Your Name _____

Your Lab Instructor's Name _____

ORGANIC CHEMISTRY FOR HEALTH AND NUTRITION
MIDTERM I
April 9, 2014

Periodic Table of the Elements

Ground State Electron Configurations

http://chemistry.about.com

About Chemistry

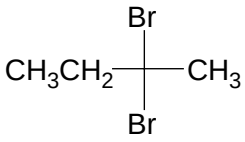
1A												3A	4A	5A	6A	7A	8A
1 H $1s^1$	2A																2 He $1s^2$
3 Li $1s^2 2s^1$	4 Be $1s^2 2s^2$											5 B $1s^2 2s^2 p^1$	6 C $1s^2 2s^2 p^2$	7 N $1s^2 2s^2 p^3$	8 O $1s^2 2s^2 p^4$	9 F $1s^2 2s^2 p^5$	10 Ne $1s^2 2s^2 p^6$
11 Na [Ne]$3s^1$	12 Mg [Ne]$3s^2$	3B	4B	5B	6B	7B	8B			1B	2B	13 Al [Ne]$3s^2 p^1$	14 Si [Ne]$3s^2 p^2$	15 P [Ne]$3s^2 p^3$	16 S [Ne]$3s^2 p^4$	17 Cl [Ne]$3s^2 p^5$	18 Ar [Ne]$3s^2 p^6$
19 K [Ar]$4s^1$	20 Ca [Ar]$4s^2$	21 Sc [Ar]$3d^1 4s^2$	22 Ti [Ar]$3d^2 4s^2$	23 V [Ar]$3d^3 4s^2$	24 Cr [Ar]$3d^5 4s^1$	25 Mn [Ar]$3d^5 4s^2$	26 Fe [Ar]$3d^6 4s^2$	27 Co [Ar]$3d^7 4s^2$	28 Ni [Ar]$3d^8 4s^2$	29 Cu [Ar]$3d^{10} 4s^1$	30 Zn [Ar]$3d^{10} 4s^2$	31 Ga [Ar]$3d^{10} 4s^2 p^1$	32 Ge [Ar]$3d^{10} 4s^2 p^2$	33 As [Ar]$3d^{10} 4s^2 p^3$	34 Se [Ar]$3d^{10} 4s^2 p^4$	35 Br [Ar]$3d^{10} 4s^2 p^5$	36 Kr [Ar]$3d^{10} 4s^2 p^6$
37 Rb [Kr]$5s^1$	38 Sr [Kr]$5s^2$	39 Y [Kr]$4d^1 5s^2$	40 Zr [Kr]$4d^2 5s^2$	41 Nb [Kr]$4d^4 5s^1$	42 Mo [Kr]$4d^5 5s^1$	43 Tc [Kr]$4d^5 5s^2$	44 Ru [Kr]$4d^7 5s^1$	45 Rh [Kr]$4d^8 5s^1$	46 Pd [Kr]$4d^{10}$	47 Ag [Kr]$4d^{10} 5s^1$	48 Cd [Kr]$4d^{10} 5s^2$	49 In [Kr]$4d^{10} 5s^2 p^1$	50 Sn [Kr]$4d^{10} 5s^2 p^2$	51 Sb [Kr]$4d^{10} 5s^2 p^3$	52 Te [Kr]$4d^{10} 5s^2 p^4$	53 I [Kr]$4d^{10} 5s^2 p^5$	54 Xe [Kr]$4d^{10} 5s^2 p^6$
55 Cs [Xe]$6s^1$	56 Ba [Xe]$6s^2$	57-71 Lanthanides	72 Hf [Xe]$4f^{14} 5d^2 6s^2$	73 Ta [Xe]$4f^{14} 5d^3 6s^2$	74 W [Xe]$4f^{14} 5d^4 6s^2$	75 Re [Xe]$4f^{14} 5d^5 6s^2$	76 Os [Xe]$4f^{14} 5d^6 6s^2$	77 Ir [Xe]$4f^{14} 5d^7 6s^2$	78 Pt [Xe]$4f^{14} 5d^9 6s^1$	79 Au [Xe]$4f^{14} 5d^{10} 6s^1$	80 Hg [Xe]$4f^{14} 5d^{10} 6s^2$	81 Tl [Xe]$4f^{14} 5d^{10} 6s^2 p^1$	82 Pb [Xe]$4f^{14} 5d^{10} 6s^2 p^2$	83 Bi [Xe]$4f^{14} 5d^{10} 6s^2 p^3$	84 Po [Xe]$4f^{14} 5d^{10} 6s^2 p^4$	85 At [Xe]$4f^{14} 5d^{10} 6s^2 p^5$	86 Rn [Xe]$4f^{14} 5d^{10} 6s^2 p^6$
87 Fr [Rn]$7s^1$	88 Ra [Rn]$7s^2$	89-103 Actinides	104 Rf [Rn]$5f^{14} 6d^2 7s^2$*	105 Db [Rn]$5f^{14} 6d^3 7s^2$*	106 Sg [Rn]$5f^{14} 6d^4 7s^2$*	107 Bh [Rn]$5f^{14} 6d^5 7s^2$*	108 Hs [Rn]$5f^{14} 6d^6 7s^2$*	109 Mt [Rn]$5f^{14} 6d^7 7s^2$*	110 Ds [Rn]$5f^{14} 6d^8 7s^2$*	111 Rg [Rn]$5f^{14} 6d^9 7s^2$*	112 Cn [Rn]$5f^{14} 6d^{10} 7s^2$*	113 Uut [Rn]$5f^{14} 6d^{10} 7s^2 p^1$*	114 Fl [Rn]$5f^{14} 6d^{10} 7s^2 p^2$*	115 Uup [Rn]$5f^{14} 6d^{10} 7s^2 p^3$*	116 Lv [Rn]$5f^{14} 6d^{10} 7s^2 p^4$*	117 Uus [Rn]$5f^{14} 6d^{10} 7s^2 p^5$*	118 Uuo [Rn]$5f^{14} 6d^{10} 7s^2 p^6$*

