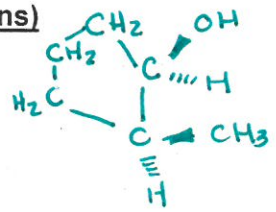
86. Thinking Critically: As you flip through your notes and past lab activities from chapter four, are there any topics left out? If so list them below and provide an example for each.

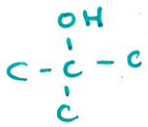
Chapter 7:Alcohols, Phenols & Thiols (23 Questions)

87. Write an abbreviated formula for:
   a. Cis-2-methylcyclopentanol



   b. 2-methyl-2-propen-1-ol
      $CH_2(OH)C(CH_3)=CH_2$
   c. 2-phenylethanol
      

88. Name the alcohols and their derivatives by the IUPAC system:



   a. $Br\overset{3}{C}H_2\overset{2}{C}H_2\overset{1}{C}H_2OH$
      3-bromopropanol
      or
      3-bromo-1-propanol
   b. $\overset{4}{C}H_2=\overset{3}{C}H\overset{2}{C}H_2\overset{1}{C}H_2OH$
      3-buten-1-ol
      or
      but-3-en-1-ol
   c. $(CH_3)_3COH$
      2-methyl-2-propanol
      2-methylisopropyl alcohol
   d. $\underset{4}{CH_3}\underset{3}{CH_2}\underset{2}{CH_2}\underset{1}{CH_2}—SH$
      1-butanthiol
   e. $HS—\underset{2}{CH_2}\underset{1}{CH_2}—OH$
      2-mercaptoethanol
      or
      2-hydroxyethanthiol

89. Define an acid according to:
   a. Arrhenius/Standard
      - produces H^+ ions in solution
   b. Bronsted-Lowry
      - donates H^+
   c. Lewis
      - accepts e^- pairs

90. Is water an acid or a base in the following reactions? Label the conjugate acid/base pairs.

$$\underset{\text{acid}}{H_3PO_4} + \underset{\text{base}}{H_2O} \rightarrow \underset{\text{conjugate base}}{H_2PO_4^-} + \underset{\text{conjugate acid}}{H_3O^+}$$

91. Which of the following are Lewis acids, and which are Lewis bases?

a. $H:^-$ Base

b. $(CH_3)_3B$ empty side ACID

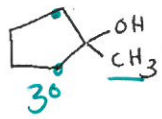
c. Mg^{2+} Acid

d. $CH_3\ddot{O}CH_3$ Base

e. $(CH_3)_3C^+$ ACID

d. $(CH_3)_2C{=}\ddot{O}$ Base

92. Classify the following alcohols

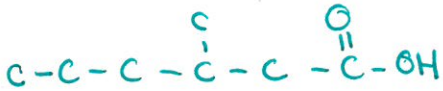
a) 

b) $CH_3CH_2\underline{C}(CH_3)_2CH_2OH$ 1°

c) $CH_3\underline{CH_2}\overset{CH_3}{\overset{|}{C}}HOH$ 2°

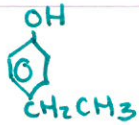
93. Draw the structure for:

d. 3-methyl hexanoic acid

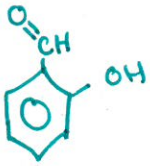


e. ethylpropanoate

c. *p*-ethylphenol



d. *o*-hydroxyacetophenone



94. The p*Ka* for ethanol is 15.9 and for 2,2,2-trifluoroethanol is 12.4.

e. Which is the stronger acid? 2,2,2-trifluoroethanol

f. Based on its name, explain why it is a stronger acid.

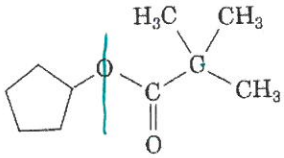
Halogens increase acidity by creating stabilizing (+) charges to develop/de-localizes the (-) oxide ion).

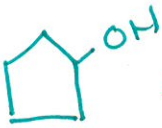
95. Rank the following five compounds in order of increasing acid strength:

2-chloroethanol, *p*-chlorophenol, *p*-methylphenol, ethanol, phenol

2 5 3 1 4

96. Name the following molecule. Then write an equation showing its formation.



$\xleftarrow{H^+}$ 

+ $HO-\overset{O}{\overset{\|}{C}}C(CH_3)_3$

cyclopentyl 2,2-dimethylpropanoate

97. Write an equation showing how you would prepare the following from 1-propanol:

A. $CH_3CH_2\overset{O}{\overset{\|}{C}}H \xleftarrow{PCC}$ C-C-C-OH

B. $CH_3CH_2\overset{O}{\overset{\|}{C}}OH \xleftarrow[CrO_3]{Jones}$ C-C-C-OH

C. $CH_3CH_2CH_2Cl \longleftarrow$ C-C-C-OH + PCl_3

D. $CH_3CH=CH_2 \xleftarrow[H^+]{}$ C-C-C-OH

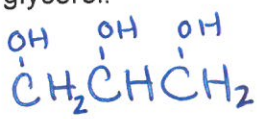
98. Alcohols & their derivatives have many uses biologically and industrially. Draw a specific example or general formula for each of the following AND give a specific example in nature or a use industrially/commercially:

