**Assignment Title:** Assignment  
**Course Code:** CHM 102

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**Question**

1) Discuss the two major classification of Alkanols. Give two Examples each for each class

2) In the Grignard synthesis of Alkanols, react a named Grignard reagent with CH3CH2CH2CH2C=OCH2CH2CH3. Show the reaction steps.

3) Discuss the industrial manufacture of ethanol showing all reaction equations and necessary enzymes and temperature of reaction

4)Determine the product obtained in the reduction of Alkanone and Alkanal. use a specific example for each and show the equation of reaction

Goodluck Guys.

**Classification of Alkanols**

Alkanols can be classified as primary, secondary or tertiary depending on the location of the OH (hydroxyl or hydroxy) functional group.  
Chemists use o notation to refer to primary, secondary and tertiary alkanols:

* primary alkanol ≡ 1o alkanol

-OH on a terminal (end of chain) C atom

* secondary alkanol ≡ 2o alkanol

-OH on a C atom bonded to 2 C atoms

* tertiary alkanol ≡ 3o alkanol

-OH on a C atom bonded to 3 C atoms

The general structure of primary, secondary and tertiary alkanols is summarised in the table below:  
(Note that R, R', R" represent alkyl, CnH2n+1, chains)

|  |  |  |  |
| --- | --- | --- | --- |
| **Classification** | **(o)** | **General Formula** | **Location of -OH group** |
| Primary | 1o | |  |  |  | | --- | --- | --- | |  | H | |  | | R- | C | -OH | |  | | H |  | | -OH on a terminal (end) carbon atom |
|  | | | |
| Secondary | 2o | |  |  |  | | --- | --- | --- | |  | H | |  | | R- | C | -OH | |  | | R' |  | | -OH on a carbon atom is bonded to 2 other carbon atoms |
|  | | | |
| Tertiary | 3o | |  |  |  | | --- | --- | --- | |  | R" | |  | | R- | C | -OH | |  | | R' |  | | -OH on a carbon atom is bonded to 3 other carbon atoms |

The table below gives examples of primary, secondary and tertiary alkanols:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Classification** | **(o)** | **General Formula** | **Examples** | |
| Primary | 1o | |  |  |  | | --- | --- | --- | |  | H | |  | | R- | C | -OH | |  | | H |  | | |  |  |  | | --- | --- | --- | |  | H | |  | | CH3-CH2-CH2- | C | -OH | |  | | H |  |   butan-1-ol (or 1-butanol) | |  |  |  | | --- | --- | --- | |  | H | |  | | CH3-CH2-CH2-CH2- | C | -OH | |  | | H |  |   pentan-1-ol (or 1-pentanol) |
|  | | | | |
| Secondary | 2o | |  |  |  | | --- | --- | --- | |  | H | |  | | R- | C | -OH | |  | | R' |  | | |  |  |  | | --- | --- | --- | |  | H | |  | | CH3-CH2- | C | -OH | |  | | CH3 |  |   butan-2-ol (or 2-butanol) | |  |  |  | | --- | --- | --- | |  | HO | |  | | CH3-CH2- | C | -CH2-CH3 | |  | | H |  |   pentan-3-ol (or 3-pentanol) |
|  | | | | |
| Tertiary | 3o | |  |  |  | | --- | --- | --- | |  | R" | |  | | R- | C | -OH | |  | | R' |  | | |  |  |  | | --- | --- | --- | |  | CH3 | |  | | CH3- | C | -OH | |  | | CH3 |  |   2-methylpropan-2-ol (or 2-methyl-2-propanol) | |  |  |  | | --- | --- | --- | |  | OH | |  | | CH3-CH2- | C | -CH2-CH3 | |  | | CH3 |  |   3-methylpentan-3-ol (or 3-methyl-3-pentanol) |

**Manufacturing alcohols from alkenes**

**The manufacture of ethanol from ethene**

Ethanol is manufactured by reacting ethene with steam. The catalyst used is solid silicon dioxide coated with phosphoric(V) acid. The reaction is reversible.



Only 5% of the ethene is converted into ethanol at each pass through the reactor. By removing the ethanol from the equilibrium mixture and recycling the ethene, it is possible to achieve an overall 95% conversion.

A flow scheme for the reaction looks like this:

