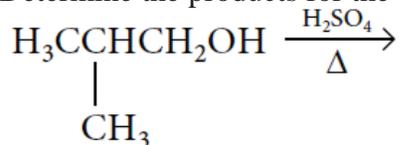


**Elimination Reactions**  
(Student textbook page 102)

12. Determine the products for the elimination reaction.



**What Is Required?**

You need to determine the product for the reaction.

**What Is Given?**

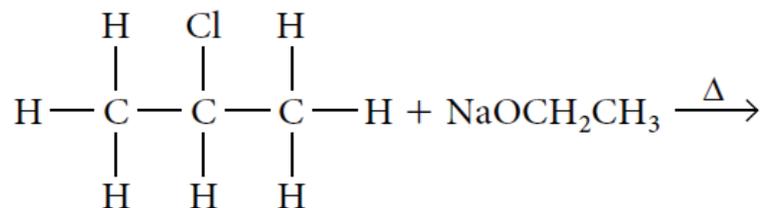
You are given the reactants and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Determine the products: Sulfuric acid typically removes a water molecule. remove the single bond between carbon 2 (the carbon atom adjacent to the carbon bonded to the hydroxyl group) and the hydrogen atom remove the single bond between carbon 1 and the hydroxyl group create a single bond between the hydroxide ion and hydrogen ion, forming water replace the single bond between carbon 1 and 2 with a double bond to form an alkene</p>	$\begin{array}{c} \text{H}_3\text{CCHCH}_2\text{OH} \\   \\ \text{CH}_3 \end{array} \xrightarrow[\Delta]{\text{H}_2\text{SO}_4}$ $\begin{array}{c} \text{CH}_3-\text{C}=\text{CH}_2 \\   \\ \text{CH}_3 \end{array} + \text{H}_2\text{O}$

**Check Your Solution**

The type of reaction is an elimination reaction. A double bond forms between carbon 1 and 2. The hydroxyl group is removed, along with a hydrogen atom which was bonded in order for the double bond to form. The hydroxide ion and hydrogen ion combine to form water.

13. Determine the products for the elimination reaction.



### What Is Required?

You need to determine the product for the reaction.

### What Is Given?

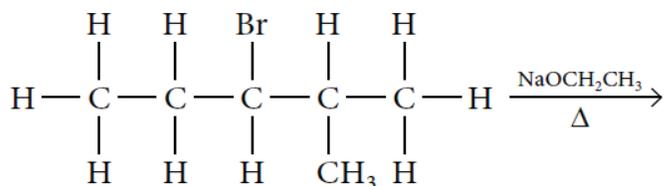
You are given then reactants and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Sodium ethoxide typically removes a halogen and a hydrogen atom.</p> <ul style="list-style-type: none"> <li>remove the single bond between carbon 2 and the chlorine atom</li> <li>remove the single bond between carbon 1 and the hydrogen atom</li> <li>replace the single bond between carbon 2 and 1 with a double bond</li> <li>create a single bond between the sodium ion and chlorine atom</li> <li>create a single bond between the ethoxide ion and the hydrogen ion</li> </ul>	$  \begin{array}{c}  \text{H} \quad \text{Cl} \quad \text{H} \\    \quad   \quad   \\  \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\    \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H}  \end{array}  + \text{NaOCH}_2\text{CH}_3 \xrightarrow{\Delta}  $ $  \begin{array}{c}  \text{H} \\    \\  \text{H}-\text{C}=\text{C}-\text{C}-\text{H} \\    \quad   \quad   \\  \text{H} \quad \text{H} \quad \text{H}  \end{array}  + \text{HOCH}_2\text{CH}_3 + \text{NaCl}  $

### Check Your Solution

The reaction is an elimination reaction. In the presence of heat and a strong base the haloalkane underwent an elimination reaction and formed an alkene, ethanol and a salt.

14. Determine the number of possible products for the following reaction. Explain your reasoning.



### What Is Required?

You need to determine the number of possible products for the following reaction.

### What Is Given?

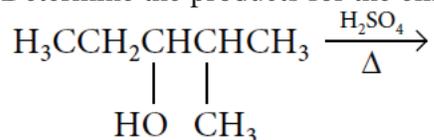
You are given the reactants and condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that will occur between a haloalkane when heated with a strong base.	elimination reaction
Determine the number minor products that form other than the alkene in an elimination reaction.	2 (ethanol and sodium bromide)
Determine the number of alkenes that can form: a double bond can be formed between carbon 3 and 4. This only results in one possible isomer a double bond can form between carbon 3 and 2. This results in two possible isomers, cis and trans	3 (2-methylpent-2-ene, cis-2-methylpent-3-ene, and trans-2-methylpent-3-ene)
Determine the total amount of products.	5 possible products

### Check Your Solution

This reaction is an elimination reaction. When the haloalkane reacts with a strong base under heat at least three products are formed, an alkene, ethanol and a salt. More than one alkene is possible in this reaction. One possible alkene results when a double bond forms between carbon 3 and 4 and two possible alkenes form when a double bond forms between carbon 3 and 2.

15. Determine the products for the elimination reaction.



### What Is Required?

You need to determine the products for the reaction.

### What Is Given?

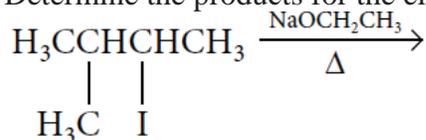
You are given the reactants and the conditions of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the possible products, Product 1: remove the single bond between hydroxyl group and carbon 3 remove the single bond between the hydrogen and carbon 2 create a double bond between carbon 2 and 3 this has one possible isomer	2-methylpent-2-ene
Product 2 remove the single bond between hydroxyl group and carbon 3 remove the single bond between the hydrogen and carbon 4 create a double bond between carbon 3 and 4 this has two possible isomers	cis-2-methylpent-3-ene
Product 3 create a single bond between the hydrogen ion and the hydroxyl ion	trans-2-methylpent-3-ene and water

### Check Your Solution

The reaction is an elimination reaction. When the alcohol reacted with a strong base an alkene and water were formed. When a double bond forms between carbon 2 and 3 only one isomer is possible but when a double bond forms between carbon 3 and 4 two isomers are possible.

16. Determine the products for the elimination reaction.



### What Is Required?

You need to determine the products for the reaction.

### What Is Given?

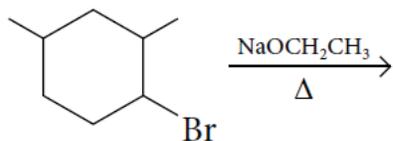
You are given the reactants and the conditions of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Determine the products that will occur: Sodium ethoxide typically removes a halogen atom and a hydrogen atom, leaving a double bond.</p> <p>Product 1 remove the single bond between the iodine atom and carbon 2 remove the single bond between the hydrogen atom and carbon 1 replace the single bond between carbon 1 and 2 with a double bond only one possible isomer</p> <p>Product 2 remove the single bond between the iodine atom and carbon 2 remove the single bond between the hydrogen atom and carbon 3 replace the single bond between carbon 2 and 3 with a double bond only one possible isomer</p> <p>Products 3 and 4 create a single bond between the iodine ion and the sodium ion create a single bond between the hydrogen ion and ethoxide ion</p>	<p>product 1: 2-methylbut-2-ene</p> <p>product 2: 3-methylbut-1-ene</p> <p>products 3 and 4: sodium bromide and ethanol</p>

### Check Your Solution

The reaction is an elimination reaction. When the haloalkane was heated with a strong base ethanol, a salt, and an alkene was formed. There were two possible alkenes.

17. Determine the major product of the reaction.



### What Is Required?

You need to determine the product of the reaction.

### What Is Given?

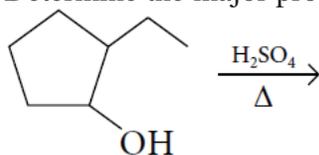
You are given the reactants and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that will occur between a haloalkane when heated with a strong base.	elimination reaction
Determine the major product: Sodium ethoxide typically removes a halogen atom and a hydrogen atom, leaving a double bond. remove the single bond between the bromine atom and carbon 1 remove the single bond between the hydrogen atom and the most substituted carbon adjacent to carbon 1. This is carbon 2 replace the single bond between carbon 1 and 2 with a double bond	<p>2,4-dimethylcyclohexene</p>

### Check Your Solution

The reaction is an elimination reaction. The major product will be the most stable alkene. This forms when the double bond forms between the halogenated carbon and the carbon adjacent to it which is more substituted.

18. Determine the major product of the reaction.



**What Is Required?**

You need to determine the major product of the reaction.

**What Is Given?**

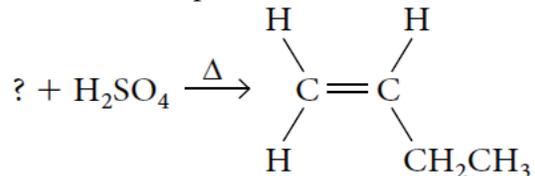
You are given the reactants and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that will occur when an alcohol is heated in the presence of a strong acid.	elimination reaction
Determine the major product remove the single bond between carbon 1 and the hydroxyl group remove the single bond between the hydrogen atom and the most substituted carbon adjacent to carbon 1. This is carbon 2 replace the single bond between carbon 1 and 2 with a double bond	<p>1-ethylcyclopentene</p>

**Check Your Solution**

The reaction is an elimination reaction. The major product will be the alkene. Since more than one alkene is possible the major one occurs when the double bond forms between the carbon bonded to the hydroxyl group and the more substituted carbon adjacent to the carbon bonded to the hydroxyl group.

19. Determine the possible reactants of the reaction.



### What Is Required?

You need to determine all possible missing reactants of the reaction.

### What Is Given?

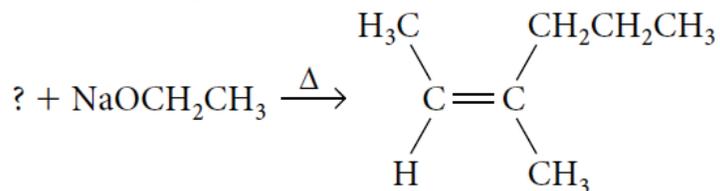
You are given a reactant, the product and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would form an alkene when heated in the presence of a strong acid.	elimination reaction
Determine the possible type of reactant.	The reactant must be an alcohol because they undergo elimination reactions in the presence of a strong acid.
Determine the possible reactants: replace the double bond between carbon 1 and 2 with a single bond (of the product) Reactant 1 add a single bond between carbon 1 and a hydroxyl group add a single bond between carbon 2 and a hydrogen atom Reactant 2 add a single bond between carbon 2 and a hydroxyl group add a single bond between carbon 1 and a hydrogen atom	$\begin{array}{c} \text{HO} \quad \text{H} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{CH}_2-\text{CH}_3 \end{array}$ butan-1-ol $\begin{array}{c} \text{H} \quad \text{OH} \\   \quad   \\ \text{H}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{CH}_2-\text{CH}_3 \end{array}$ and butan -2-ol

### Check Your Solution

The type of reaction is an elimination reaction. When alcohols are heated in the presence of a strong acid an alkene forms, therefore the reactant is an alcohol. Two reactants are possible because the alcohol could form a single bond with either carbon which is participating in the double bond.

20. Determine the possible reactants of the reaction.



### What Is Required?

You need to determine all possible missing reactants of the reaction.

