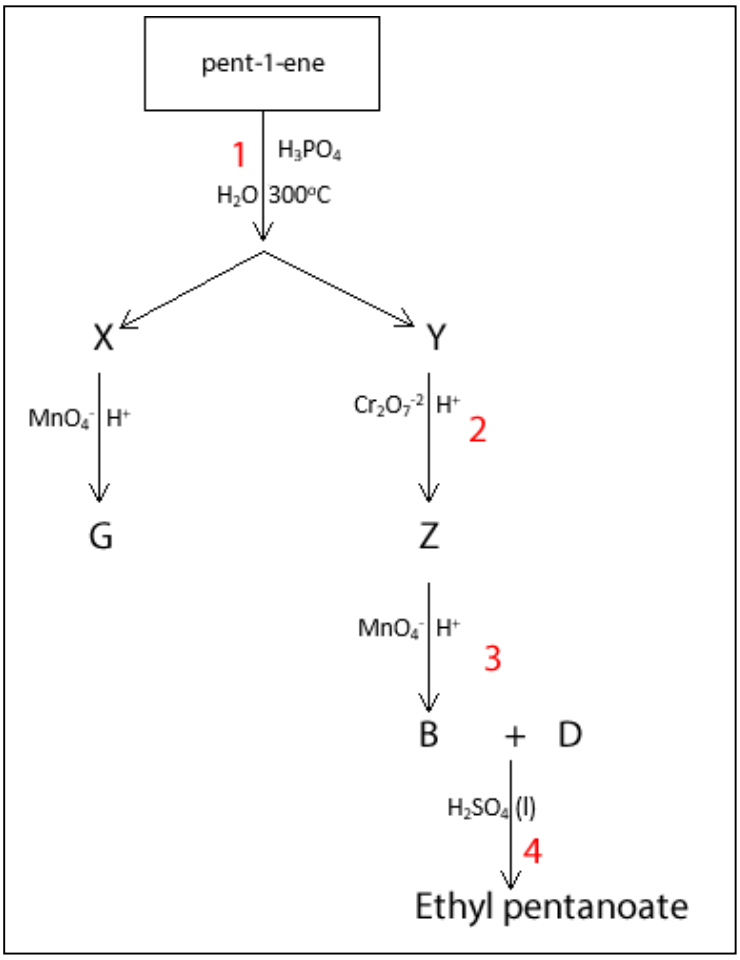
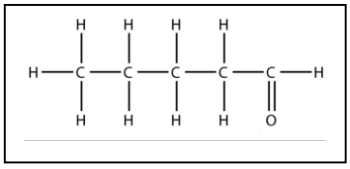
Friday worksheet 9
Organic Click to refresh yourself with setreoisomers



1) Pent-1-ene is the starting compound for the two reaction pathways shown on the right.
   a) Name substance Y

   Pentan-1-ol

   b) Draw the structural formula of substance Z



   c) Name the class of organic compound (homologous series) to which Compound Z belongs

   Aldehyde

   d) Give the IUPAC name of substance B

   Pentanoic acid

   e) Write the semi-structural formula of substance D

   CH_3CH_2OH

   f) Name the class of organic compound (homologous series) to which Compound G belongs.

   Ketone

   g) Name the class of organic compound (homologous series) to which Compound X belongs

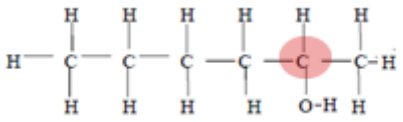
   Secondary alcohol

   h) Show that reaction is an oxidation reaction.
   pentan-1-ol ($C_5H_{12}O$) → pentanal ($C_5H_{10}O$)
   Oxidation state of carbon in pentan-1-ol is -2 and in pentanal it is -1.60. An increase in oxidation state hence oxidation. Keep in mind that carbon atoms can have an oxidation state that is a fraction as it is the average oxidation state of all the carbons that is calculated.

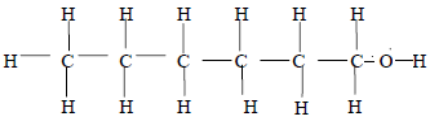
   i) What type of reactions is :

Addition	*Oxidation*	*Esterification*

j) Consider the two products X and Y of reaction 1, above. Draw the structural formula of each compound and give the number of optical isomers that exist for each.



