Chemistry

1(a) Primary alkanols

they are those alcohols where the carbon atom on the hydroxyl group (OH) is attached to only one single alkyl group.

Some examples include;

CH_3-CH_2-OH	$CH_3-CH_2-CH_2-OH$	$CH_3-CH(CH_3)-CH_2-OH$
ethanol	Propan-1-ol	2-methylpropan-1-ol

Note: The existence of only one linkage among -OH group and an alkyl group are the things that qualifies any alcohol as primary.

1(b) Secondary alkanols

they are those alkohols where the carbon atom of the hydroxy group is attached to two alkyl groups on either side. The two alkyl groups present may be either structurally identical or different.

Some examples include;

$CH_3-CH(OH)-CH_3$	$CH_3-CH(OH)-CH_2CH_3$	$CH_3-CH_2-CH(OH)-CH_2$
propan-2-ol	butan-2-ol	pentan-3-ol

2. Using (CH_3MgCl) Methylmagnesium chloride;
Grignards Synthesis of

$CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + CH_3MgCl$

Using the formula $RMgX + R'RC{=}O \rightarrow R'RC{-}OMgX$

$CH_3CH_2CH_2CH_2C{=}OCH_2CH_2CH_3 + CH_3MgCl \rightarrow CH_3CH_2CH_2CH_2C(CH_3)(CH_2CH_2CH_3){=}O + Mg(OH)X$

Reactant ⇒

~~$CH_3CH_2CH_2CH_2C{=}O$~~

$CH_3CH_2CH_2CH_2C(CH_3){=}O + Mg(OH)Cl$

$CH_2CH_2CH_3$

3. Industrial preparation of Ethanol.
Carbohydrates such as starch are major group of natural compounds that can be made to yield ethanol by the biological process of fermentation. It yields 95% ethanol.

STEPS:

(1). The starch containing material on warming with malt to 60°c for a specific period of time are converted to maltose by the enzyme diastase contained in malt.

$$\underset{\text{Carbohydrate}}{2(C_6H_{10}O_5)_n} + nH_2O \xrightarrow[60^\circ c\ /\ \text{diastase}]{} \underset{\text{maltose}}{nC_{12}H_{22}O_{11}}$$

(2). The maltose is broken down into glucose on adding yeast which contains the enzyme maltase and at a temperature of 15°c

$C_{12}H_{22}O_{11} + H_2O \longrightarrow 2C_6H_{12}O_6$

maltose — 15°c/maltase — glucose

(3). The glucose at constant temperature of 15°c is then converted into alcohol by the enzyme Zymase contained also in yeast.

$C_6H_{12}O_6 \longrightarrow 2CH_3CH_2OH + 2CO_2$

Glucose — 15°c/Zymase — Ethanol — Carbon(iv)oxide

4- Reduction of Carboxyl Compounds (Alkanone and Alkanal) using Lithium tetrahydrido aluminate (II) / ethoxyethane

$LiAlH_4/(C_2H_5)_2O$

(1) For Ketones

Reduction of Ketones gives secondary alkanols

$CH_3CH_2-\overset{O}{\overset{\|}{C}}-CH_2CH_3 \xrightarrow[[H_2]]{LiBH_4/(C_2H_5)_2O} CH_3CH_2-\underset{H}{\overset{OH}{C}}-CH_2$

Pentan-3-one — Pentan-3-ol

$\downarrow$

$CH_3CH_2-\underset{H}{\overset{OH}{C}}-CH_2CH_3$

Pentan-3-ol

Reduction of Aldehydes gives primary alcohols

$$CH_3CH_2CH_2CHO \xrightarrow[[H_2]]{LiAlH_4(Et_2O)} CH_3CH_2CH_2CH_2OH$$

Butanal

Butan-1-ol