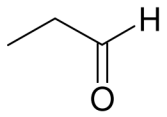
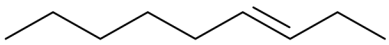
Name:_____

Organic Chemistry Test – SCH 4C

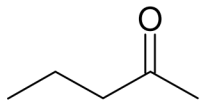
1. For each of the following structures write the name of the functional group (i.e. the family of organic compounds to which it belongs), the name of the compound where requested, comment on the level of polarity for the compound and finally state the type of intermolecular force present between molecules (choose from van der Waal, dipole or hydrogen bond). Use the information on the bottom of the next page to assist in naming.



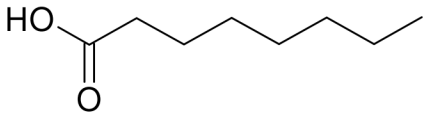
functional group	aldehyde
name	propanal
polarity	moderately polar
intermolecular force	dipole



functional group	alkene
name	3-nonene
polarity	non-polar
intermolecular force	van der Waal

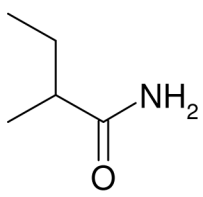


functional group	ketone
name	2-pentanone
polarity	moderately polar
intermolecular force	dipole



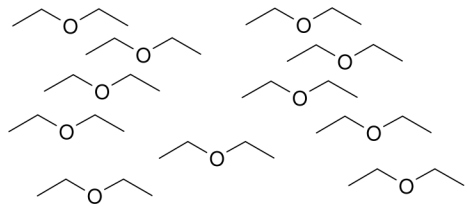
functional group	carboxylic acid
name	octanoic acid
polarity	very very polar (non polar chain)
intermolecular force	hydrogen bond*

*van der Waals produced by chain portion of molecule, will add force to the overall intermolecular attraction

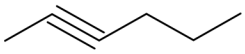


functional group	amide
polarity	very very polar*
intermolecular force	hydrogen bond

*because there are hydrogens attached to the nitrogen hydrogen bonding will occur with this amide



functional group	ether
polarity	slightly polar
intermolecular force	weak dipole

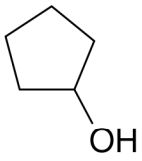


functional group alkyne

name 2-hexyne

polarity non-polar

intermolecular force van der Waal

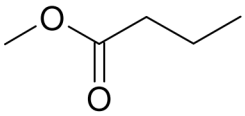


functional group alcohol

name cyclopropanol

polarity very polar

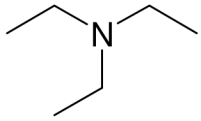
intermolecular force hydrogen bond



functional group ester

polarity moderately polar

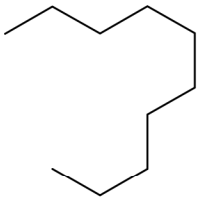
intermolecular force dipole



functional group amine

polarity slightly polar

intermolecular force weak dipole

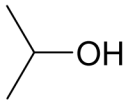


functional group alkane

name decane

polarity non-polar

intermolecular force van der Waal



functional group alcohol

name 2-propanol

polarity very polar

intermolecular force hydrogen bond

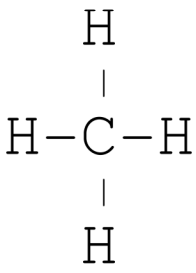
Prefix – number of carbons relationship

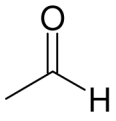
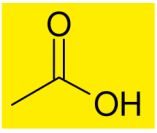
meth – 1
eth – 2
prop – 3
but – 4
pent – 5
hex – 6
hept – 7
oct – 8
non – 9
dec – 10

Suffix – functional group relationship

ane – alkane
ene – alkene
yne – alkyne
anol – alcohol
anal – aldehyde
anone – ketone
anoic acid – carboxylic acid

2. For each of the following pairs of compounds,
   - draw a structure using either full structures, abbreviated structures (i.e. H not drawn in) or simplified stick structures
   - state the polarity of each compound
   - state the name of the primary intermolcular force of attraction
   - circle the one with the highest boiling point
   - give and explanation for the reasoning behind your choice of highest boiling point.

methane	butane
	
polarity non-polar	polarity non-polar
intermolecular force van der Waal	intermolecular force van der Waal
explanation for choice of highest boiling point the larger the molecule the stronger the van der Waal force	

ethanal	ethanoic acid
	
polarity moderately polar	polarity very very polar
intermolecular force dipole	intermolecular force hydrogen bond
explanation for choice of highest boiling point hydrogen bond is stronger than dipole	

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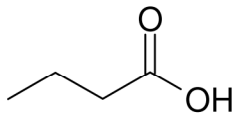
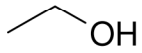
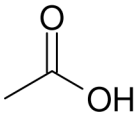
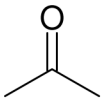
butanoic acid	octanoic acid
	
polarity very very polar	polarity very very polar
intermolecular force hydrogen bond	intermolecular force hydrogen bond
explanation for choice of highest boiling point both have a strong hydrogen bond, however the octanoic acid has additional van der Waals forces due to the longer carbon chain	

ethanol	2-decene
	
polarity very polar	polarity non-polar
intermolecular force hydrogen bond	intermolecular force van der Waal
explanation for choice of highest boiling point the size of the decane produces enought van der Waals force to make the intermolecular attraction here stronger than the hydrogen bond in the ethanol	

3. Identify the type of intermolecular force (there are three to choose from) that will act between molecules in the liquid or solid state for each molecule

water	hydrogen bond
	van der Waal
	hydrogen bond
H—Cl	dipole
NH_3	hydrogen bond
	dipole

4. List the three types of intermolecular forces in order of increasing strength (assume all molecules are roughly the same size) What is the primary reason for this increase in strength. Explain.

van der Waal < dipole < hydrogen bond

the greater the polarity of a molecule the greater the intermolecular force of attraction between adjacent molecules:

van der Waal = non-polar
dipole = slightly to moderately polar
hydrogen bond = very to very very polar