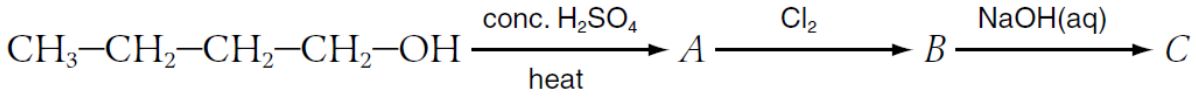
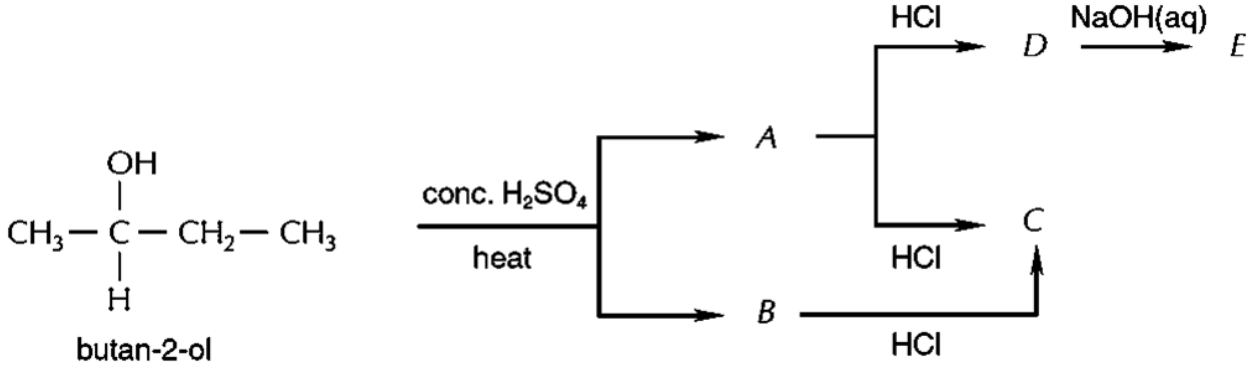
Quiz (Inter-conversion of Carbon Compounds)

1. Identify *A*, *B* and *C*. Explain your answer.



2. Suggest a synthetic route for the conversion of 1-chloropropane to 1,2-dichloropropane.

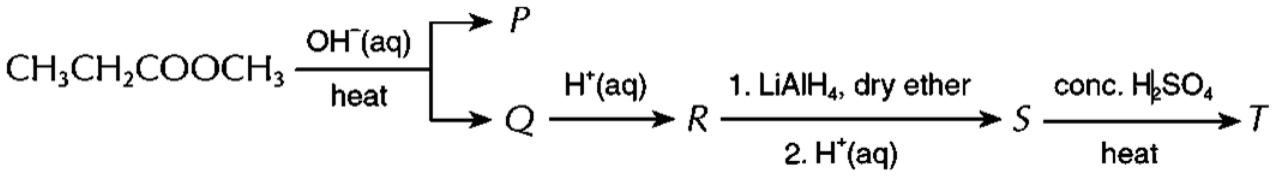
3. Consider the following multi-step synthesis.



   (a) Identify *A* to *E*.
   (b) Suggest a reagent that can convert butan-2-ol to *C* directly.
   (c) What is the relationship between butan-2-ol and *E*?

4. Suggest a synthetic route for the conversion of propanamide to propan-1-ol.

5. Consider the following multi-step synthesis.



   (a) Identify *P* to *T*.
   (b) Suggest the name of the polymer that can be prepared from *T*.

6. Compound *A*, C_3H_7Cl, reacts with sodium hydroxide solution to give *B*, C_3H_8O. On prolonged oxidation with acidified potassium dichromate solution, *B* gives *C*, C_3H_6O. Identify *A*, *B* and *C*.

7. Suggest a synthetic route for the conversion of ethyl propanoate to 1-chloropropane.

8. Compound *W*, C_4H_8, reacts with hydrogen chloride to give *X*, C_4H_9Cl (without isomeric product). *X* reacts with sodium hydroxide solution to give *Y*, $C_4H_{10}O$. When *Y* is mixed with ethanoic acid and a few drops of concentrated sulphuric acid, a sweet-smelling compound *Z*, $C_6H_{12}O_2$, is obtained. Identify *W*, *X*, *Y* and *Z*.

