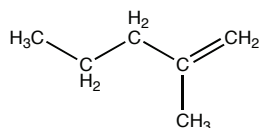
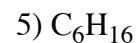
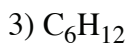
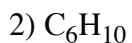
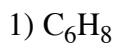


1. (2 points) What is the chemical formula for the molecule at right?

**(3)****(Chptr 11)**

2. (2 points) What is the functional group in CH_3COOH ?

1) alcohol

2) ketone

3) aldehyde

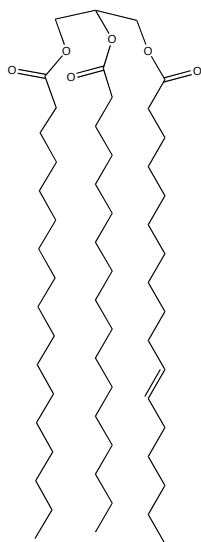
4) carboxylic acid

5) ether

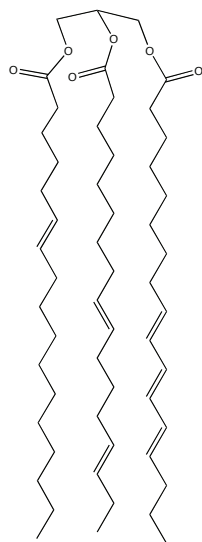
(4) carboxylic acid – the trick is to complete the octet around carbon 2. What do you have to do to achieve an octet? (Chptr 18)

3. (2 points) Triglycerides are a common form a fat in our bodies. Which of the following triglycerides is *most* likely to be a liquid at room temperature?

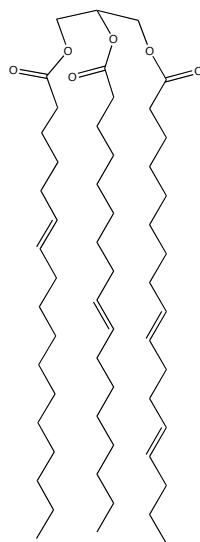
1)



2)

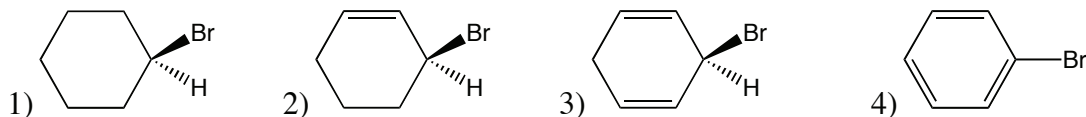


3)



(2) It has the most double bonds (Chptrs 12 and 18)

4. (2 points) Which molecule below has a chiral center?



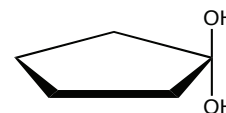
5) 1, 2 and 3 all have chiral centers

(2) Look at the asymmetry PRS question 3/5 (Chptr 15)

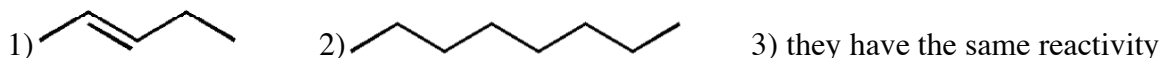
5. (2 points) The molecule at right is

1) a cis isomer 2) a trans isomer 3) not an isomer

(3) not isomer- with respect to the ring (Chptr 11)



6. (2 points) Which molecule below is less reactive, in general?



