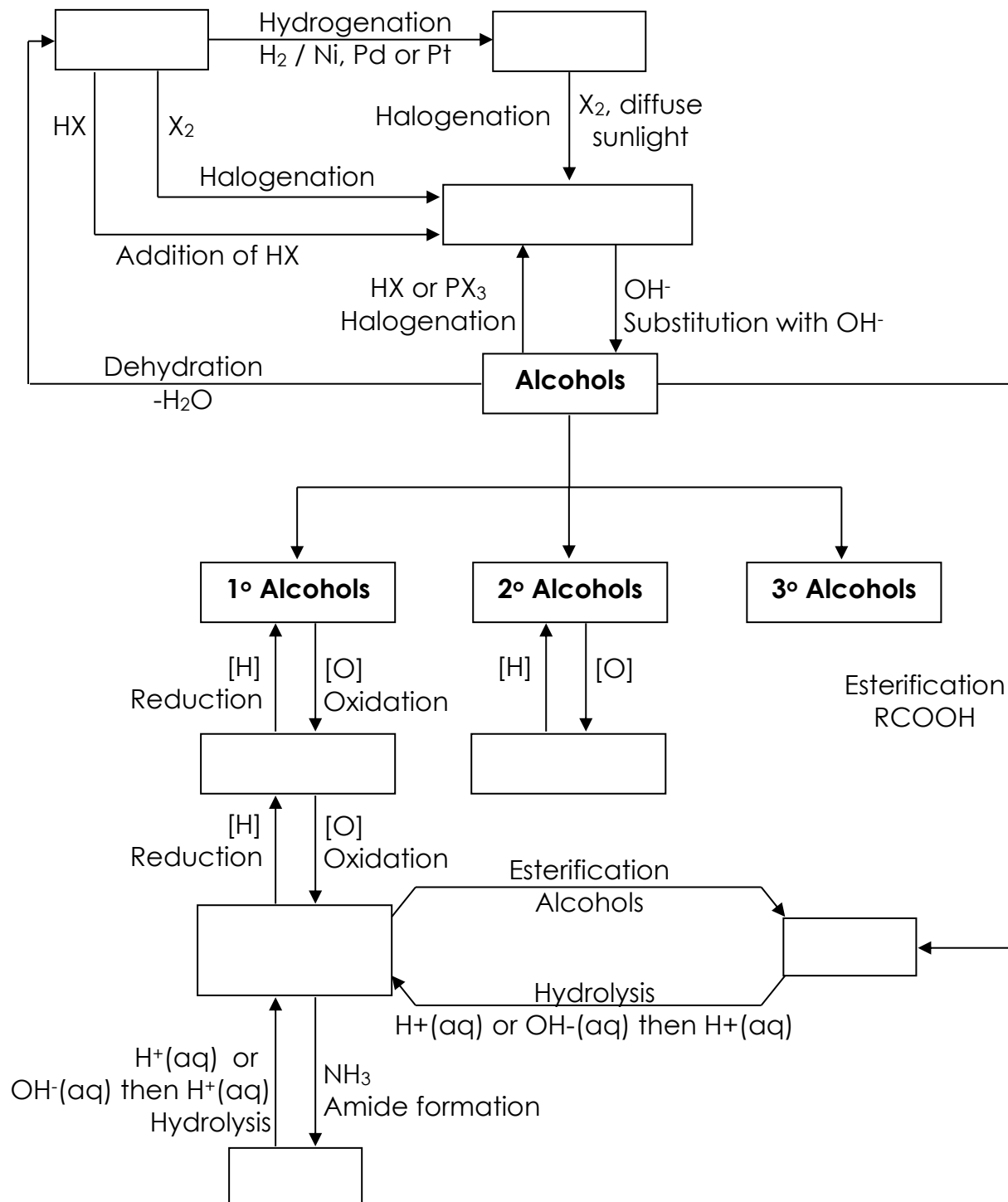
