Friday Worksheet **Name: ……..**

Organic worksheet 5

1) 2.10 g of an alkene that contains only one double bond per molecule reacted completely with 3.55 g of chlorine, Cl_2.
The molar mass of chlorine, Cl_2, is 71.0 g mol^{-1}.
Which one of the following is the molecular formula of the alkene? Explain how you arrived at your choice and show all working .

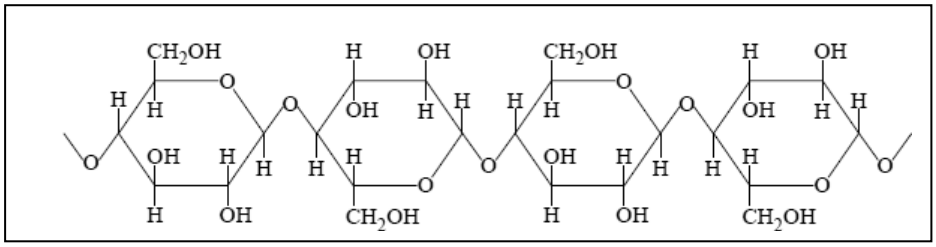
Since the alkene has only one double bond one mole of Cl_2should react for every mole of alkene.

$n_{alkene} = n_{chlorine}$ = 3.55 / 71.0 = 0.05 mol

Formula mass = mass /mol
Formula mass $_{alkene}$ = 2.10 /0.05 =42g/mol

C. C_3H_6

2) A section of cellulose polymer is shown below.



This polymer is chemically degraded to obtain the monomer.

a) Name the monomer

Glucose

b) What two words best describe the reaction that forms cellulose from its monomers?

Condensation polymerisation

c) The monomer of cellulose is used to form ethanol. Write the chemical reaction taking place indicating the appropriate catalyst, reactant and products.
$C_6H_{12}O_6$ (aq) enzymes-> $2CH_3CH_2OH$(aq) + 2 CO_2 (g)

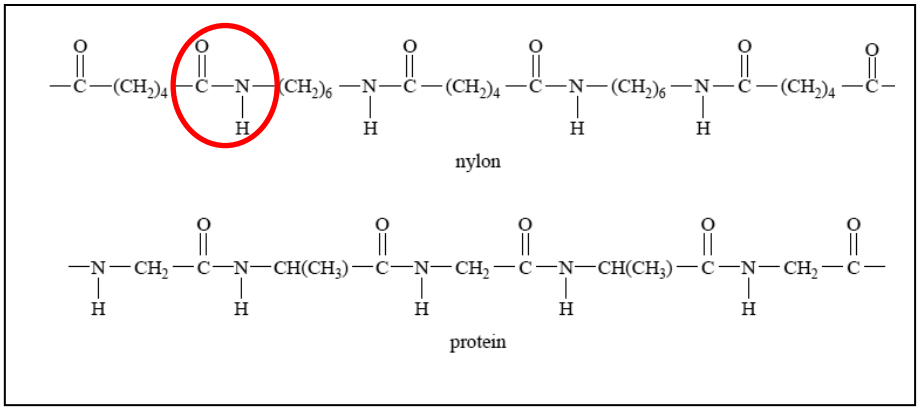
d) What is the reaction in c) above called?
Fermentation

e) What type of reaction is d) above? Select form the list below explain why.
i) Oxidation, ii) Reduction, iii) Addition, iv) Substitution
Oxidation
Carbon in glucose has an oxidation state of 0 while carbon in CO_2 has an oxidation state of 4+

f) Starch is a spiral polymer of glucose. A plant cell forms a small starch molecule composed of 100 glucose molecules. If each glucose molecule has a molar mass of 160.2 g mol^{-} what is the formula mass of the polymer?

For a polymer containing 100 molecules of glucose there are 99 links that have to be made.
Every link gives off a water molecule.
So the polymer has a formula mass of 100 X 160.2 – 99 X 18 = 16020 -1782 = 14238 g/mol

3)



a) Name the monomers of the protein chain shown?

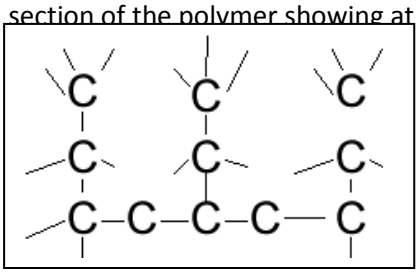
Alanine and glycine

b) What is the functional group, that is circled above, called?

Amide bond

4) A polymer is formed from but-2-ene molecules only.

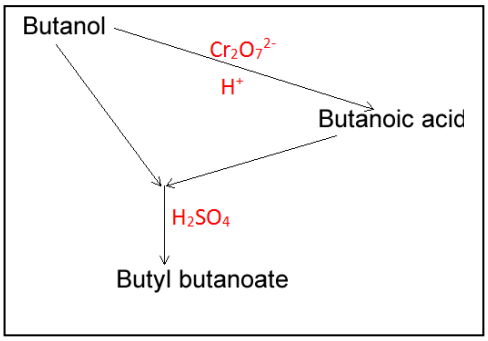
a) Draw a section of the polymer showing at least two units of the monomer



c) A polymer is formed from 100 molecules of but-2-ene. What is the formula mass of the polymer?

100 X 56.1 = 5610 g/mol

5) a) Given a pure sample of butan-1-ol describe the steps that are required to prepare a sample of **pure** butyl butanoate. Include any reagents that are used in the synthesis. An annotated flow chart may be used in your answer.



b) Discuss how the product could be tested to see if it is pure butyl butanoate using IR spectroscopy.

The IR spectrum will not show absorption peaks at 2500-3300 (O-H acid) nor at 3200 – 3350 (O-H alcohol)