Draw molecules with the following functional groups:

1. cyclic alkene, quaternary carbon
   Draw the product of an ADDITION reaction of your molecule with H₂ (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 H₂O is eliminated.

5. ketone, aryl amine
   Draw the product of an ADDITION reaction of the ketone double bond in your molecule with H₂.

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 Br₂ (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).

   ![Secondary iodide, aryl ether](image)

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).

    ![Cyclic alkane, propyl side chain](image)

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.

    ![Aldehyde, aryl alcohol (phenol)](image)

12. five carbon carboxylic acid, amine
    Draw the product of an internal ACID/BASE reaction of your molecule.

    ![Five carbon carboxylic acid, amine](image)

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).

    ![Aryl amide](image)

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?)

    ![Eight carbon acid chloride](image)
15. primary nitrile, tertiary fluoride

Draw the product of an ADDITION reaction of $\text{H}_2$ to the carbon-nitrogen triple bond of your molecule. Then ADD another $\text{H}_2$ 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 $\text{KC}≡\text{N}$ (potassium cyanide, the other product will be $\text{KBr}$.)

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 $\text{H}_2\text{O}$ is eliminated.

19. aryl chloride group, secondary chloride

Draw the product of an ELIMINATION reaction of your molecule in which $\text{HCl}$ is eliminated from the alkyl piece.

20. cyclic alkane, tertiary bromide, secondary bromide

Draw the product of a SUBSTITUTION reaction involving the $2^\circ$ bromo of your molecule and $\text{LiI}$ (the other product will be $\text{LiBr}$).

21. benzylic secondary alcohol, aryl sulfide

Draw the product of an ELIMINATION reaction in which $\text{H}_2$ is eliminated from the C-O alcohol bond of your molecule (what is the functional group formed?)

22. alkene, alkyl groups on all sp$^2$ carbons

Draw all possible products of an ADDITION reaction of $\text{HBr}$ 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.