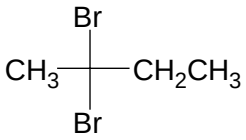
Lanthanides	57 La [Xe]$5d^1 6s^2$	58 Ce [Xe]$4f^1 5d^1 6s^2$	59 Pr [Xe]$4f^3 6s^2$	60 Nd [Xe]$4f^4 6s^2$	61 Pm [Xe]$4f^5 6s^2$	62 Sm [Xe]$4f^6 6s^2$	63 Eu [Xe]$4f^7 6s^2$	64 Gd [Xe]$4f^7 5d^1 6s^2$	65 Tb [Xe]$4f^9 6s^2$	66 Dy [Xe]$4f^{10} 6s^2$	67 Ho [Xe]$4f^{11} 6s^2$	68 Er [Xe]$4f^{12} 6s^2$	69 Tm [Xe]$4f^{13} 6s^2$	70 Yb [Xe]$4f^{14} 6s^2$	71 Lu [Xe]$4f^{14} 5d^1 6s^2$
Actinides	89 Ac [Rn]$6d^1 7s^2$	90 Th [Rn]$6d^2 7s^2$	91 Pa [Rn]$5f^2 6d^1 7s^2$	92 U [Rn]$5f^3 6d^1 7s^2$	93 Np [Rn]$5f^4 6d^1 7s^2$	94 Pu [Rn]$5f^6 7s^2$	95 Am [Rn]$5f^7 7s^2$	96 Cm [Rn]$5f^7 6d^1 7s^2$	97 Bk [Rn]$5f^9 7s^2$	98 Cf [Rn]$5f^{10} 7s^2$	99 Es [Rn]$5f^{11} 7s^2$	100 Fm [Rn]$5f^{12} 7s^2$	101 Md [Rn]$5f^{13} 7s^2$	102 No [Rn]$5f^{14} 7s^2$	103 Lr [Rn]$5f^{14} 6d^1 7s^2$

* values are based on theory and are not verified

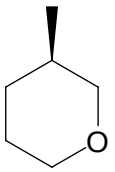
Good luck on this exam!
Please try to relax. Remember it is your job to simply SHOW ME WHAT YOU KNOW.

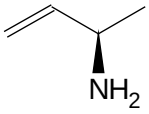
1. What is the relationship between the following two molecules? Are they identical, enantiomers or diasteriomers? (5 pts)



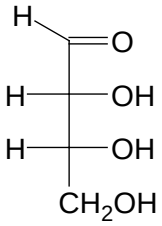


2. Determine the R/S configuration of each chiral center shown below. Make sure to clearly indicate the priority (1, 2, 3 or 4) of each group attached to the chiral carbon. (10 pts)

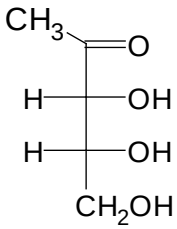
a. 

b. 