(2) addition reactions are not possible (Chptr 12)

7. (2 points) Rank boiling points, highest to lowest:

1) $\text{CH}_3\text{CH}_3 > \text{CH}_3\text{NH}_2 > \text{CH}_3\text{OH}$

2) $\text{CH}_3\text{CH}_3 > \text{CH}_3\text{OH} > \text{CH}_3\text{NH}_2$

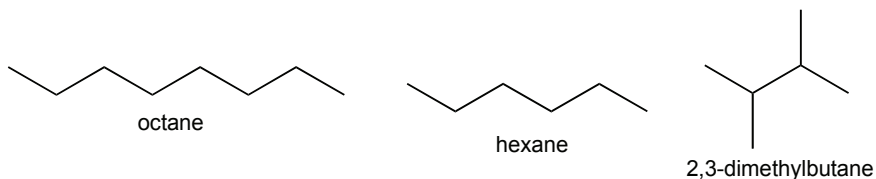
3) $\text{CH}_3\text{OH} > \text{CH}_3\text{NH}_2 > \text{CH}_3\text{CH}_3$

4) $\text{CH}_3\text{NH}_2 > \text{CH}_3\text{OH} > \text{CH}_3\text{CH}_3$

5) They are all about the same

(3) OH hydrogen bonds better than NH2 - PRS 3/5 (Chptr 14)

8. (2 points) Which molecule below has the lowest boiling point?



1) octane

2) hexane

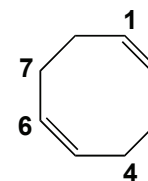
3) 2,3-dimethylbutane

(3) it's branched, so does not associate with itself well (Chptr 11)

9. (2 points) In the molecule at right, the ideal bond angle around the 4-carbon is:

- 1) 120° 2) 109° 3) 90° 4) 180°

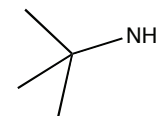
(2) 109° It's sp³ - OWL 12.1a (Chptr 12)



10. (2 points) In the molecule at right, the amine is classified as:

- 1) primary 2) secondary 3) tertiary

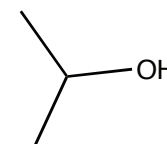
(1) primary (Chptr 16)



11. (2 points) In the molecule at right, the alcohol is classified as:

- 1) primary 2) secondary 3) tertiary

(2) secondary (Chptr 14)



12. (2 points) Aldehydes are readily oxidized (by oxygen in air) to

- 1) ketones 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) aldehydes are not readily oxidized

(3) carboxylic acids – see Chapter 17.4.a. Note that the C adopts a higher oxidation number in the carboxylic acid. H is replaced by OH

13. (2 points) Ketones are readily oxidized (by oxygen in air) to

- 1) aldehydes 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) ketones are not readily oxidized

(5) not readily oxidized – see Chapter 17.4.a. OH does not readily replace an alkane off of the ketone.

14. (2 points) Ketones are reduced by H₂ and an appropriate catalyst to

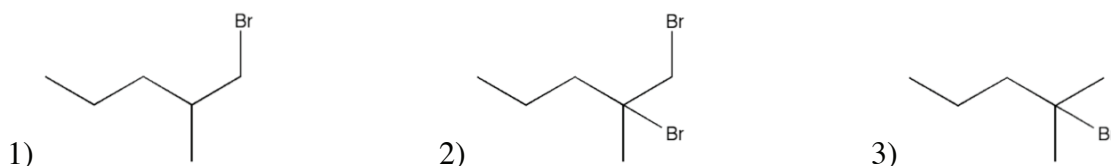
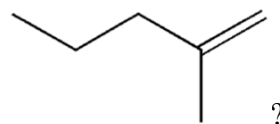
- 1) ketones 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) ketones are not readily reduced

(2) alcohols – see Chapter 17.4.b. Note that the C adopts a lower oxidation number in the alcohol. You can see that H₂ is “added” across the C=O bond

15. (2 points) Aldehydes are reduced by H_2 and an appropriate catalyst to
- 1) ketones
 - 2) alcohols
 - 3) carboxylic acids
 - 4) the parent alkanes
 - 5) aldehydes are not readily reduced

(2) alcohols – see Chapter 17.4.b. Note that the C adopts a lower oxidation number in the alcohol. You can see that H_2 is “added” across the $C=O$ bond

