

1. (2 points) What is the functional group in CH_3COOH ?

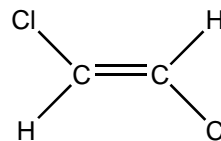
- 1) alcohol 2) ketone 3) aldehyde 4) carboxylic acid 5) ether

2. (2 points) What is the functional group in CH_3COH ?

- 1) alcohol 2) ketone 3) aldehyde 4) carboxylic acid 5) ether

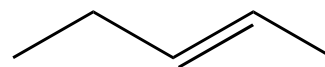
3. (2 points) The molecule at right is

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



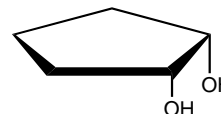
4. (2 points) The molecule at right is

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



5. (2 points) The molecule at right is

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

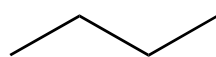


6. (2 points) In the molecule at right the hydroxyl is in what position?

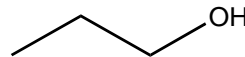
- 1) axial 2) equatorial 3) cis 4) trans



7. (2 points) Which molecule below has the highest boiling point?



butane

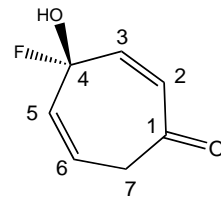


1-propanol

- 1) butane

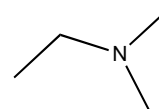
- 2) 1-propanol

For questions 8 through 11, please refer to the molecule at right

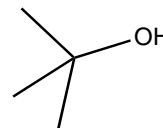


8. (2 points) In the molecule above, the ideal bond angle around the 7-carbon is:
- 1) 120° 2) 109° 3) 90° 4) 180°
9. (2 points) In molecule above, carefully circle all chiral centers. If there are none, write "no chiral centers" next to the drawing.
10. (2 points) Can the molecule above, as a pure species, participate in intermolecular hydrogen bonding?
- 1) yes 2) no
11. (2 points) Which atoms lie in the same plane? Think carefully.
- 1) carbons 1, 2, 3, 4, 7, and the O of the carbonyl only
 2) carbons 1, 2, 3, 4, 7 only
 3) carbons 1, 2, 3 only
 4) carbons 1, 2, 3, 4 only
 5) all atoms except F and those in OH
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12. (2 points) In the molecule at right, the amine is classified as:
- 1) primary 2) secondary 3) tertiary



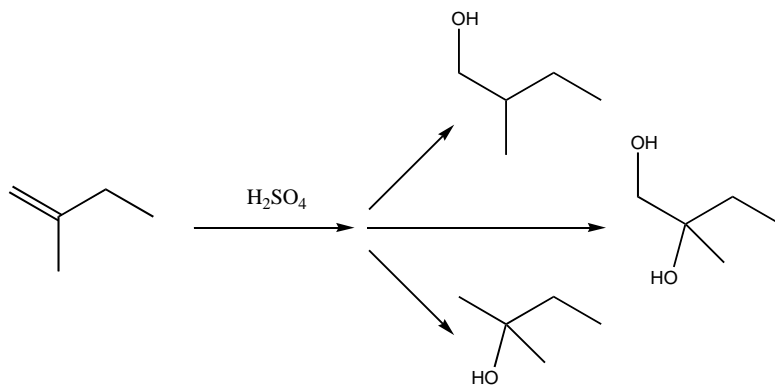
13. (2 points) In the molecule at right, the alcohol is classified as:
- 1) primary 2) secondary 3) tertiary



14. (2 points) Which is the weaker acid?
- 1) cyclohexanol 2) phenol 3) they are the same

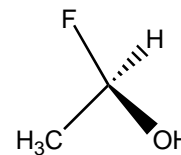
15. (2 points) Ketones are readily oxidized (by oxygen in air) to
1) aldehydes 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) ketones are not readily oxidized
16. (2 points) Aldehydes are readily oxidized (by oxygen in air) to
1) ketones 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) aldehydes are not readily oxidized
17. (2 points) Ketones are reduced by H_2 and an appropriate catalyst to
1) ketones 2) alcohols 3) carboxylic acids 4) the parent alkanes
5) Ketones are not readily reduced
18. (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

19. (2 points) Circle the correct reaction product:

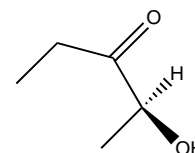


20. (2 points) A racemic mixture
- 1) rotates polarized light to the right
 - 2) rotates polarized light to the left
 - 3) does not rotate polarized light

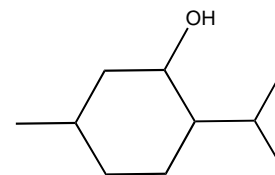
21. (2 points) The molecule at right is which enantiomer?
- 1) R
 - 2) S



22. (2 points) The molecule at right is which enantiomer?
- 1) R
 - 2) S



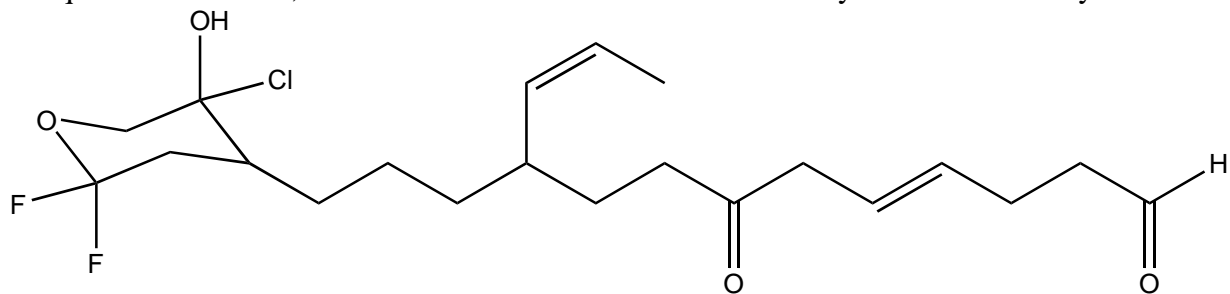
23. How many stereoisomers are possible for the molecule at right?
Answer: _____



