**1. Names and Structures** (1 pts each/8 points total)

Exam II: Organic Chemistry I Alfred State College \_\_\_\_\_\_/100 pts

Wednesday 18 Nov 2015

Your Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide the correct name or structure below. Use IUPAC rules unless otherwise indicated.

a) b)





\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

functional group form IUPAC (include E,Z if pertinent )





c) d)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

functional group form IUPAC



f)

e)

common name 4-chloro-1-ethyl-1,3-dimethylbutyl alcohol





\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Common name IUPAC (include E,Z if pertinent)

\_\_\_\_/8

##### Reactions to and from Alkyl Halides: Basic Facts and Vocabulary (11 pts)

1. For both SN1 and SN2 substitution of halogens on ROH, write below the common initial reaction?:



1. What name/term is used to describe the position shown here

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. When addition of HBr across a double bond

adds Br to the side containing the larger groups=> \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_addition.

1. What is the order of reactivity for F-, Cl-, Br-, I- when substituting the OH on 1o alcohols ?

 \_\_\_\_\_\_\_\_> \_\_\_\_\_\_\_\_\_\_\_> \_\_\_\_\_\_\_\_\_>\_\_\_\_\_\_\_\_\_\_\_

1. Whose (variously spelled Russian) rule decides which is the most likely alkene formed from alkyl halides ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. In the modern, solution phase reaction of alcohols to alkyl chlorides using pyridine, the common chloride source is the compound: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. What solvent is commonly employed in the reaction shown below: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. The reaction of KOH in ethanol with 1-bromobutane to form an alkene is what class of reaction ?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Term used to describe when a left handed alcohol is converted to a mixture of left and right-handed chlorides \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. In the reaction below, clearly identify the substrate (Sub), nucleophile (Nuc) and leaving group (L): (3 pts)



11) What reaction class is illustrated by the reaction below ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



\_\_\_\_\_11

##### Mechanisms: Just the Facts (14 pts total)

**In each pair, circle the outcome associated with SN2 halogenation of alcohols (7 pts)**

a) product is inverted vs initial alcohol products are racemized

b) rate increases in polar, protic solvent rate increases in weakly-polar,non-protic solvent

c) rate increases with Br- concentration rate indifferent to Br- concentration

d) rate increases with H+ concentration rate indifferent to H+ concentration

e) unimolecular bimolecular

f) requires reflux reflux unncesssary

g) activated complex is 3-coordinated activated complex is 5-coordinated

h) rearrangements occur rearrangements don’t occur

**In each pair, circle the outcome associated with SN1 halogenation of alcohols (6 pts)**

a) both alcohol and halide affect rate only alcohol affects rate

b) rate limiting step involves 5-coordinate rate limiting step involves 3-coordinate

 complex intermediate

c) rate of reaction increases with non-protic rate of reaction increases with polar protic

 polar solvents solvents

d) works only on 1o alcohols works on 2o and 3o alcohols

e) rate varies sharply with attacking halogen rate is indifferent to halogen

f) rearrangements occur rearrangements don’t occur

**IV. Mechanistic Sooth-Saying (1 pt each/9 pts total)**

#### On speed ( 1 pt each/4 pts total)

Which will react faster assuming HBr/ aqueous w/reflux is applied in each case ?

a) t-butanol or sec-butanol **or ~ same**

b)



 **or ~same**

**c)**



 **or ~same**



**d)**

 **or ~same**

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**Matchmaking (1 pt ea/5 pts total)**

**Match the mechanism to the acronym**  a**cronym** Match from list

1. Mechanism for conversion of ethyl bromide to an ethene \_\_\_\_\_\_\_ Sn 1

b) Mechanism for conversion of CH3Br to CH3NH2: \_\_\_\_\_\_\_ Sn2

c) Mechanism for bromination of an alkane: \_\_\_\_\_\_\_ E2(elimination)

d) Mechanism for bromination of a 3o alcohol: \_\_\_\_\_\_\_ RAD(free radical)

e) Mechanism involving formation of a inverted product\_\_\_\_\_\_

**V. Trivial Pursuit fill-in (1 pt each/5 pts total)**

a) CH3 SH is an example of a(n)\_\_\_\_\_\_\_\_\_\_\_\_\_ol

b) What is my class name ? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



 (hint: has an angelic component)

c) Zusammen is the German word for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d) Name of synthetic route that leads to bigger alcohols \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e) Gilman reactions to larger alkanes are also called: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactions.

**VI) Little Boxes ( 38 pts)**



 **+**



w/pyridine or KHCO3 in solvent

+

neat

isobutanol + Nao



 **ethanol**

 **+ KOH +**

**Zn + + ZnCl2**





**\_\_\_/20**

**\_\_\_\_/20**



 **Only this form**



 **+**



 **+**

 **Major Minor**

 ** +**

 **Neat or in ether**



**PBr3**(g) +

 **H2O**



 **+ + NaBr**





 **+ 2**



**H2SO4/reflux/NaBr**



 **+**

 **Only this form**

**\_\_\_\_/17**



#####  +





 …then add

A metal



 neat





 Br2

**­­­VII. Willie Nelson Time: On the Road again (14 pts)**

**Starting with any 4 carbon alcohol, suggest a route to Winona: (5 pts)**



 **Winona**

**Starting with any 5 carbon alcohol and either ketones or aldehydes,suggest a route to Bob:**

 **(7 pts)**



 **Bob**

**In one step, convert Bob to (mostly) Babette: (2 pts)**



**Bob --------------🡪 Babette Babette**

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