g. alcohol	R-OH	ethanol → grain alcohol Methanol → wood alcohol isopropyl alcohol → antiseptic
h. glycol	OH OH C-C	Antifreeze (ethul glycol) ethylene glycol
i. glycerol	OH OH OH C-C-C	Triglycerides, nitroglycerin, phospholipids
j. aldehyde	O -R-H	Carbohydrate Hangovers
k. ketone	O R-C-R'	ATP
l. carboxylic acid	O -C-OH	Fatty ACID → triglycerides
m. thiol	R-SH	skunk odor, garlic, onion, natural gas
n. quinone		Beetle defense system, vitamin K, e^- transport

99. Thinking Critically: As you flip through your notes and past lab activities from chapter seven, are there any topics left out? If so list them below and provide an example for each.

Chapter 7:Alcohols, Phenols & Thiols (18 Questions)

100. Draw the structure of glycerol.



101. What is the geometry of the double bonds in an unsaturated fatty acid?

CIS (Z)

102. Using the table below, label the fatty acids as saturated and unsaturated.

Common name	Number of carbons	Structural formula
lauric	12	$CH_3(CH_2)_{10}COOH$
myristic	14	$CH_3(CH_2)_{12}COOH$
palmitic	16	$CH_3(CH_2)_{14}COOH$
stearic	18	$CH_3(CH_2)_{16}COOH$
arachidic	20	$CH_3(CH_2)_{18}COOH$
oleic	18	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COOH$
linoleic	18	$CH_3(CH_2)_4CH{=}CHCH_2CH{=}CH(CH_2)_7COOH$
linolenic	18	$CH_3CH_2CH{=}CHCH_2CH{=}CHCH_2CH{=}CH(CH_2)_7COOH$

saturated

unsaturated

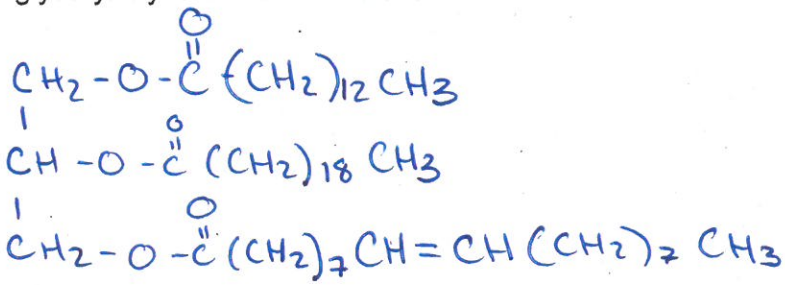
103. What are the five different types/subgroups of lipids?

1) Triglycerides [Fats/Oils]
2) Phospholipids
3) Prostaglandins
4) Waxes
5) steroids.

104. What type of lipid is a salt of a long fatty acid chain? Soap

105. What ions cause hard water to form? Ca^{2+}, Fe^{2+}, Mg^{2+}

106. Draw glyceryl myristoarachidolinoleate.

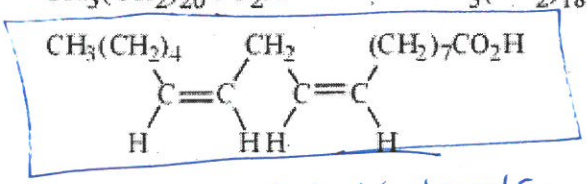


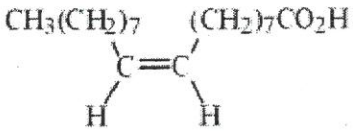
107. What happens when you hydrogenate a unsaturated fatty acid?

It becomes saturated + hardens

108. Circle which fatty acid below would have the lowest boiling point. ~~below~~ or melting and explain why.

$CH_3(CH_2)_{20}CO_2H$ $CH_3(CH_2)_{18}CO_2H$





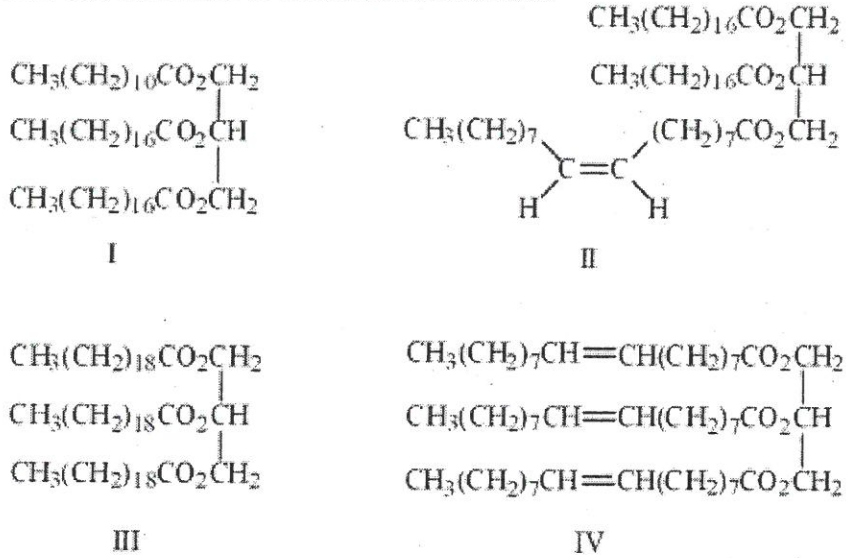
↑ presence of double bonds

109. Describe the solubility of a lipid in polar vs nonpolar solvents.

insoluble soluble

110. What is the main difference that distinguishes whether lipids are classified as fats or oils? % saturation (presence of single/double bonds)

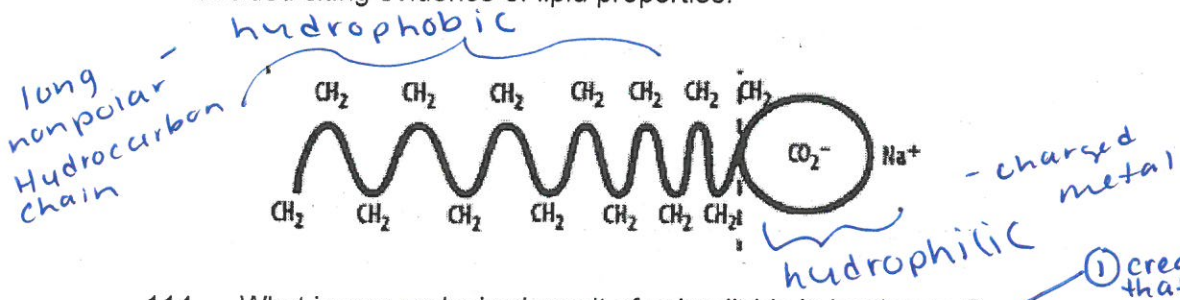
111. On saponification with sodium hydroxide, which fat or oil will yield two moles of the sodium salt of stearic acid and one mole of the salt of lauric acid?



112. Fill in the table below matching the type of lipid to its description. Lipid types can be used more than once or not at all.

Lipid Type	Description/Example
prostaglandin	Aspirin, and other pain killers, are used to inhibit members of this lipid group.
phospholipid	Consists of glycerol, 2 fatty acids, and a phosphate/amine group.
Fat	Consists of glycerol and 3 fatty acids
phospholipid	Major component of cell membranes
wax	Coating on leaves
prostaglandin	Locally acting hormones-one type stimulates mucous production in the stomach
steroid	Examples include testosterone and cortisone.

113. On the soap molecule below, label the hydrophilic and hydrophobic portions. Explain how you decided citing evidence of lipid properties.

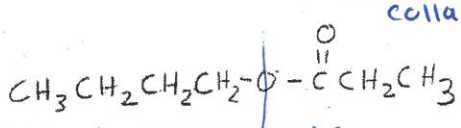


114. What is one undesired result of using lipids in hard water?

① create alkaline solutions that damage fabrics

② ppt creating bathtub/collar rings &/or dulling of hair.

115. Name the following molecule



butyl propanoate

1 H 1.00794																	2 He 4.002602
3 Li 6.941	4 Be 9.012182											5 B 10.811	C 12.0107	7 N 14.00674	8 O 15.9994	9 F 18.9984032	10 Ne 20.1797
11 Na 22.989770	12 Mg 24.3050											13 Al 26.581538	14 Si 28.0855	15 P 30.973761	16 S 32.066	17 Cl 35.4527	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.955910	22 Ti 47.867	23 V 50.9415	24 Cr 51.9961	25 Mn 54.938049	26 Fe 55.845	27 Co 58.933200	28 Ni 58.6534	29 Cu 63.545	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.92160	34 Se 78.96	35 Br 79.504	36 Kr 83.80
37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 196.56655	48 Cd 112.411	49 In 114.818	50 Sn 118.710	51 Sb 121.760	52 Te 127.60	53 I 126.90447	54 Xe 131.29
55 Cs 132.90545	56 Ba 137.327	57 La 138.9055	72 Hf 178.49	73 Ta 180.94.79	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.217	78 Pt 195.078	79 Au 196.56655	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.58038	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)		114 (289) (287)		116 (289)		118 (293)

58 Ce 140.116	59 Pr 140.50765	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.92534	66 Dy 162.50	67 Ho 164.93032	68 Er 167.26	69 Tm 168.93421	70 Yb 173.04	71 Lu 174.967
90 Th 232.0381	91 Pa 231.035888	92 U 238.0289	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)