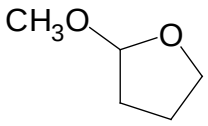
3. Draw a diasteriomer of the following compound. (5 pts)

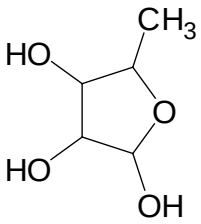


4. Draw an enantiomer of the following compound. (5 pts)

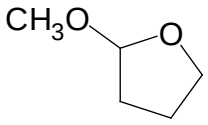


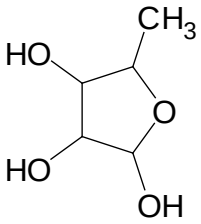
5. Which functional group (acetal or hemiacetal) is shown in each of the following molecules? (2 pts)

a. 

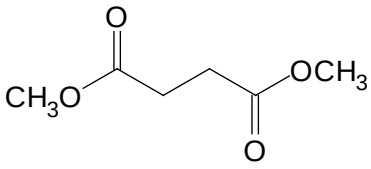
b. 

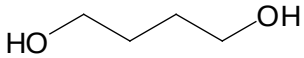
6. For each molecule from question 5, draw the structure of the ketone/aldehyde plus alcohol that were used to synthesize it. (12 pts)

a. 

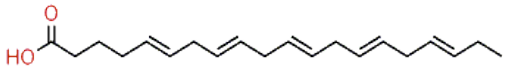
b. 

7. Draw the structure of the polymer that would form upon polymerization of the following two compounds. (6 pts)





8. Match each fatty acid from the left with *one or more* terms on the right. (10 pts)

a. 

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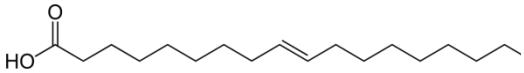
b. 

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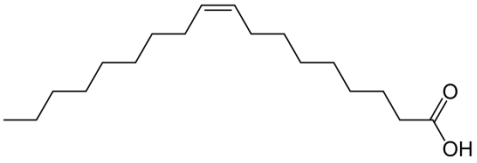
c. 

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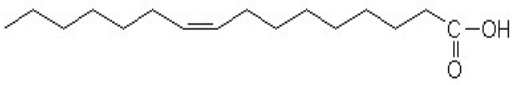
d. 

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e. 

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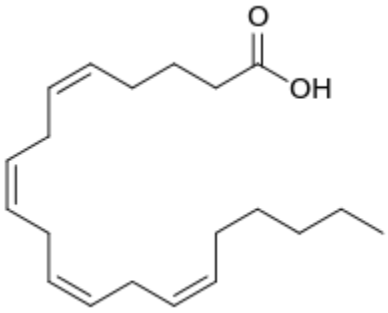
f. 

_____

I. Trans

II. Saturated

III. Monounsaturated

IV. Polyunsaturated

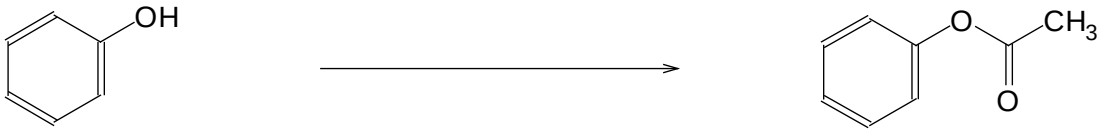
V. Omega-3

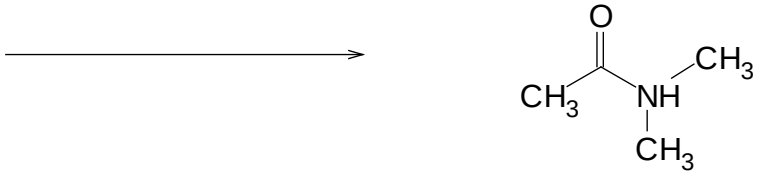
VI. Omega-6

9. Which of the fatty acids from question 7 would produce a fat that is a *solid* at room temperature? (1 pt)

10. Fill in the missing reagent(s) needed to accomplish each of the following reactions. (20 pts)

a. 