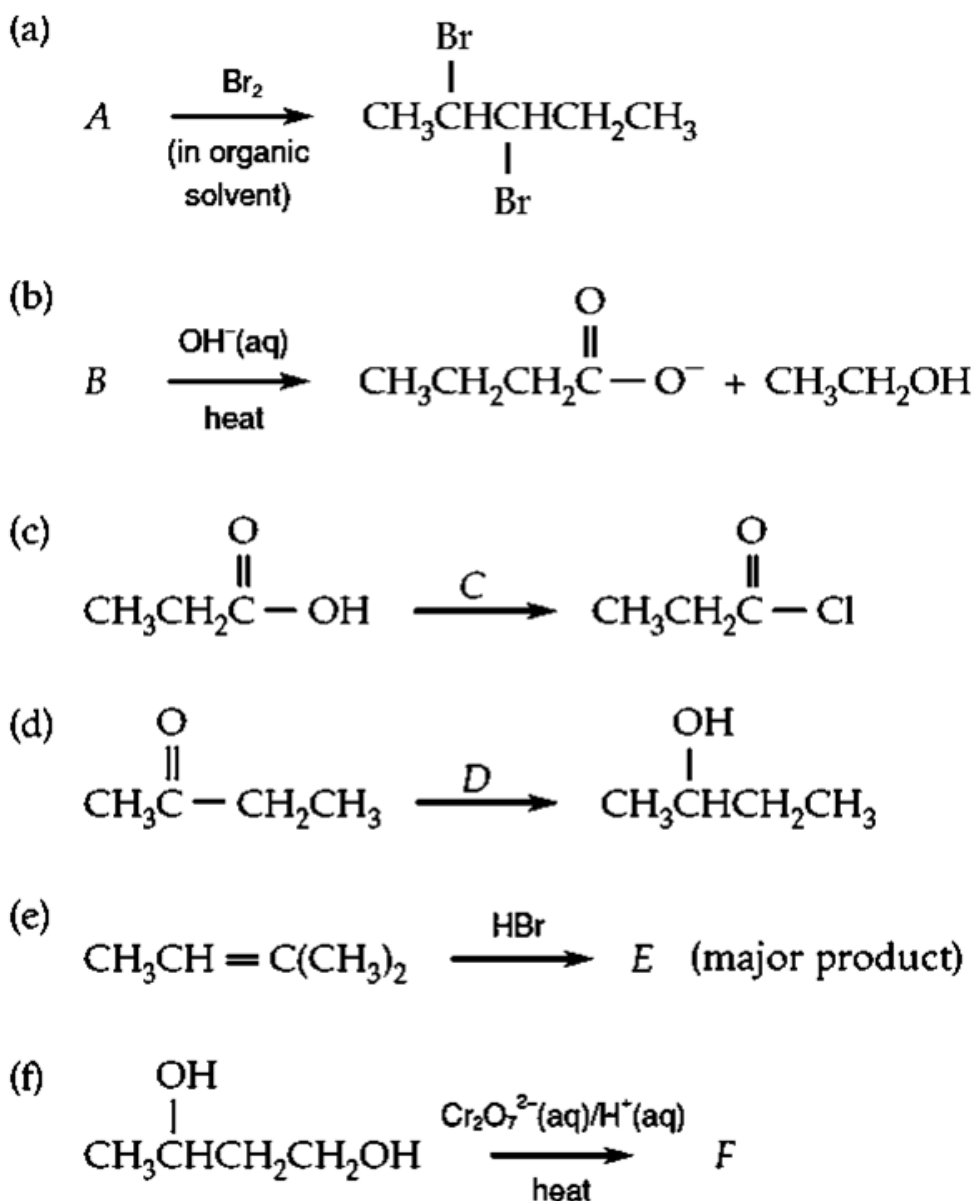


