## Answers to the organic chem classwork

This is to use in class.

## Do not write on it.

Do not take this out of the room.



| 5 |   <br> ethanal <br> 3-heptanone <br> hexanimide <br> methyl-ethyl ether |   <br> ethene propyl hexanoate 3,4 dibromol hexyne cyclo-pentane |
| :---: | :---: | :---: |
| 6 |  <br> 4 ethyl,2-methyl octane <br> ethyl ethanoate <br> 2-octene <br> 2-butyne |   <br> 3-hexanamine pentanamide methyl pentanoate cyclo-butane |

1. Addition: 2 pentene $+\mathrm{Br}_{2}$ into 2,3 dibromopentane
2. Substitution: propane $+\mathrm{Cl}_{2}$ form 2chloropropane +HCl
3. Polymerization: tetrafluoroethene forms polytetrafluoroethane
4. Fermentation of GLUCOSE $\left(\mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6}\right)$ into 2 products. Make sure to show yeast + water by the arrow.
5. Esterfication of 1-propanol and pentanoic acid forms propyl pentanoate
6. Saponification: write a word equation, not the structural molecules.




$\mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6(\mathrm{AQ})} \xrightarrow[\text { ENNYMES }]{\text { YEAT }} 2 \mathrm{C}_{2} \mathrm{H}_{5} \mathrm{OH}_{(\mathrm{AQ})}+2 \mathrm{CO}_{2(\mathrm{G})}$
 $+$



## Saponification:

Triple Ester (FAT) $+3 \mathrm{NaOH} \rightarrow$ Triple Alcohol +3 SOAP molecules (each has one $\mathrm{Na}^{+1}$ ion)

| SCENT | Circle the Functional Groups ONLY <br> in these STRUCTURAL FORMULAS | Name all <br> Functional Groups <br> in each molecule |
| :---: | :---: | :---: | :---: | :---: |
| banana |  |  |
| cinnamon |  |  |
| caraway |  |  |
| (rye bread) |  |  |
| (flowers) |  |  |


| SCENT | Circle the Functional Groups ONLY in these STRUCTURAL FORMULAS | Name all <br> Functional Groups in each molecule |
| :---: | :---: | :---: |
| hyacinth (flowers) |  | alcohol |
| jasmine |  | Ester |
| licorice |  | Ether |
| mushroom |  | Alcohol <br> 16 H atoms in total (count the parentheses first, it's easier) |
| orange |  | Ester <br> Octyl ethanoate |
| peach |  | Ester <br> 20 H atoms in total (count the parentheses first, it's easier) |


| SCENT | Name all <br> in these STRUCTURAL FORMULAS <br> Functional Groups <br> in each molecule |
| :---: | :---: | :---: | :---: | :---: |
| peppermint |  |


| SCENT | Circle the Functional Groups ONLY <br> in these STRUCTURAL FORMULAS | Name all <br> Functional Groups <br> in each molecule |
| :---: | :---: | :---: |
| Vinegar | $\mathrm{H}-\mathrm{C}$ | Organic Acid <br> ethanoic acid |


| strawberry |  | Ether and Ester |
| :---: | :---: | :---: |
| vanilla |  | Aldehyde <br> Alcohol and Ether |
| wintergreen |  | Organic acid and Ester <br> 5 double bonds |


| Homologous Series Name | general formula <br> $\mathrm{n}=$ number of carbon atoms | EXAMPLES |  |  |
| :---: | :---: | :---: | :---: | :---: |
|  |  | $\underset{\text { (4 Carbon chains) }}{\text { Name }}$ | Structural Diagrams <br> with all hydrogen atoms showing <br> And condensed structural formulas |  |
| alkanes | $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}+2}$ | propane |  | $\mathrm{CH}_{3} \mathrm{CH}_{2} \mathrm{CH}_{3}$ |
| alkenes | $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}}$ | propene |  | $\mathrm{CH}_{3} \mathrm{CHCH}_{3}$ |
| alkynes | $\mathrm{C}_{\mathrm{n}} \mathrm{H}_{2 \mathrm{n}-2}$ | propyne |  | $\mathrm{CHCCH}_{3}$ |

2methyl, 4ethyl, 3fluoroheptane

5ethyl
3,6,7 trimethyl 1-octene

1chloro
3,3 difluoro
4,5 dimethyl 1 hexyne


$\mathrm{CH}_{3}$


## $\mathrm{CH}_{4}+\mathrm{Cl}_{2} \rightarrow \mathrm{CH}_{3} \mathrm{Cl}+\mathrm{HCl} \quad$ This is substitution




Draw out the molecules to show the addition reaction between 2 butyne + fluorine form into 2,3 difluro- 2 butene



Name the reactants and products in this esterification reaction

ethanol and ethanoic acid form into ethyl ethanoate and water

Name the reactants and products in this esterification reaction

methanol and
butanoic acid

methyl butanoate and water

Balance

$$
ـ \mathrm{C}_{6} \mathrm{H}_{12} \mathrm{O}_{6(\mathrm{AQ})} \xrightarrow[+ \text { water }]{\xrightarrow{\text { Enzymes }}}
$$

this reaction

$$
2 \mathrm{CO}_{2(\mathrm{G})}+
$$

$$
2 \mathrm{C}_{2} \mathrm{H}_{5} \mathrm{OH}_{(\mathrm{AQ})}
$$

Draw the structural diagrams AND condensed structural formulas showing these reactions.
Substitute in a fluorine atom with ethane, forming fluoro-ethane +HF


Substitute in a chlorine atom with propane, forming 1-chloropropane +HCl


Substitute in an iodine atom with propane, this time forming 2-iodo-propane +HI


$+\mathrm{HI}$

Substitute in a bromine atom with pentane, this time forming 2-bromopentane +HBr


Substitute in a fluorine atom with 2-bromopentane, this time forming 1-fluror,2-bromopentane + HF



With alkenes, the double bond becomes single. With alkynes, the triple bond becomes a double In both cases, ADD 2 ATOMS INTO THE NEW MOLECULE. In each box, draw structural formulas for each.

Add a bromine molecule to 2-pentene


Add a chlorine molecule to 2-butyne


Add a hydrogen molecule to propene



Add a hydrogen molecule to 1-butyne




Draw and label the structural diagrams for propanoic acid and for ethanol, and the two products.
Circle the OH and the H that makes the water. NAME both products that form.



| Water |
| :---: |
| and |
| Ethyl propanoate |

Combine methanol with hexanoic acid to produce the wonderful smell of bananas! Do the same as above, draw 2 diagrams for the acid and the alcohol, circle the -OH and the -H that forms water, then draw and properly name both products that form.