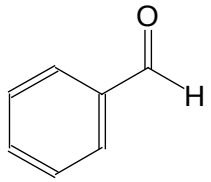
b. 

c. $CH_3{-}NH{-}CH_3$ 

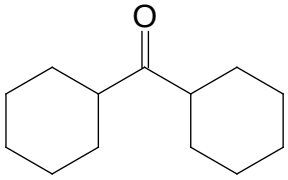
d. CH_3CH_2OH 

d. 

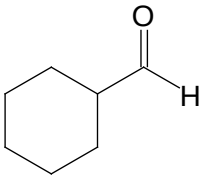
11. Give the product of each of the following reactions. (24 pts)

a. 

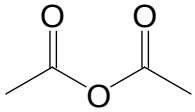
$\xrightarrow{Ag(NH_3)_2^+}$

b. 

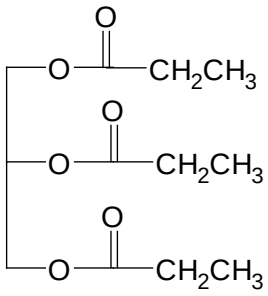
$\xrightarrow{H_2 / Pd}$

c. 

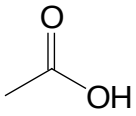
$\xrightarrow{NaBH_4, \text{ then water}}$

d. 

$\xrightarrow{H_2O}$

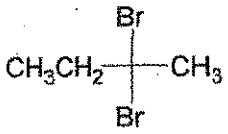
e. 

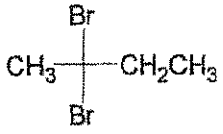
$\xrightarrow{\text{excess } OH^-}$

f. 

$\xrightarrow{NaHCO_3}$

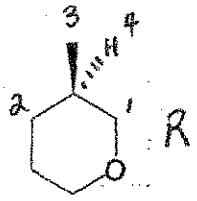
1. What is the relationship between the following two molecules? Are they identical, enantiomers or diasteriomers? (5 pts)



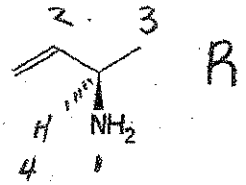


2. Determine the R/S configuration of each chiral center shown below. Make sure to clearly indicate the priority (1, 2, 3 or 4) of each group attached to the chiral carbon. (10 pts)

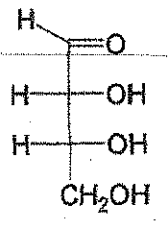
a.

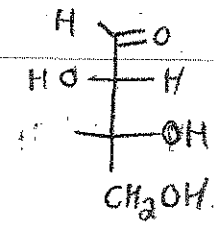


b.

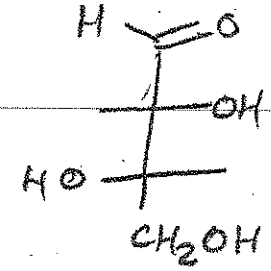


3. Draw a diasteriomer of the following compound. (5 pts)

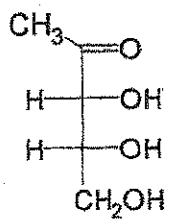


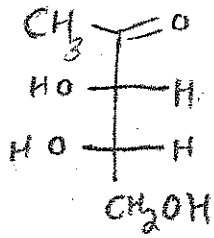


or

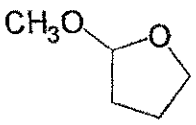


4. Draw an enantiomer of the following compound. (5 pts)

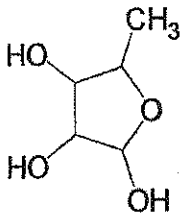




5. Which functional group (acetal or hemiacetal) is shown in each of the following molecules? (2 pts)

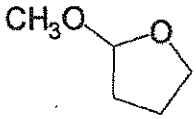
a. 

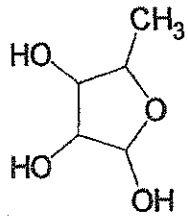
acetal

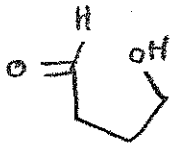
b. 