16. (2 points) What is the product of the reaction of HBr with



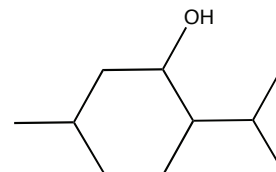
(3) – This was a PRS question for 2/21/08 (Chptr 11)

17. (2 points) A racemic mixture
- 1) rotates polarized light to the right
 - 2) rotates polarized light to the left
 - 3) does not rotate polarized light

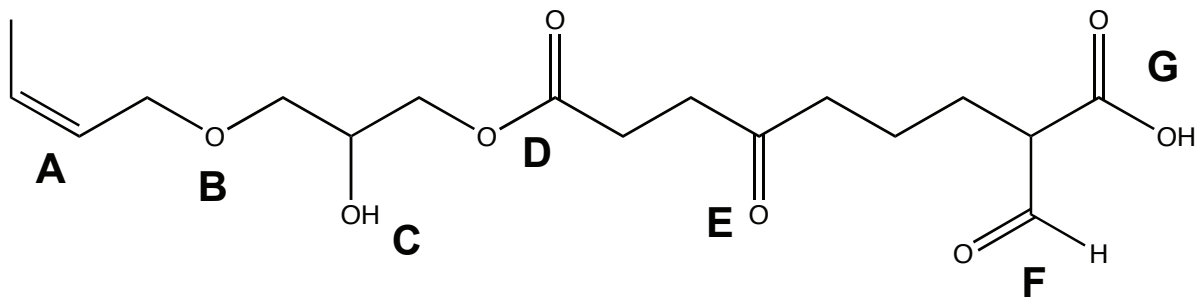
(3) half the molecules rotate light to the right, while the other half rotates it to the left, so the mixture has no net rotation. (Chptr 15)

18. How many chiral centers are in the molecule at right?
- 1) 0
 - 2) 1
 - 3) 2
 - 4) 3
 - 5) 10

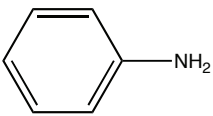
(4) There are 3 stereocenters (Chptr 15)

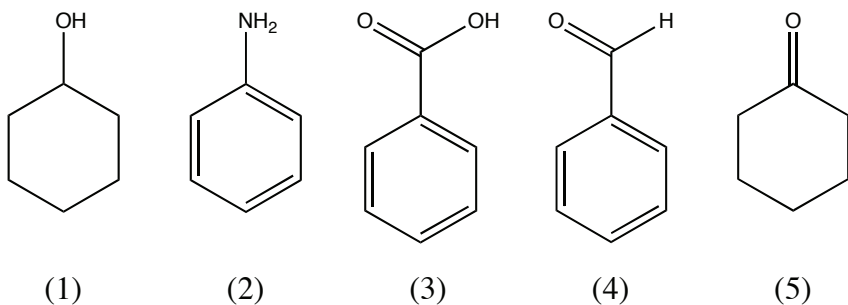


For questions 19 to 23, refer to the molecule below. Please mark your answers neatly.



19. (2 points) Which of the above represents a ketone group?
 1) B 2) D 3) E 4) F 5) G
(3) E (Chptr 17)
20. (2 points) Which group above is acidic?
 1) B 2) D 3) E 4) F 5) G
(5) G – a carboxylic acid (Chptr 14)
21. (2 points) Which of the above represents an ester group?
 1) B 2) D 3) E 4) F 5) G
(2) D (Chptr 14)
22. (2 points) Which of the above represents an aldehyde group?
 1) B 2) D 3) E 4) F 5) G
(4) F (Chptr 17)
23. (2 points) The functionality at A is:
 1) cis 2) trans 3) neither
(1) cis (Chptr 12)

24. The molecule at right is: 
- 1) toluene 2) aniline 3) benzoic acid 4) benzaldehyde 5) cyclohexamine
(2)



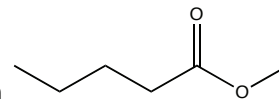
25. (2 points) Which molecule above in a reaction with $K_2Cr_2O_7$ and H_2SO_4 yields cyclohexanone?