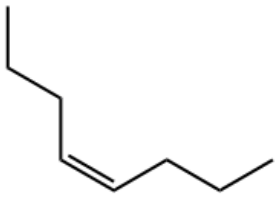
X has 1 chiral centre hence has two optical isomers



Y has no chiral centres hence has no optical isomers

2) Draw the skeletal structure of the compounds mentioned in each box below.

cis-oct-4-ene

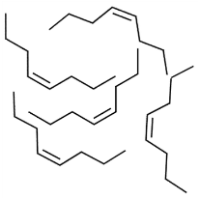


trans-oct-4-ene

a. Cis-oct-4-ene has a boiling point of 128 °C and a melting point of -119 °C
Trans-oct-4-ene has a boiling point of 122 °C and a melting point of -94 °C

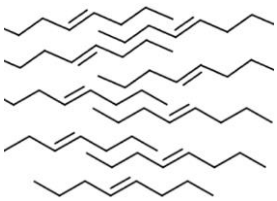
i. Using diagrams explain the differences between the melting temperatures of the cis and trans isomers.

Cis-oct-4-ene



Since cis isomers are kinked there packing arrangement in the solid structure is fairly lose. This makes for weak attraction amongst the molecules due to the fact that there is little surface area of each molecule that overlaps with other molecules so that dispersion force can take hold.

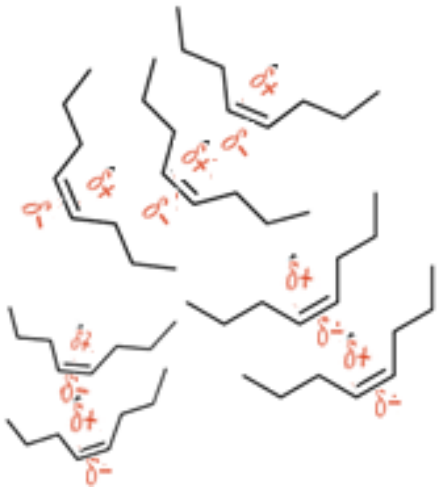
Trans-oct-4-ene



Since trans isomers have a linear geometry they can pack tightly together in the solid crystal structure. This makes for strong attraction amongst the molecules due to the fact that there is a significant surface area of each molecule that overlaps with other molecules so that dispersion force can take hold.

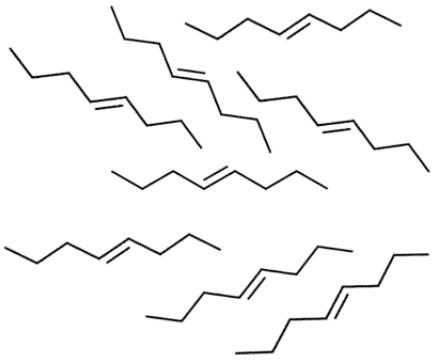
ii. Using diagrams explain the differences between the boiling temperatures of the cis and trans isomers.

Cis-oct-4-ene



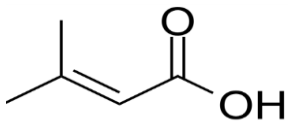
Dipoles across the cis double bond aid the forces of attraction between the molecules in the liquid state. These dipoles now exert an influence

Trans-oct-4-ene

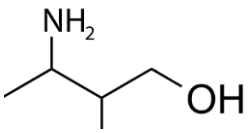


No dipoles exist with the trans double bonds and hence the only force of attraction is that of dispersion forces only. Hence the force of attraction is a lot less then with the cis isomer that has dipole-dipole as well as dispersion forces.

3) Give the IUPAC name for the molecules

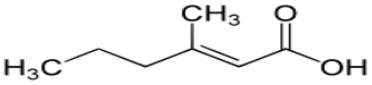


3-methylbut-2-enoic acid



3-amino-2-methylbutan-1-ol

4) Name the stereoisomer shown on the right.



***trans*-3-methyl-2-hexenoic acid**

***trans*-3-methylhex-2-enoic acid**