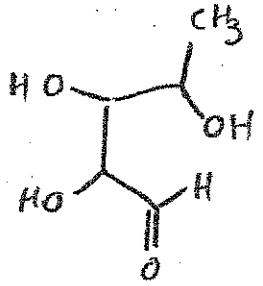
hemiacetal

6. For each molecule from question 5, draw the structure of the ketone/aldehyde plus alcohol that were used to synthesize it. (12 pts)

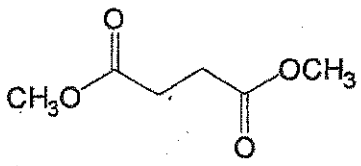
a. 

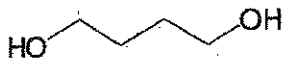
b. 

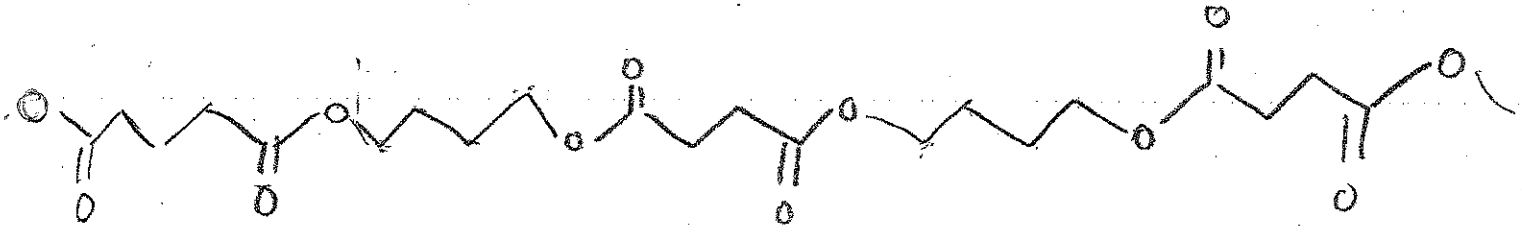




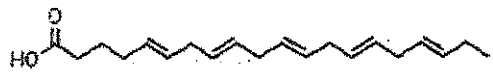
7. Draw the structure of the polymer that would form upon polymerization of the following two compounds. (6 pts)

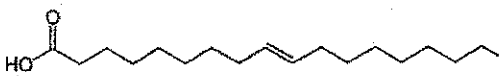


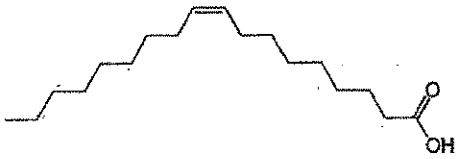


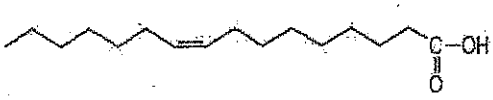


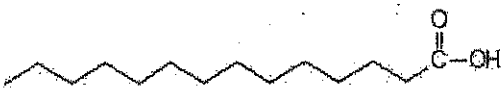
8. Match each fatty acid from the left with *one or more* terms on the right. (10 pts)