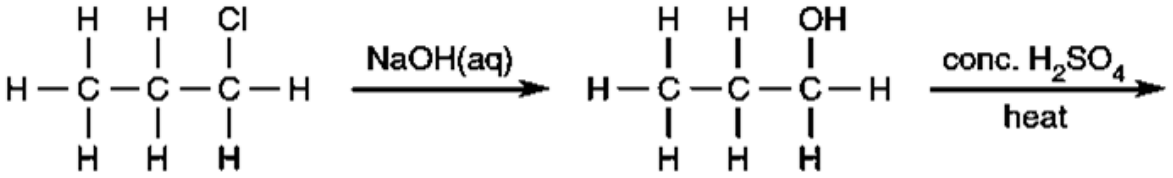
Suggested Answer

1. *A* is but-1-ene, $CH_3CH_2CH=CH_2$.
But-1-ene is produced by dehydration of butan-1-ol. Since the –OH group is at the end of the carbon chain, the C=C bond of the alkene is at the terminal position of the molecule.

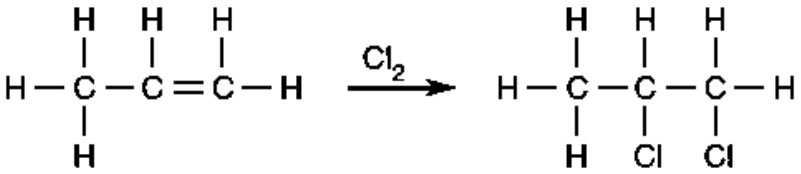
B is 1,2-dichlorobutane, $CH_3CH_2CHClCH_2Cl$.
Addition of chlorine to the C=C bond of but-1-ene produces only 1,2-dichlorobutane.

C is butane-1,2-diol, $CH_3CH_2CH(OH)CH_2OH$.
Substitution of the Cl atoms of 1,2-dichlorobutane by –OH groups produces only butane-1,2-diol.

2.

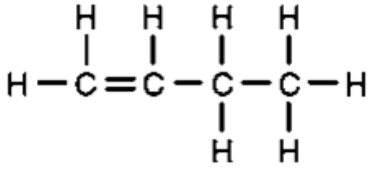


(Accept other correct synthetic routes.)

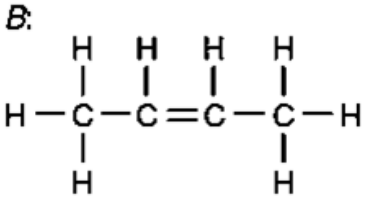


3. (a)

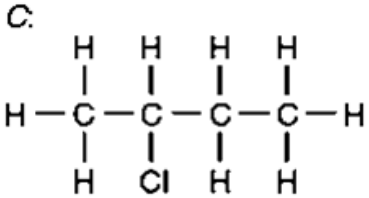
A:



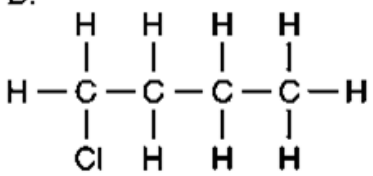
B:



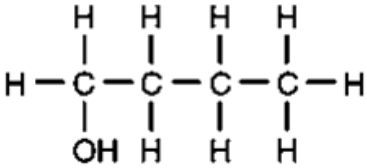
C:



D:



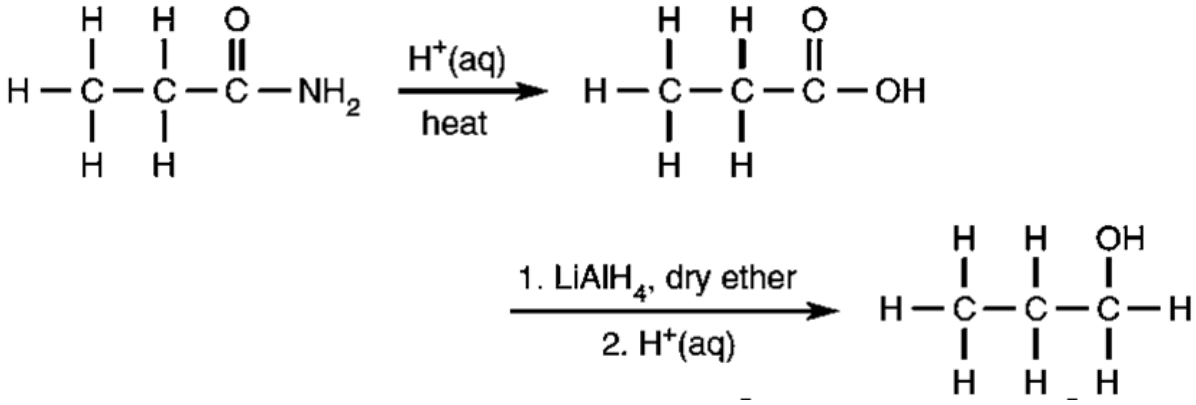
E:



(b) Concentrated hydrochloric acid / hydrogen chloride / phosphorus trichloride

(c) They are structural isomers / position isomers.