### What Is Given?

You are given the product, a reactant and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would form an alkene when heated in the presence of a strong base.	elimination reaction
Determine the type of reactant.	The reactant must be a haloalkane because they undergo elimination reaction in the presence of a strong base such as sodium ethoxide.
Determine the possible reactants: replace the double bond between carbon 2 and 3 with a single bond (of the product) Reactant 1 add a single bond between carbon 2 and a halogen atom (X) add a single bond between carbon 3 and a hydrogen atom Reactant 2 add a single bond between carbon 3 and a halogen atom (X) add a single bond between carbon 2 and a hydrogen atom	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\   \quad   \\ \text{X} \quad \text{CH}_3 \end{array} \quad \begin{array}{c} \text{X} \\   \\ \text{CH}_3-\text{CH}_2-\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \\   \\ \text{CH}_3 \end{array}$ <p>Where X = F, Cl, Br, or I</p>

### Check Your Solution

The reaction is an elimination reaction. Haloalkanes form alkenes when heated with a strong base therefore the reactant must be a haloalkane. Two different structures are possible because the halogen can form a bond with either carbon that is participating in the double bond in the product.

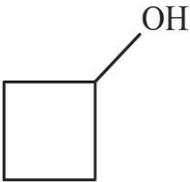
21. Determine the major product that would form from the following reaction.  
1-cyclobutanol + sulfuric acid  $\rightarrow$

**What Is Required?**

You need to determine the major product of the reaction.

**What Is Given?**

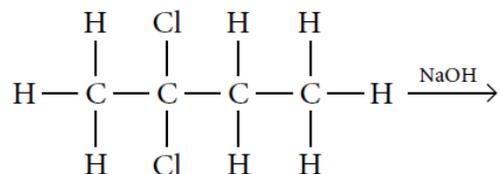
You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would occur when an alcohol is in the presence of a strong acid.	elimination reaction
Draw the reactant alcohol.	
Determine the major product: remove the single bond between carbon 1 and the hydroxyl group remove the single bond between a carbon adjacent to carbon 1 and a hydrogen atom replace the single bond between carbon 1 and the adjacent carbon with a double bond	

**Check Your Solution**

The reaction is an elimination reaction. When an alcohol reacts with a strong acid an alkene is formed. The double bond will form between the carbon that is bonded to the hydroxyl group and the adjacent carbon that is more substituted. In this case both carbons are equally substituted.

22. Predict the final products of the following reaction.  
(Hint: Eliminate both Cl atoms.)



### What Is Required?

You need to determine the product for the reaction.

### What Is Given?

You are given the reactants of the reaction.

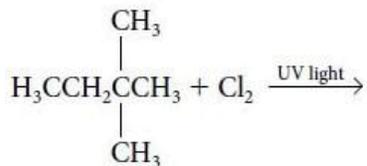
Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that will occur when a haloalkane reacts with a strong base.	elimination reaction (twice)
Determine all possible products. Product 1 remove both single bonds between carbon 2 and the chlorine atoms remove two single bonds between carbon 1 and the hydrogen atoms replace the single bond between carbon 1 and 2 and replace it with a triple bond Product 2 remove both single bonds between carbon 2 and the chlorine atoms remove two single bonds between carbon 3 and the hydrogen atoms replace the single bond between carbon 2 and 3 and replace it with a triple bond	but-1-yne $\text{HC}\equiv\text{C}-\text{CH}_2\text{CH}_3$ and but-2-yne, $\text{H}_3\text{C}-\text{C}\equiv\text{C}-\text{CH}_3$

### Check Your Solution

The reaction is an elimination reaction. However, two elimination reactions occur to the same bond creating an alkyne instead of an alkene. There are two possible products because there are two carbons adjacent to the carbon bonded to the chlorine atoms.

**Substitution Reactions**  
**(Student textbook page 104)**

23. Determine one possible product for the following substitution reaction.



**What Is Required?**

You need to determine one possible product for the reaction.

**What Is Given?**

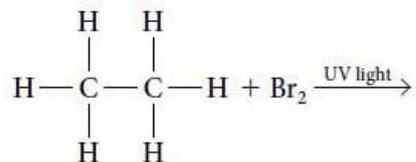
You are given the reactants and conditions of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction.	substitution reaction
This reaction is not specific. Any number, from one to all, of the hydrogen atoms could be replaced with a chlorine atom.	Depending on the amount of chlorine any or all of the hydrogen atoms could be replaced by chlorine. A few examples are: $\begin{array}{c} \text{Cl} \\   \\ \text{Cl}-\text{C}-\text{CH}_2-\text{C}-\text{CH}_3 \\   \\ \text{Cl} \end{array} \quad \begin{array}{c} \text{CH}_3 \\   \\ \text{CH}_3-\text{CH}_2-\text{C}-\text{CH}_3 \\   \\ \text{CH}_2 \\   \\ \text{Cl} \end{array}$

**Check Your Solution**

The type of reaction is a substitution reaction. When an alkane reacts with halogens in the presence of UV light a mixture of products is possible in which any variety of hydrogens are replaced by chlorine.

24. Determine how many possible products (not including HBr) may be formed in the following reaction.



### What Is Required?

You need to find the number of possible products for the reaction.

### What Is Given?

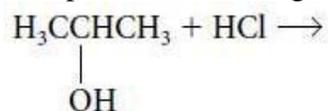
You are given the reactants and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction will occur when an alkane reacts with a halogen in the presence of UV light.	substitution reaction
Draw all possible substitutions, starting with one hydrogen being replaced by one chlorine. Rule out any structures that are the same.	<p>There are 9 possible products.</p> $  \begin{array}{ccc}  \begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array} &  \begin{array}{c} \text{Br} \quad \text{H} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{H} \quad \text{H} \end{array} &  \begin{array}{c} \text{Br} \quad \text{H} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{H} \\   \quad   \\ \text{Br} \quad \text{H} \end{array} \\  \\  \begin{array}{ccc}  \begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{H} \quad \text{H} \end{array} &  \begin{array}{c} \text{H} \quad \text{H} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{H} \quad \text{Br} \end{array} &  \begin{array}{c} \text{H} \quad \text{Br} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{H} \quad \text{Br} \end{array} \\  \\  \begin{array}{ccc}  \begin{array}{c} \text{Br} \quad \text{Br} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{H} \quad \text{H} \end{array} &  \begin{array}{c} \text{Br} \quad \text{Br} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{H} \quad \text{Br} \end{array} &  \begin{array}{c} \text{Br} \quad \text{Br} \\   \quad   \\ \text{Br}-\text{C}-\text{C}-\text{Br} \\   \quad   \\ \text{Br} \quad \text{Br} \end{array}  \end{array}  $

### Check Your Solution

The reaction is a substitution reaction. A bromine atom can replace any and all hydrogen atoms if enough bromine is present.

25. Complete the following substitution reaction.



**What Is Required?**

You need to determine the products for the reaction.

**What Is Given?**

You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Determine the products. When hydrohalogen acid react with alcohols, the halogen substitutes for the hydroxyl group.</p> <p>Product 1 remove the single bond between carbon 2 and the hydroxyl group remove the single bond between the hydrogen and chlorine atom create a single bond between carbon 3 and the chloride ion</p> <p>Product 2 create a single bond between the hydroxide ion and the hydrogen ion</p>	$\begin{array}{c} \text{CH}_3-\text{CH}-\text{CH}_3 \\   \\ \text{Cl} \end{array} + \text{H}-\text{OH}$

**Check Your Solution**

The alcohol reacted with the acid containing a halogen in a substitution reaction. The hydroxyl group was replaced with the halogen producing a haloalkane and water.

