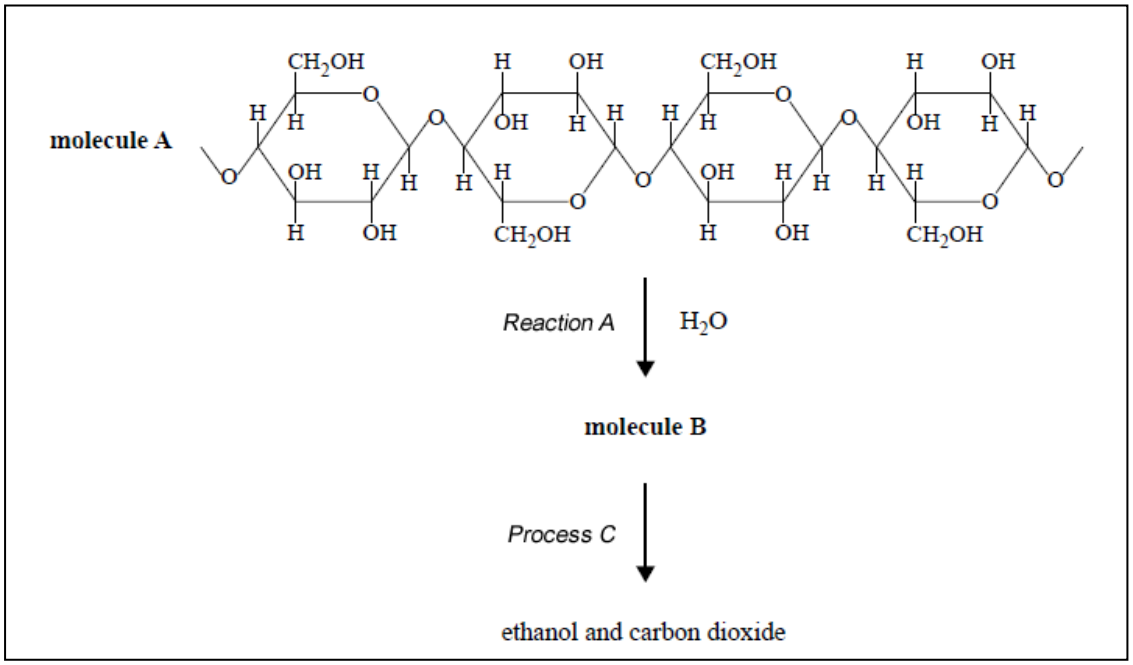
Friday Worksheet **Name: …….**

Biofuels worksheet 1



1) Biochemical fuels, such as bioethanol, can be produced using pulped plant material. Consider the biochemical pathway, shown above, which converts substances available in pulped plant material to ethanol.
   a) What is the chemical formula of molecule B?
   b) What type of reaction is reaction A?
   c) What is the name of process C?

2) It is argued that ethanol produced in this way could be considered renewable and carbon neutral compared to other fuels such as petroleum.
   a) Explain why this form of ethanol production can be considered renewable and carbon neutral.

   b) Discuss the advantages and disadvantages of using energy resources such as bioethanol.

3) Wood pulp is used by bacteria to produce ethanol. 1.40 kg of wood pulp is used in the process and 428 mL of liquid ethanol is collected. A sample of 6.28 mL of this ethanol is then completely combusted in a bomb calorimeter. One litre of water was heated from an initial temperature of 22.00 °C to 59.20 °C.

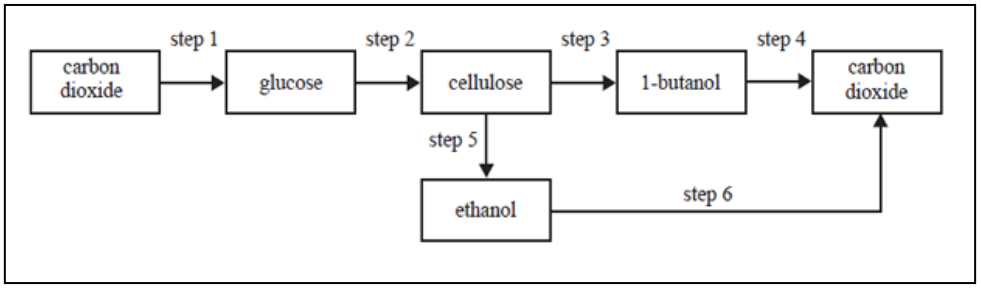
a) Write a balanced chemical equation for the combustion of ethanol.

b) What was the amount of energy produced by 6.28 mL of bioethanol that was completely combusted in the bomb calorimeter

c) Using the molar heat of combustion of ethanol, determine the mass of ethanol present in the 6.28 mL sample.

d) Ethanol produced in this way is known as a biofuel. Define a biofuel.

e) It is known that a type of bacteria, *clostridium acetobutylcium,* converts cellulose to butanol. The following diagram represents a series of steps (which may involve multiple reactions) for the formation and combustion of the biofuels, ethanol and 1-butanol.



i. Which step represents photosynthesis?

ii. Which step represents fermentation?