(1) (Chptr 14)

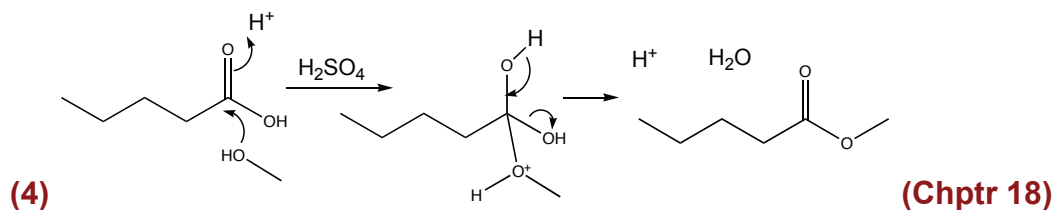
26. (2 points) Which molecule above in a reaction with H_2 and a transition metal catalyst yields cyclohexanol?

(5) (Chptr 17)

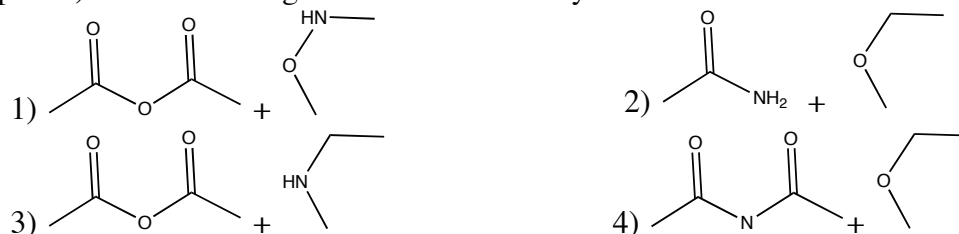
27. (2 points) Which two reagents react in the presence of H_2SO_4 to form



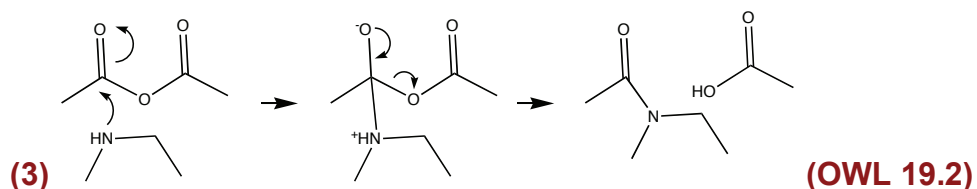
- 1) pentanol and methanoic acid
- 2) pentanol and methane
- 3) pentanoic acid and sodium hydroxide
- 4) pentanoic acid and methanol
- 5) none of the above



28. (2 points) Which two reagents react most readily to form

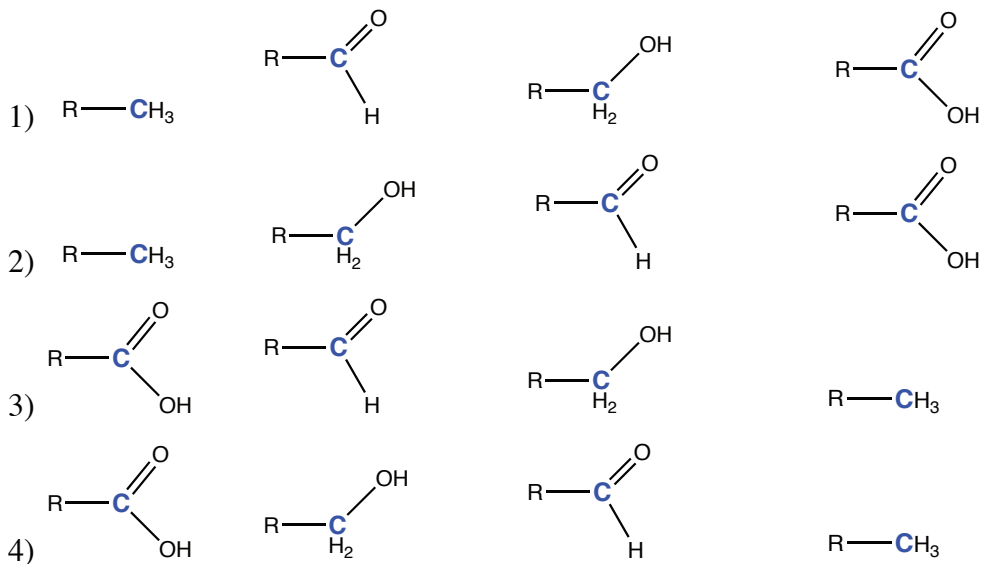


5) none of the above react to form that product

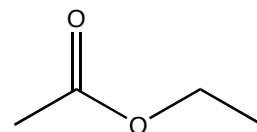


There was a typo in numbering the answers. (2) or (3) scores correct.

29. (2 points) Which listing portrays the carbons in decreasing oxidation state

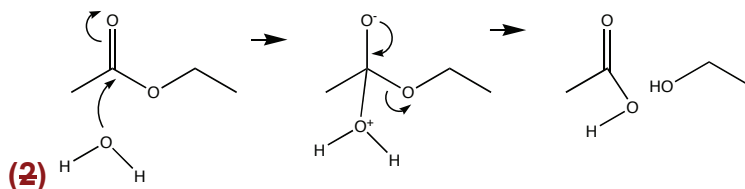


(3) See our discussion in class



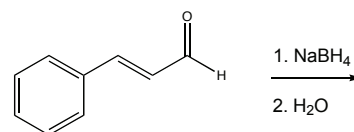
30. (2 points) Hydrolysis of the compound at right would yield

- 1) Ethanoic (acetic) acid and methanol 2) Ethanol and methanoic (formic) acid
 3) Propanoic acid and methanol 4) Propanol and methanoic (formic) acid
 5) This compound does not undergo hydrolysis

**(2)****(Chptr 18)**

****Typo** the correct answer should be ethanol and ethanoic (or "acetic") acid**

31. (2 points) The products of the reaction of cinnamaldehyde with NaBH_4 (see scheme at right) are:



- 1) a carboxylic acid 2) a diol
 3) sodium boroster 4) an alcohol
 5) no reaction will occur

(4) see p 441 of text (Chptr 17)

32. (2 points) Which do you think is more acidic: benzoic acid or acetic acid?

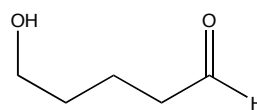
- 1) benzoic acid 2) acetic acid

(1) benzoic acid can delocalize the deprotonated charge (Chptr18 and 13)

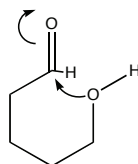
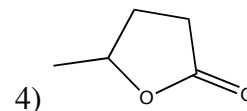
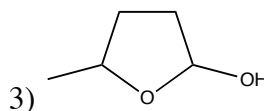
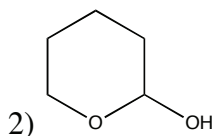
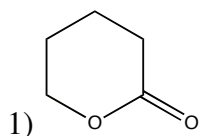
33. (2 points) Which do you think is more acidic: acetic acid or trichloroacetic acid?

- 1) trichloroacetic acid 2) acetic acid

(1) in trichloroacetic acid, the Cl's pull e^- density away (Chptr18 and 13)



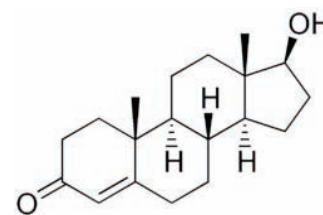
34. (2 points) The molecule at right can cyclize to form:



(2) Formation of hemiacetals

See p 443 (Chptr 17)

35. (2 points) Roger Clemens needs your help. Someone has given him only one of the possible stereoisomers of testosterone. What are the odds (assuming a random grabbing of bottles) that he has the correct stereoisomer?



- 1) 1 in 8 2) 1 in 32 3) 1 in 64
4) 1 in 100 5) I don't know, but he should retire

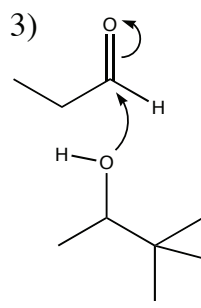
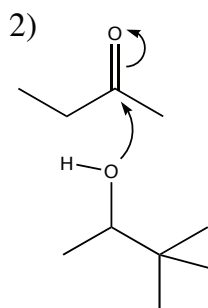
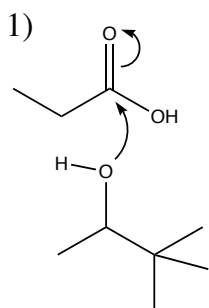
(3) There are 6 chiral centers. $2^6 = 64$ (Chptr 15)

36. (2 points) Testosterone (see above) is expected to have what kind of geometry?

- 1) absolutely flat 2) almost flat 3) very distorted

(3) Lots of sp^3 centers!

37. (2 points) The following represent initial steps in a reaction. Which is most favorable?



(1) The extra OH group stabilizes the resulting negative charge (Chptr 18)

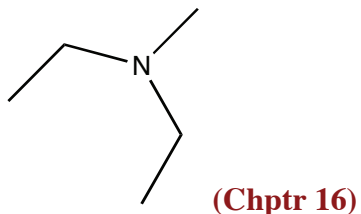
38. (2 points) Which are you most likely to find as a flavoring added to your favorite candy?

- 1) an aldehyde 2) a long, branched alkane 3) a carboxylic acid

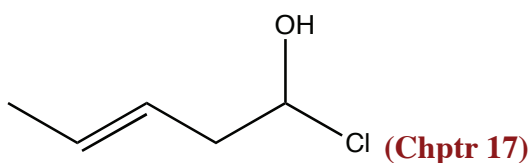
(1) aldehydes have low vapor pressures, so your nose can smell them. Candies that smell good, taste good. see p 439 (Chptr 17)

Turn this page in, along with your OpScan Sheet (be sure your name is on both!)

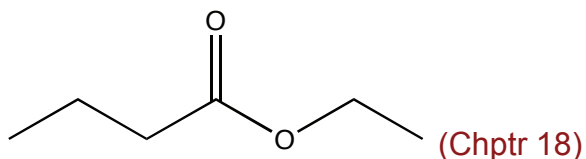
41. (5 points) Draw the structure for diethylmethylamine:



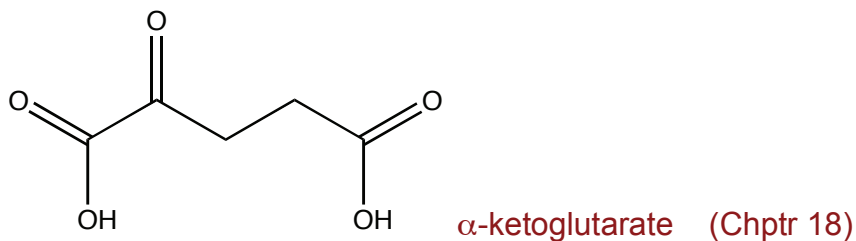
42. (5 points) Draw the structure for 1-chloro-3-pentenol:



43. (5 points) Draw the structure for pineapple flavor: ethyl butanoate



44. (5 points) Draw the structure for ~~2-ketopentanoic~~ 2-ketopentanedioic acid



The name provided on the original exam does not conform to IUPAC formalism – my apologies. If you get close to the right answer, you'll get credit (or partial credit)

Turn this page in, along with your OpScan Sheet (be sure your name is on both!)

Turn this page in, along with your OpScan Sheet (be sure your name is on both!)