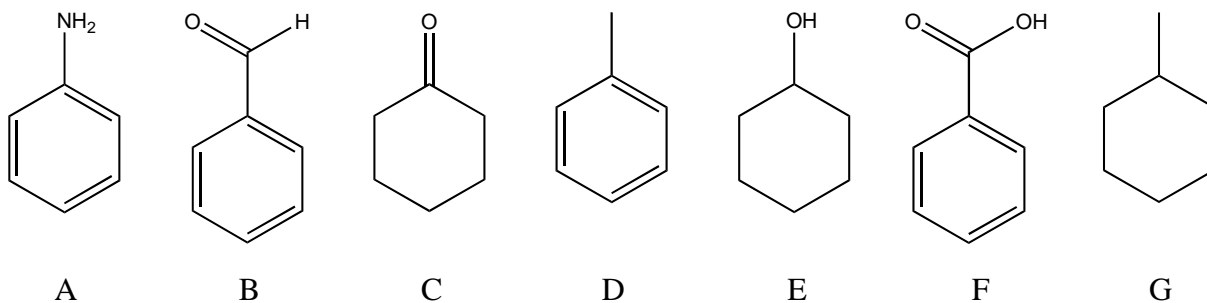
Use the choices below for each of the questions 24 through 27

- | | |
|---|--|
| 1) $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_2\text{CH}_3)\text{CH}_2\text{CH}_2\text{CH}_3$ | 4) $\text{CH}_3\text{CH}_2\text{CHOHCH}_2\text{CH}_2\text{CH}_3$ |
| 2) $\text{CH}_3\text{CH}_2\text{COOCH}_2\text{CH}_2\text{CH}_3$ | 5) $\text{CH}_3\text{CH}_2\text{OCH}_2\text{CH}_2\text{CH}_3$ |
| 3) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_2\text{CH}_3$ | |
24. (2 points) Which of the above has a ketone functional group? _____
25. (2 points) Which of the above has an ester functional group? _____
26. (2 points) Which of the above has an ether functional group? _____
27. (2 points) In which of the above pure compounds would intermolecular H-bonding interactions be expected to have an effect on boiling point?

For questions 28 to 32, refer to the molecule below. Please mark your answers neatly.



28. (2 points) Circle an aldehyde functional group and clearly write “**A**” next to it.
29. (2 points) Circle a **ketone** functional group and clearly write “**K**” next to it.
30. (2 points) Circle an **ether** functional group and clearly write “**E**” next to it.
31. (2 points) Circle each **chiral center** and clearly write “**C**” next to each.
32. (2 points) Circle a **cis bond** and clearly write “**cis**” next to it.



33-39. (2 points each) Place the letter for each molecule above next to its correct name below.

- | | | |
|----------------------------------|---|--|
| <input type="checkbox"/> toluene | <input type="checkbox"/> benzoic acid | <input type="checkbox"/> methylcyclohexane |
| <input type="checkbox"/> phenol | <input type="checkbox"/> benzaldehyde | <input type="checkbox"/> cyclohexanol |
| <input type="checkbox"/> aniline | <input type="checkbox"/> cyclohexanoic acid | <input type="checkbox"/> cyclohexylamine |
| | <input type="checkbox"/> cyclohexanal | <input type="checkbox"/> cyclohexanone |

For the following, refer to the structures above and reply with the corresponding letter (A-G).

40. (2 points) Which molecule above in a reaction with $K_2Cr_2O_7$ and H_2SO_4 yields benzoic acid? ____
41. (2 points) Which molecule above in a reaction with H_2 and a transition metal catalyst yields cyclohexanol? ____
42. (2 points) Which molecule above in a reaction with $K_2Cr_2O_7$ and H_2SO_4 yields cyclohexanone? ____

43. (4 points) Draw the structure for diethylmethanamine:

44. (4 points) Draw the structure for 3-butenal:

45. (4 points) Draw the structure for 2,4-dimethylpentanal

46. (4 points) Draw the structure for para-chlorotoluene

Chem 250 Bonus Question***Evening Exam 1***

Elena loves her horse (she likes everything with four legs and a tail). One day her horse becomes terribly ill. The vet diagnoses a bacterial infection and prescribes a course of antibiotics. Unfortunately, the antibiotics cost \$1,000 per week and Elena doesn't have that kind of money. The vet gives her a free sample he obtained from a salesman, but that's only good for 3 days. She gives that to her horse and he starts to improve, but it will take 3 weeks of treatment.

Her friend Bob says he can get the same antibiotic for \$20/week via the internet (www.crackpotdrugs.com), so they order some. In the mean time, Elena worries "how do we know this is the real thing?" So when the internet antibiotic arrives she takes some of it and some of the free sample and gives them to her friend Sharon, who works in a chemistry lab. Sharon runs elemental analysis and mass spec and tells Elena that both samples show the same composition and bond connectivity – and they both match up with what is expected for the structure of the antibiotic.

Elena gives the new drug to her horse, who immediately takes a turn for the worse.

(2 points) What's happening? Why do you think the horse took a turn for the worse?

(2 points) Had Elena taken Chem 250, she might have asked for one more test that could have warned her about a potential problem. Describe that test.