. allylic secondary alcohol
Draw the product of an ELIMINATION reaction of your molecule in which H_2O is eliminated.
5. ketone, aryl amine
Draw the product of an ADDITION reaction of the ketone double bond in your molecule with H_2 .
6. primary benzylic bromide
Draw the product of a SUBSTITUTION reaction of your molecule with KOH (KBr is the other product).
7. cyclic alkene, aldehyde
Draw the product of an ADDITION the carbon-carbon double bond with Br_2 (Br-Br).
8. cyclic alkane, tertiary bromide
Draw a product of an ELIMINATION reaction of your molecule in which H-Br is eliminated.
9. secondary iodide, aryl ether
Draw the product of a SUBSTITUTION reaction of your molecule's I with NaSH (NaI is the other product).
10. cyclic alkane, propyl side chain
Draw all the possible monochloro products of a SUBSTITUTION reaction of the H's in your molecule with Cl_2 (HCl is the other product).
11. aldehyde, aryl alcohol (phenol)
Draw the product of an ADDITION reaction to the aldehyde double bond with water to form a molecule that has 2 OH groups on the same carbon.
12. five carbon carboxylic acid, amine
Draw the product of an internal ACID/BASE reaction of your molecule.
13. aryl amide
Draw the product of a SUBSTITUTION reaction of ONE of the aryl H's in your molecule with Cl_2 (the other product will be HCl).

14. eight carbon acid chloride
Draw the product of a SUBSTITUTION reaction of the Cl of your molecule with MeOH (the other product will be HCl; what functional group is formed?)
15. primary nitrile, tertiary fluoride
Draw the product of an ADDITION reaction of H₂ to the carbon-nitrogen triple bond of your molecule. Then ADD another H₂ to that molecule to get a third structure.
16. vinyl bromide, primary bromide
Draw the product of a SUBSTITUTION reaction of the primary bromo group of your molecule with KC≡N (potassium cyanide, the other product will be KBr.)
17. aryl iodide, aryl carboxylic acid
Draw the product of a SUBSTITUTION reaction of ONE of the aryl H's in your molecule with a nitro group.
18. six carbons, alkene, tertiary alcohol
Draw all possible products of an ELIMINATION reaction of your molecule in which H₂O is eliminated.
19. aryl chloride group, secondary chloride
Draw the product of an ELIMINATION reaction of your molecule in which HCl is eliminated from the alkyl piece.
20. cyclic alkane, tertiary bromide, secondary bromide
Draw the product of a SUBSTITUTION reaction involving the 2° bromo of your molecule and LiI (the other product will be LiBr).
21. benzylic secondary alcohol, aryl sulfide
Draw the product of an ELIMINATION reaction in which H₂ is eliminated from the C-O alcohol bond of your molecule (what is the functional group formed?)
22. alkene, alkyl groups on all sp² carbons
Draw all possible products of an ADDITION reaction of HBr to your molecule.
23. ester, cyclic tertiary bromide group
Draw the product of an ELIMINATION reaction in which HBr is lost from your molecule.
24. aldehyde, tertiary alcohol
Now the product of an ADDITION reaction in which ethanol is added to the aldehyde double bond of your molecule to form a molecule that has OH and OEt groups on the same carbon.