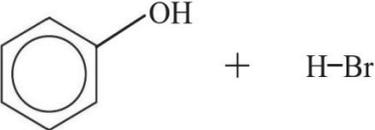
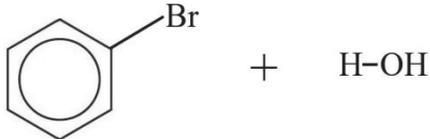
26. Complete the following substitution reaction.  
phenol + HBr  $\rightarrow$

**What Is Required?**

You need to determine the products for the reaction.

**What Is Given?**

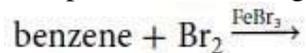
You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
Draw out the reactants.	
Determine the products. When hydrobromic acid reacts with an alcohol, the bromide ion replaces the hydroxyl group. Product 1 remove the single bond between carbon 1 and the hydroxyl group remove the single bond between the hydrogen atom and bromine atom create a single bond between carbon 1 and the bromide ion Product 2 create a single bond between the hydrogen ion and the hydroxide ion	

**Check Your Solution**

The alcohol reacted with the acid containing a halogen in a substitution reaction. The hydroxyl group was replaced with the halogen producing a halogenated benzene ring and water.

27. Complete the following substitution reaction.

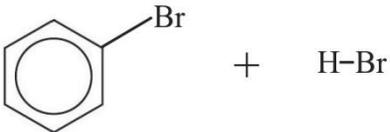


**What Is Required?**

You need to determine the products for the reaction.

**What Is Given?**

You are given the reactants and condition of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Determine the products. When benzene reacts with a halogen molecule in the presence of the catalyst, FeBr<sub>3</sub>, it forms a halobenzene and a hydrohalogen acid.</p> <p>Product 1 remove the single bond between a hydrogen atom and a carbon atom in the benzene ring remove the single bond between the two bromine atoms create a single bond between the carbon you removed the hydrogen from and a bromide ion</p> <p>Product 2 create a single bond between the hydrogen ion and the bromide ion</p>	

**Check Your Solution**

The aromatic hydrocarbon reacted with the diatomic halogen in a substitution reaction. A hydrogen was replaced with the halogen producing a halogenated benzene ring and an acid.

28. Complete the following substitution reaction.  
2-chloropropane + OH<sup>-</sup> →

**What Is Required?**

You need to determine the products for the reaction.

**What Is Given?**

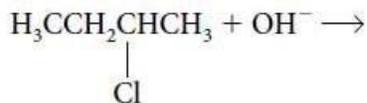
You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
<p>Determine the products. When a haloalkane reacts with a hydroxide ion, the hydroxide replaces the halogen on the alkane.</p> <p>Product 1 remove the single bond between carbon 2 and the chlorine atom creating a chloride ion</p> <p>Product 2 create a single bond between carbon 2 and the hydroxide ion</p>	$\begin{array}{c} \text{OH} \\   \\ \text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_3 \end{array} + \text{Cl}^-$

**Check Your Solution**

The halogenated alkane and hydroxide ion underwent a substitution reaction resulting in an alcohol and a chloride ion.

29. For the following reaction, determine the products and explain how you decided between a substitution reaction and an elimination reaction.



**What Is Required?**

You need to determine the products of the reaction and explain your reasoning for the type of reaction that occurs.

**What Is Given?**

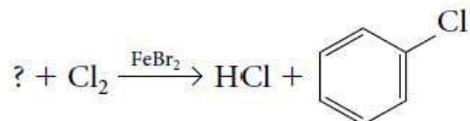
You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction and give reasoning.	Substitution reaction. A base such as $\text{NaOCH}_2\text{CH}_3$ would give an elimination reaction but a hydroxide ion results in a substitution reaction.
Determine the products. Product 1 remove the single bond between carbon 2 and the chlorine atom Product 2 create a single bond between carbon 2 and the hydroxide ion	$\text{CH}_3\text{—CH}_2\text{—}\underset{\text{OH}}{\text{CH}}\text{—CH}_3 + \text{Cl}^-$

**Check Your Solution**

The halogenated alkane and hydroxide ion underwent a substitution reaction resulting in an alcohol and a chloride ion.

