**In-Class Exam III: Organic Chemistry I Alfred State College \_\_\_\_\_\_/51 pts**

**Monday 10 December 2012**

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

**3.1. Nomenclature of Alkenes (4 pts)**

Name or draw the compounds below using IUPAC rules unless otherwise indicated. If necessary, make sure to indicate whether the structure is E or Z





\_\_\_\_\_ethenol\_\_\_\_\_\_\_\_\_\_ \_\_(E)\_\_6,6-dibromo-3-hepten-3-ol\_\_\_





3-chloro-1-cyclopentenol

E) 7-(1-chlorocyclopropyl)-2,3,4-trimethyl-4-octene

**3.2. Match-Maker Chemistry (8 pts)**

Match the 8 items on the left with the most pertinent descriptor in the list on the right

(Several in the list below are not used.) 1)Baeyer test reagent for alkenes \_\_h\_\_

a) makes halohydrins

b) E1

c)requires beta H

d) ether (dry)

e) carbocation mechanism

f) NBS (N-bromosuccinimide)

g)NH3 (l) and Nao

h)KMnO4 (in CH2Cl2 cold)

i) Pd black and H2

j) peroxides (H2O2)

k) SN2

2)reagents for E-only alkene \_\_g\_\_

3)necessary for anti-Mark. addition of HBr across C=C \_\_j\_\_

4)Br2/H2O in CCl4 \_\_a\_\_

5) dehydrohalogenation of alkyl halides \_\_c\_\_

6) Markovnikoff additions across C=C \_\_e\_\_

7)reagent needed for allylic substitution of Br on alkene \_\_f\_\_

8) mechanism for dehydration of alcohols \_b\_\_

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**3.3** **Eliminating Snacks (6 pts/ 1 pt per completely correct line)**

CIRCLE for both the dehydration and dehydrohalogenation *menus*, the effect of the listed variations on the rates on these two reaction types. **(n/a** means **n**ot **a**pplicable)

**variation effect on dehydration rate effect on dehydrohalogenation rate**

1) substrate concentration up  ***up n/a down up n/a down***

2) OH- concentration increased ***up n/a down up n/a down***

3) Rearrangement occurs ***yes no yes no***

4) Primary H effects occur *yes no* ***yes***  *no*

5) Reaction can occur without βH ***yes***  ***no*** ***yes no***

6) dominant reaction mechanism ***E1 E2 SN1 SN2***  ***E1 E2 SN1 SN2***

**3.4 Soothsaying (8 pts)**

Predict all the possible (=can form) alkenes possible from the reaction shown below and **CIRCLE** the **major** **product**

(3 pts)



**KOH/ethanol**



**major**

Predict all the possible alkenes possible (= can form) from the reaction below and **CIRCLE** the **major** **product**: (**5** pts)

Primary Hydride shift Methyl shift

Possible carbocations



**60% H2SO4/reflux**



\_\_\_/14

* 1. **BOXES, LITTLE BOXES (19 points total/ 1 pt each)**

Fill in the reagents, products, solvents and/or conditions missing in the reactions below:



1)

peroxides

**( Z)-2-butene only**



3)

**E-Only product**

+



4)

H2SO4 /reflux

5) +

2,2-dimethyl-1-propanol

**Major Minor**

Neat or in ether with light



6) +



6) +

**in wet CCl4**



7)

Dry ether

AN ALCOHOL

reagent

**­­\_\_\_/19**

##### **Laboratory Allegories (6 pts total )**

1)Once upon a time, Joe Chemist was asked by his incessantly cackling and height-challenged professor to run several reactions. The first was a substitution to convert n-butanol to n-butyl bromide. Which of the possible, initial steps makes the most sense:

* 1. *mixing KOH and ether*
  2. ***Adding NaBr to an 80% sulfuric acid solution***
  3. *adding a small sliver of I2  to the butanol*
  4. *mixing NaBr with acetone*

2)After wiping drool from his professor off his lab coat, Joe gets the reagents for the above reaction into a 50 mL round bottom flask. His next step to make n-butyl bromide is:

1. *solvent extracting the mixture after 20 minutes of standing*
2. *adding sodium carbonate to neutralize the solution*
3. ***refluxing the mixture vigorously for 40 minutes***
4. *chilling the flask and the adding KOH in ethanol*

3)Just as Joe finishes his substitution, the obviously drugged-out gnome of an instructor begins ranting and giggling about carrying out an elimination on cyclohexanol. The initial steps of this synthesis should be:

*a)refluxing followed by distillation in concentrated nitric acid*

***b)slow distillation in the presence of concentrated sulfuric acid***

*c) vigorous refluxing followed by solvent extraction in water*

*d) adding a sliver of I2 along with Mg to the cyclohexanol*

4)After Joe completes the above reaction, the little creep of a professor slithers up. Eyes blinking like a meth addicted lizard he asks Joe to run a Grignard reaction that will lead to a mixture of 2-methyl- 1 and 2-hexene. The reagents he should gather up should include:

1. *cyclohexanol, Mg, I2, dry ether, acetone, sulfuric acid*
2. *n-butyl alcohol, Mg, dry ether, KOH, methyl ethyl ether, sodium carbonate*
3. ***n-butyl bromide, Mg, dry ether, acetone, sulfuric acid, phosphoric acid***
4. *acetone, I2, n-butyl bromide, Mg, KOH and sodium carbonate, sulfuric acid*

5) After disappearing into his office to take a copious hit or three of his `medicine’, Joe’s professor staggers back in and in a slurred voice asks Joe to characterize the alkene made in the previous problem using 4 different tests. What 4 tests make the most sense?

*a) meth test, NBS test, refractive index , observation of strong, broad band at 3500 cm-1*

***b) bromine test, Baeyer test, observation of medium sharp band near 3050 cm-1, observation of***

***2 GC peaks at 102 oC (one major and one minor)***

*c) bromine test, refractive index, combustion test, color of product is blue*

*d) Strong sharp IR band observed at 1700 cm-1; Baeyer test; Markovnikoff test; soluble in water*

6) Finally…should Joe hit the professor repeatedly with a rubber truncheon? (circle one) **YES YES YES**

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