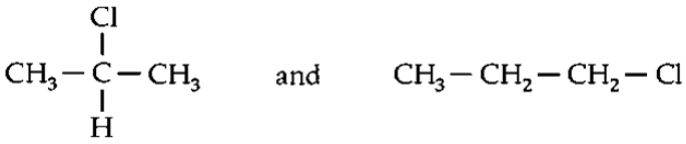
4.



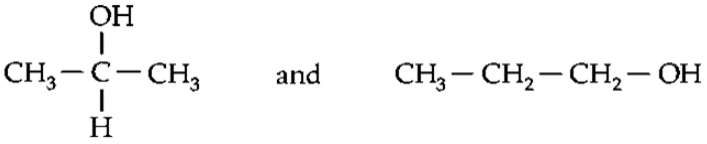
5. (a) *P*: CH_3OH; *Q*: $CH_3CH_2COO^-$;
R: CH_3CH_2COOH; *S*: $CH_3CH_2CH_2OH$;
T: $CH_3CH{=}CH_2$

(b) Polypropene

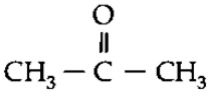
6. There are two possible structures for *A*:



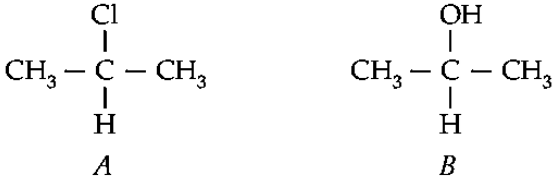
The molecular formula of *B* can be written as C_3H_7OH. *B* is likely to be a product of substitution (by –OH) reaction of the haloalkane *A*. Then the two possible structures of *B* are:



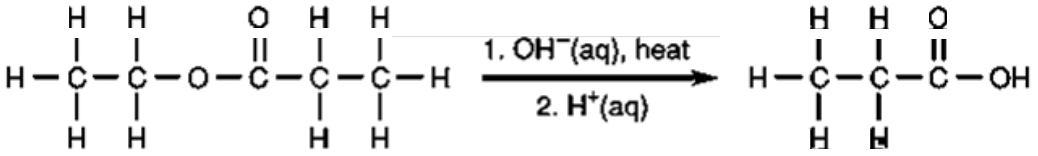
C is the oxidation product of the alcohol *B*. It has only one oxygen atom and is not further oxidized by acidified potassium dichromate solution to an acid. Hence, it is probably a ketone. Its structure should be:



From the structure of *C*, it can be deduced that *B* is a secondary alcohol. Therefore, the structures of *A*



7.



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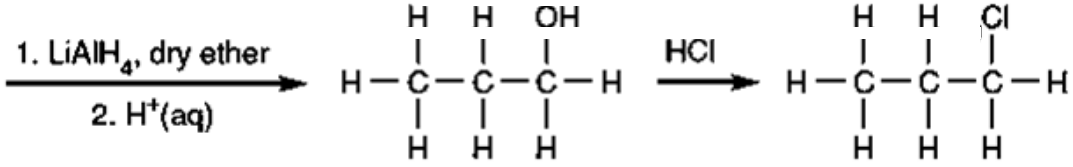
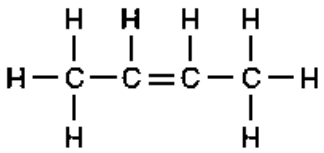
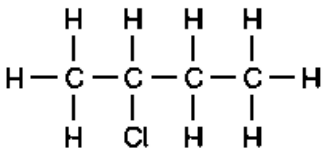


8.

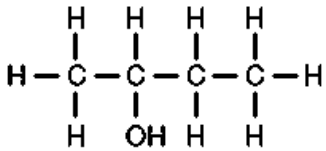
W:



X:



Y:



Z: