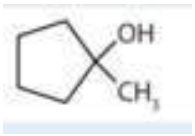
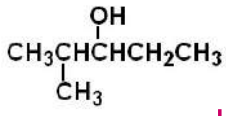
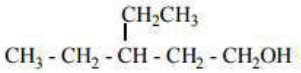
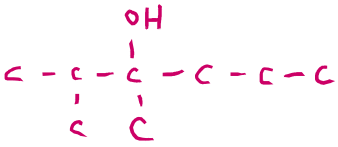
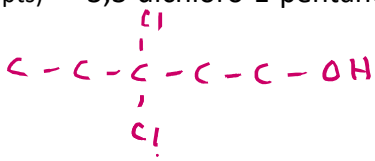
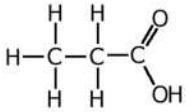
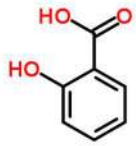
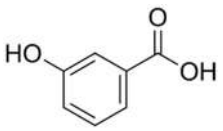
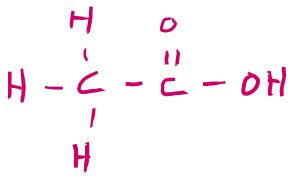
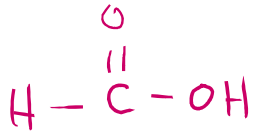
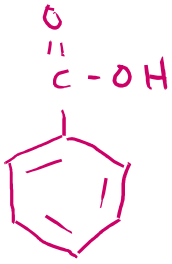
Review: Alcohols, Carboxylic Acids, Esters, and Aspirin

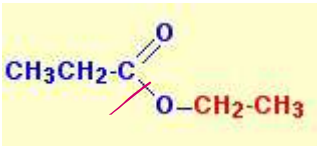
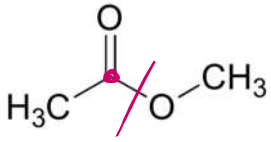
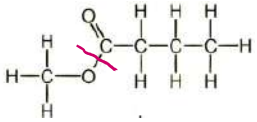
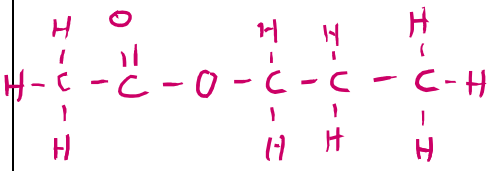
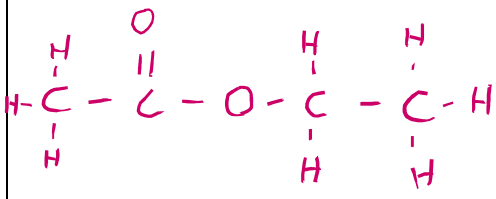
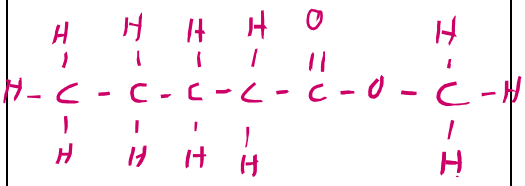
Part 1 - Alcohols: (15pts) Name or draw each of these alcohols and categorize as primary (1°), secondary (2°), or tertiary (3°)

1. (2pts)  1-methylcyclopentanol 1° 2° (3°)	2. (2pts)  2-methyl-3-pentanol 1° (2°) 3°	3. (2pts)  3-ethyl-1-pentanol (1°) 2° 3°
4. (3pts) 2,3-dimethyl-3-hexanol  1° 2° (3°)	5. (3pts) 1-propanol  (1°) 2° 3°	6. (3pts) 3,3-dichloro-1-pentanol  (1°) 2° 3°

Part 2 – Carboxylic Acids: (17pts)Name or draw each of these carboxylic acids. Write the common or IUPAC names as requested.

7. (3pts)  IUPAC: propanoic acid Common: propionic acid Location: bacteria in sweat glands	8. (2pts)  IUPAC: 2-hydroxybenzoic acid Common: Salicylic acid Location: willow bark	9. (2pts)  IUPAC: 3-hydroxybenzoic acid
10. (4pts) Acetic acid  IUPAC: ethanoic acid Location: Vinegar	11. (4pts) Methanoic acid  Common: formic acid Location: ant saliva	12. (2pts) Benzoic acid 

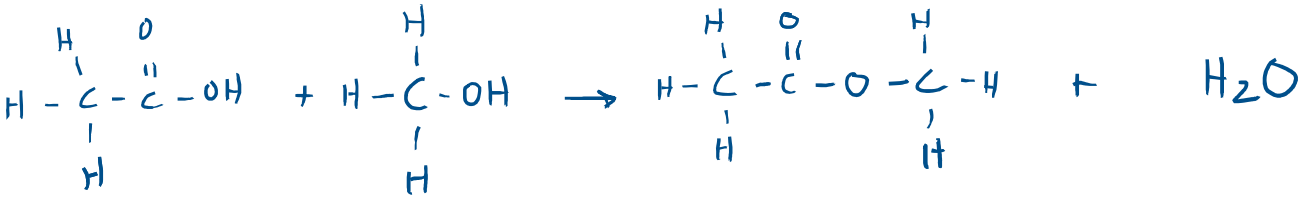
Part 3 - Esters: **(12pts) Name or draw each of the esters in the space provided.**

13. (2pts)  ethyl propanoate	14. (2pts)  methyl ethanoate	15. (2pts)  methyl butanoate
16. (2pts) Propyl ethanoate 	17. (2pts) ethyl ethanoate 	18. (2pts) Methyl pentanoate 

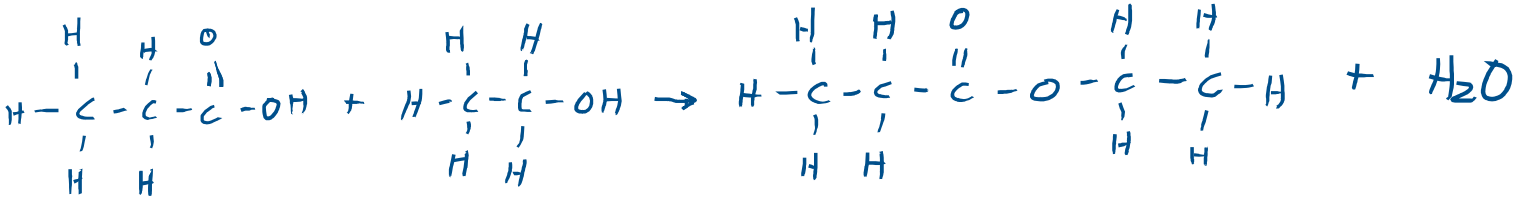
Part 4: Formation of Esters Reactions

19. (20pts) Please finish the word equation and then draw the structures for the reactions between each of the following:

a. Ethanoic acid + methanol → methyl ethanoate + water

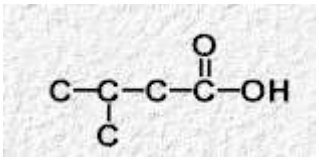


b. Propanoic acid + ethanol → ethyl propanoate + water



Part 4: Mixed Compounds (21pts) **Finish each table.**

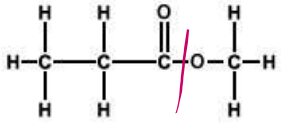
20. (2pts)



IUPAC: 3 - methyl butanoic acid

Common: 3 - methyl - butyric acid

21. (2pts)



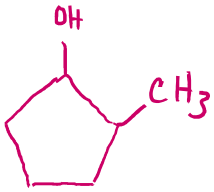
methyl propanoate

22. (2pts)

1,6 - hexanediol

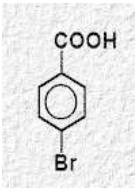
1° 2° 3°

.23. (3pts) 2-methyl-cyclopentanol



1° 2° 3°

24. (2pts)

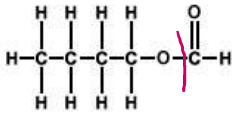


IUPAC: 4 - bromobenzoic acid

Common:

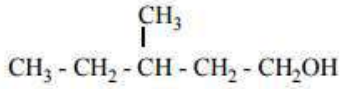
para - bromo benzoic acid

25. (2pts)



1 - butyl methanoate

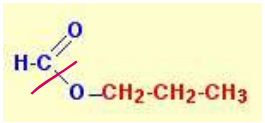
26. (2pts)



3 - methyl - 1 - pentanol

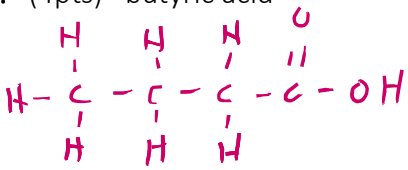
1° 2° 3°

27. (2pts)



propyl methanoate

28. (4pts) butyric acid



IUPAC:

butanoic acid

Location:

rancid butter

Part 5: Description of the Synthesis of an Ester Lab (5 pts)

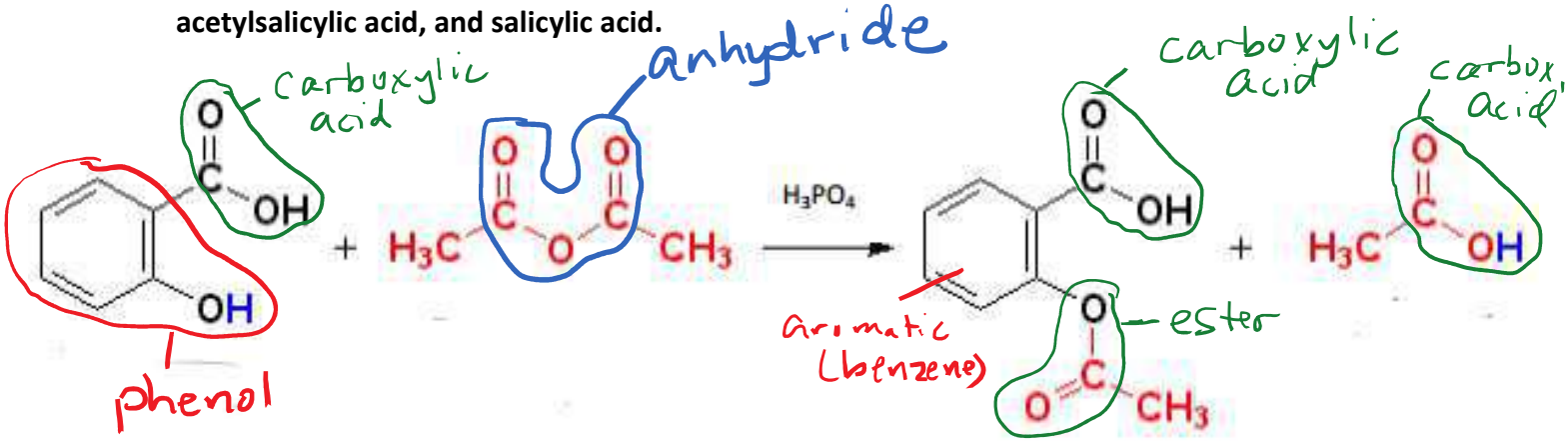
29. Please describe the process by which you made the pineapple fragrant ester, ethyl butanoate. Answer in the past tense with no personal pronouns. CORRECTLY IDENTIFY the carboxylic acid and alcohol needed to make ethyl butanoate. Be specific with the equipment used and the role of each substance. Draw a sketch if you think it might help with understanding.

A boiling water bath was prepared using a hot plate and a 400 mL beaker. The following was added to a test tube: 6 drops of ethanol, 2 drops of butanoic acid, and 5 drops of concentrated sulfuric acid. The test tube was heated in the boiling water bath for 3 minutes. After the test tube was removed, 5 mL of distilled water was added and the scent was wafted.

Part 6: Aspirin

30. A. (5pts) Please **circle and label** each functional group on each substance in this reaction.

B. (4pts) On the lines beneath each substance, label the name of each: **acetic acid, acetic anhydride, acetylsalicylic acid, and salicylic acid.**



Salicylic acid + acetic anhydride → acetylsalicylic acid + acetic acid.

31. (3pts) List three things aspirin is effective for.

- reducing fever
- pain relief
- reducing inflammation

32. (2pts) Define antipyretic and analgesic

fever reducer / pain reliever \

33. (2pts) Explain where salicylic acid is found in nature and how it has been used in its natural form historically.

It is found naturally in willow bark and teas were made historically with the willow bark for the medicinal properties.

34. (2pts) List unpleasant side effects of salicylic on the body

- irritates esophagus and stomach; may cause ulcers and hemorrhaging ('bleeding).

35. (2pts) Describe your aspirin vs commercial aspirin titration results and explain why these results make sense.

Titrations with our aspirin vs. Commercial aspirin showed ours to contain more aspirin per gram. Evidence of this was that our aspirin used more sodium hydroxide per gram before the end point was reached. This makes sense because commercial aspirin uses starch as a binder.

36. (3pts) Would salicylic acid or acetylsalicylic acid produce a positive test with iron (III) chloride? What is the evidence of a positive test with the iron (III) chloride? Explain why each would or would not produce a positive test.

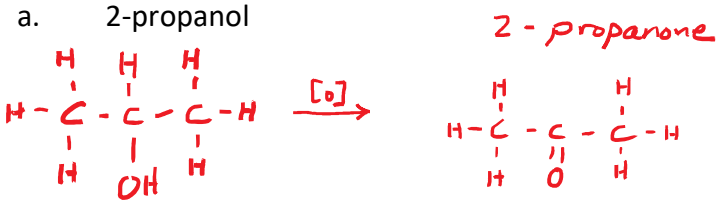
Salicylic acid would test positive (purple color) with iron(III) chloride. It tests positive because it has a phenol group, in which aspirin (acetylsalicylic acid) does not have a phenol group.

37. (4pts) Describe the role of acid-base body conditions on the breakdown of aspirin in the body (specifically the transition from the stomach to the small intestines)

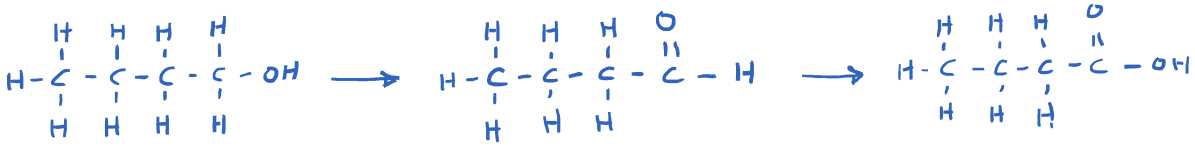
Aspirin remains largely unreacted in the acidic environment of the stomach. When it reaches the basic environment of the small intestines, it reacts with water to break down into salicylic acid and acetic acid. From here, the salycilic acid can enter the blood stream and begin working

38. Name and write structures for the product(s) that result from the oxidation of these alcohols.

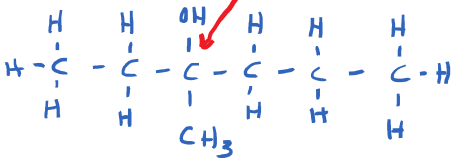
a. 2-propanol



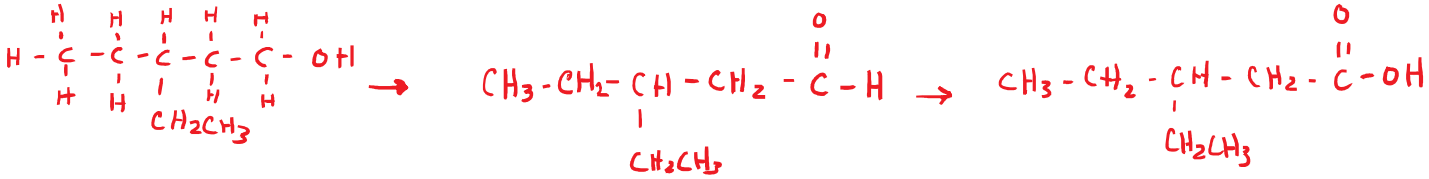
b. 1-butanol → butanal → butanoic acid



c. 3-methyl-3-hexanol → NO Reaction
tertiary alcohol (3°)



d. 3-ethyl-1-pentanol → 3-ethyl pentanol → 3-ethyl pentanoic acid



e. 3-heptanol → 3 - heptanone