Further Exercise

CONCEPT MAP



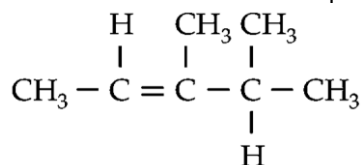
1.



2. If a few drops of bromine are added to hexane, a red-orange solution forms. No reaction occurs if the reaction mixture is kept in the dark. However, when it is put under sunlight, the red-orange solution is slowly decolorized and a misty gas is given off.

- Which substance is responsible for the red-orange colour of the solution?
- Name the misty gas formed in this reaction.
- Why does the reaction only occur in sunlight?
- Write an equation for the reaction if the mole ratio of bromine and hexane used is 1 : 1.

3. 2,3-dimethylpentan-3-ol can undergo dehydration to give two products. The following is the structural formula of one of the products:



- (a) Suggest the reagent and condition required for the dehydration of 2,3-dimethylpentan-3-ol.
- (b) (i) Write the structural formula of another product of the dehydration of 2,3-dimethylpentan-3-ol.
- (ii) State the type of isomerism exhibited by the two products.
- (c) State the observable change when 2,3-dimethylpentan-3-ol and acidified potassium dichromate solution are heated under reflux. Explain your answer.
- (d) 2,3-dimethylpentan-3-ol can undergo substitution reaction with phosphorus triiodide. Write a chemical equation for the reaction involved.
4. A breathalyser can be used to detect the alcohol content in the breath sample of suspected drunken drivers. One type of breathalyser contains a small tube filled with potassium dichromate crystals.
- (a) State the colour change of the crystals if the breath sample of a suspected drunken driver contains alcohol.
- (b) Write a half equation to explain the colour change of the crystals mentioned in (a).
- (c) State the change in the oxidation number of chromium in the reaction.
- (d) Write a chemical equation for the reaction between ethanol and acidified potassium dichromate solution. (Use [O] to represent the acidified potassium dichromate solution).

5. Three unlabelled bottles A, B and C each containing butanol, butanal or butanone are tested by reacting with different reagents. The experimental results are tabulated below.

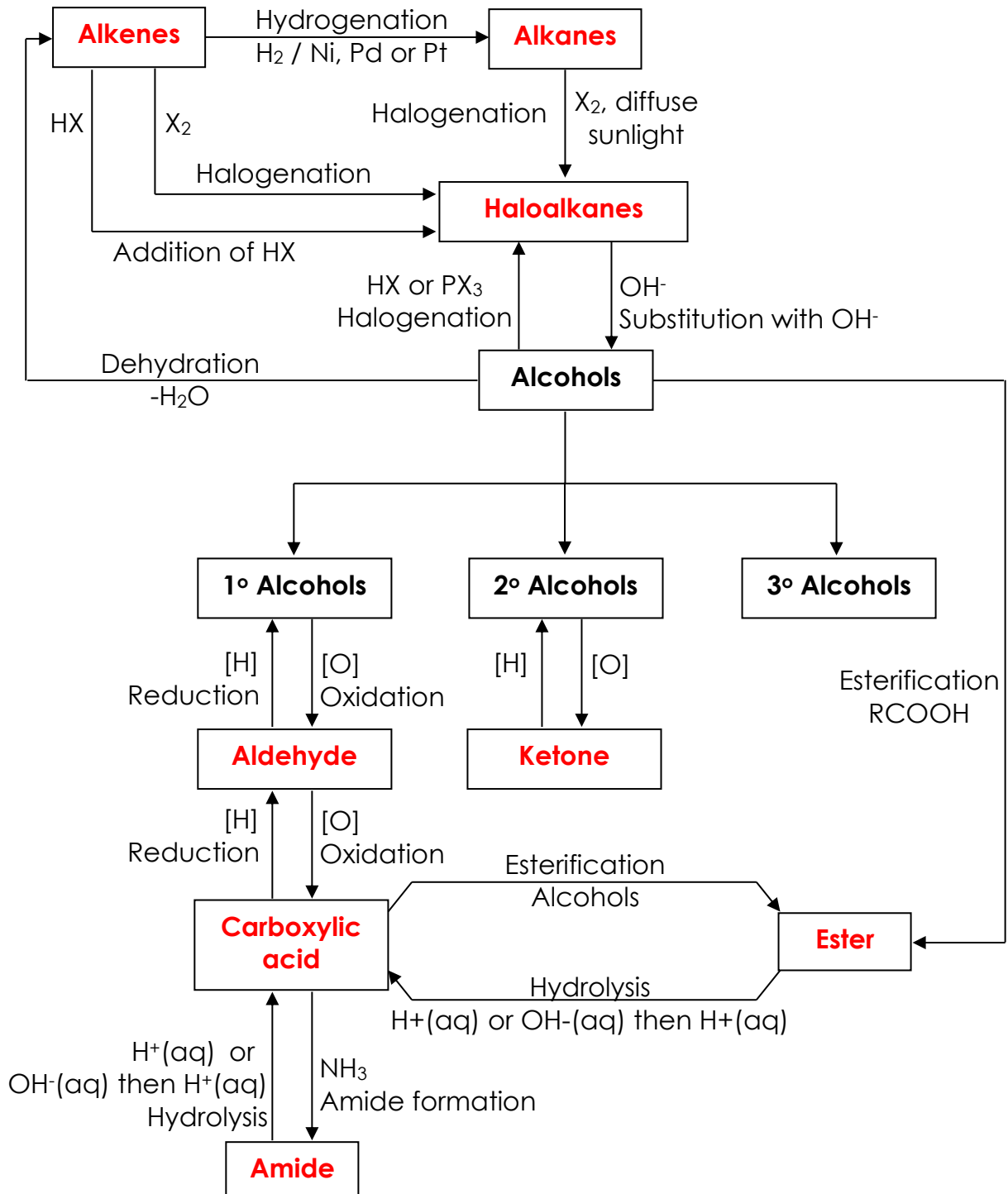
Bottle	Warmed with acidified potassium dichromate solution	Warmed with a mixture of ethanoic acid and concentrated sulphuric acid
A	No observable change	No observable change
B	The colour of the reaction mixture changes from orange to green.	A fruity smell is detected.
C	The colour of the reaction mixture changes from orange to green.	No observable change