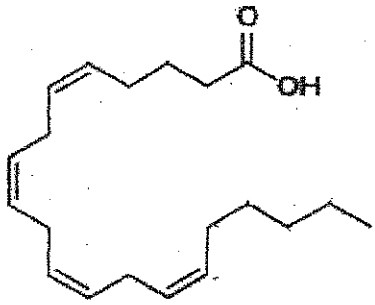
a.  I, IV, V

b.  I, III

c.  III

d.  III

e.  II

f.  IV, VI

I. Trans

II. Saturated

III. Monounsaturated

IV. Polyunsaturated

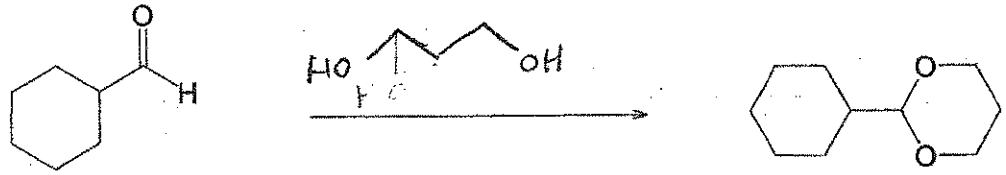
V. Omega-3

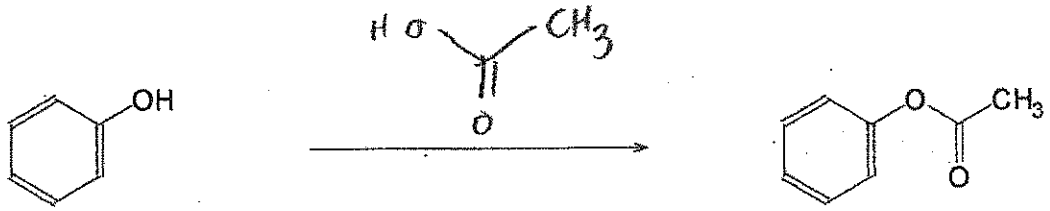
VI. Omega-6

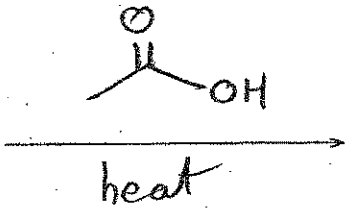
9. Which of the fatty acids from question 7 would produce a fat that is a *solid* at room temperature? (1 pt)

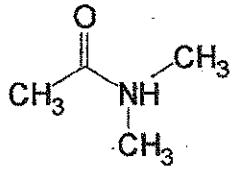
e

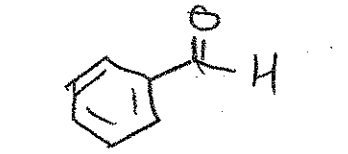
10. Fill in the missing reagent(s) needed to accomplish each of the following reactions. (20 pts)

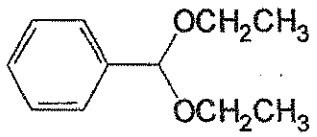
a. 

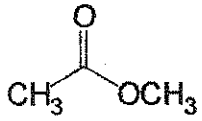
b. 

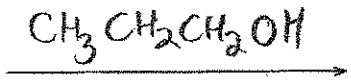
c. $CH_3-NH-CH_3$ 

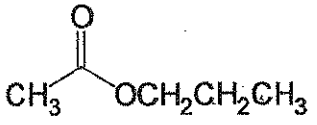


d. CH_3CH_2OH 

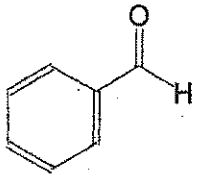
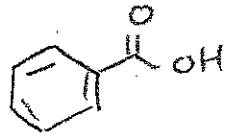


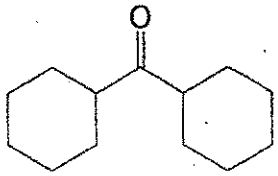
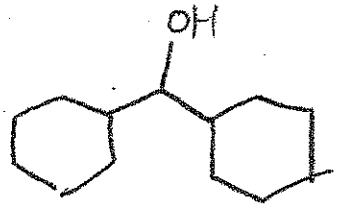
d. 

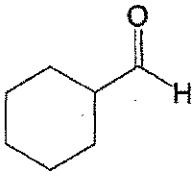
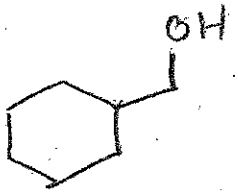


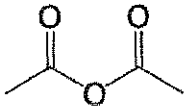
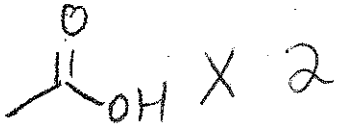


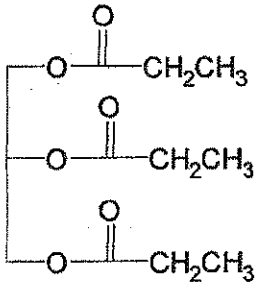
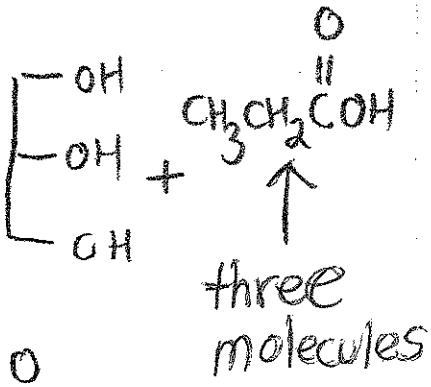
11. Give the product of each of the following reactions. (24 pts)

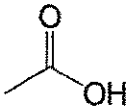
a.  $Ag(NH_3)_2^+$ 

b.  H_2 / Pd 

c.  $NaBH_4$, then water 

d.  H_2O 

e.  excess OH^- 

f.  $NaHCO_3$