30. Determine the missing reactants for the following equation.



### What Is Required?

You need to determine the missing reactant of the reaction.

### What Is Given?

You are given the products, a reactant, and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would yield a halogenated aromatic hydrocarbon and a hydrohalogen acid.	substitution reaction
Do the reverse of a substitution reaction to obtain reactant. remove the single bond between carbon 1 and the chlorine atom (in the products) remove the single bond between the hydrogen atom and the chlorine atom (in the products) create a single bond between the two chloride ions create a single bond between carbon 1 in the benzene ring and the hydrogen ion	

### Check Your Solution

The type of reaction is a substitution reaction. The reactant must be a benzene ring. Both chlorines from  $\text{Cl}_2$  are accounted for in the products in  $\text{HCl}$  and chlorobenzene. Therefore, the  $\text{H}$  in  $\text{HCl}$  must have come from the benzene ring as a reactant and during substitution reactions a halogen ion can replace a hydrogen atom.

31. Determine the missing reactants for the following equation.



### What Is Required?

You need to find the reactants for the reaction.

### What Is Given?

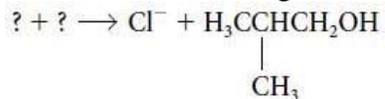
You are given the products and the condition of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would yield a halogenated alkane and an acid that contains a halogen when UV light is present.	substitution reaction
Determine the type of reactants that would be involved in the reaction.	alkane and bromine
Determine the reactants by doing the reverse of the substitution reaction. Reactant 1 remove the single bond between carbon 1 and the bromine atom (in the product) remove the single bond between the hydrogen and bromine atom (in the product) create a single bond between carbon 1 and the hydrogen ion Reactant 2 create a single bond between the two bromide ions	$\text{CH}_3 - \text{CH}_2 - \text{CH}_3 + \text{Br} - \text{Br}$

### Check Your Solution

The reaction is a substitution reaction. When an alkane and bromine undergo a substitution reaction in the presence of UV light the products are a halogenated alkane and hydrogen bromide.

32. Determine the missing reactants for the following equation.



**What Is Required?**

You need to find the missing reactants from the reaction.

**What Is Given?**

You are given the products of the reaction.

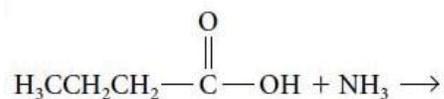
Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that would yield a chloride ion and an alcohol.	substitution reaction
Do the reverse of a substitution reaction to obtain the reactants. Reactant 1 remove the single bond between the carbon 1 and the hydroxyl group Reactant 2 create a single bond between carbon 1 and the chloride ion	$\text{CH}_3\text{—}\underset{\text{CH}_3}{\text{CH}}\text{—CH}_2\text{Cl} + \text{OH}^-$

**Check Your Solution**

When a halogenated alkane reacts with a hydroxide ion in a substitution reaction the products are an alcohol and a halogen ion.

**Esterification Reactions**  
**(Student textbook pages 108-9)**

33. Identify this reaction as an esterification reaction or a condensation reaction and determine the products.



**What Is Required?**

You need to identify the type reaction and determine the products.

**What Is Given?**

You are given the reactants of the reaction.

Plan Your Strategy	Act on Your Strategy
Determine the type of reaction that will occur between a carboxylic acid and ammonia.	condensation reaction
Determine the two products. Product 1 remove the single bond between carbon 1 of the carboxylic acid and the hydroxyl group remove a single bond between the nitrogen and one of its hydrogen atoms create a single bond between carbon one and amine ion Product 2 create a single bond between the hydrogen ion and hydroxide ion	$\text{CH}_3-\text{CH}_2-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{NH}_2 + \text{H}-\text{OH}$

**Check Your Solution**

The reaction is a condensation reaction. The carboxylic acid and ammonia reacted to form an amide and water.