- (a) Identify the compounds in each of the three bottles. Explain your answer briefly.
- (b) Explain why it is advisable to pour the mixture of B and ethanoic acid into water in order to detect the smell of the products.
6. A compound W with a straight carbon chain has the molecular formula of C_4H_8O . W is readily oxidized by acidified potassium dichromate solution to compound X, with the molecular formula of $C_4H_8O_2$. An aqueous solution of X turns blue litmus paper red. Upon the reduction of W, compound Y forms.
- (a) Suggest an observable change when W is oxidized to X by acidified potassium dichromate solution.
- (b) (i) Name compound X.
(ii) Write the structural formula of X.
- (c) State the reagents and conditions required for the conversion of W to Y.
- (d) Name the type of reaction involved when X and Y are heated in the presence of concentrated sulphuric acid.
- (e) Write the condensed structural formula of the organic product formed in (d).

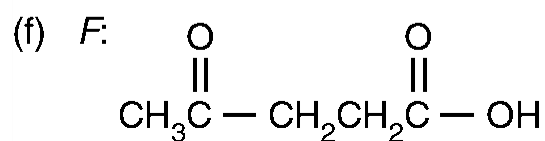
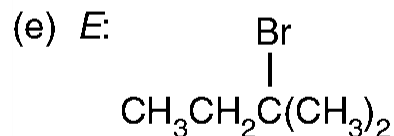
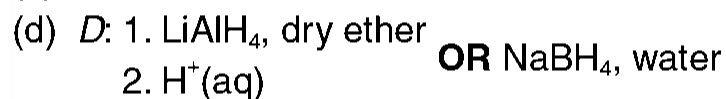
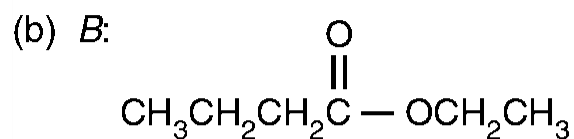
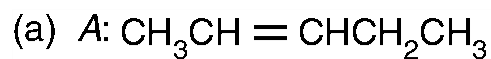
7. To prepare ethanamide from ethanoic acid, phosphorus trichloride is mixed with ethanoic acid. The resultant mixture then reacts with ammonia to give ethanamide.
- (a) Write a chemical equation for the preparation of ethanamide from ethanoic acid.
 - (b) Explain why ammonia is NOT directly added to ethanoic acid in the experiment.
 - (c) State ONE safety precaution of the experiment.
 - (d) Ethanamide can be converted back to ethanoic acid. Suggest the reagent and condition required for the conversion.

Suggested Answer

CONCEPT MAP



1.



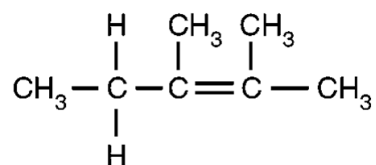
2. (a) Bromine

(b) Hydrogen bromide

(c) Sunlight provides energy for initiating the reaction.

3. (a) Conc. H_2SO_4 , heat **OR** Al_2O_3 , heat

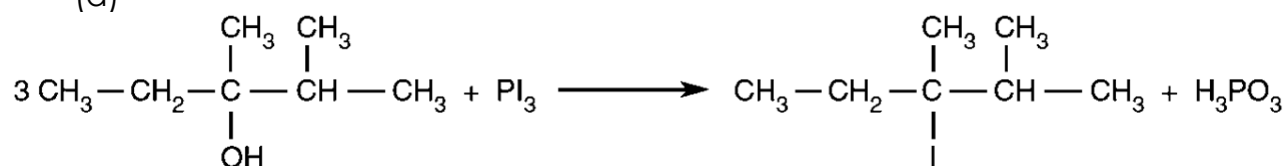
(b) (i)



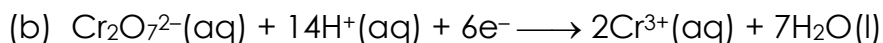
(ii) Position isomerism

(c) There is no observable change. 2,3-dimethylpentan-3-ol is a tertiary alcohol, which has no reaction with acidified potassium dichromate solution.

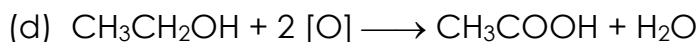
(d)



4. (a) The colour of the crystals changes from orange to green.



(c) From +6 to +3



5. (a) As A is not oxidized by acidified potassium dichromate solution, it should be butanone (a ketone).

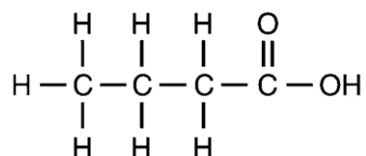
As B can react with ethanoic acid to form a fruity smell substance (probably an ester), it is likely to be butanol. Thus, C is butanal.

(b) When the mixture is poured into water, ethanoic acid will dissolve in water, leaving the fruity smell ester to float over the water surface.

6. (a) The orange acidified potassium dichromate solution turns green.

(b) (i) Butanoic acid

(ii)



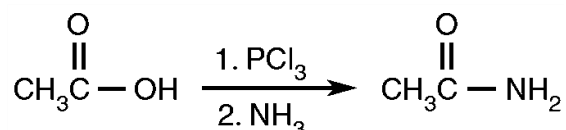
(c) 1. LiAlH_4 , dry ether
2. $\text{H}^+(\text{aq})$

OR NaBH_4 , water

(d) Esterification



7. (a)



(b) If ammonia is directly added to ethanoic acid, neutralization between ammonia and ethanoic acid will occur instead.

(c) Phosphorus trichloride/ethanoic acid is corrosive. Hence, wear protective gloves/safety spectacles when doing the experiment.

(d) 1. $\text{NaOH}(\text{aq})$, heat;
2. $\text{H}^+(\text{aq})$

OR $\text{H}^+(\text{aq})$; heat