

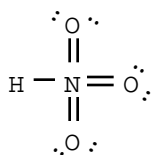
Ch. 1 Intro and Review

Ch. 2 Structure and Properties of Organic Molecules

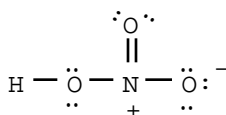
Ch. 3 Structure and Stereochemistry of Alkanes

(Note: Beware of "all of the above", "none of the above", "a and b", etc.)

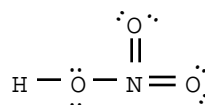
1. Which of the following are correct Lewis structures, including formal charges, for nitric acid, HNO_3 ?



A

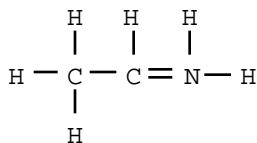


B

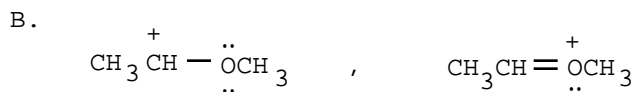
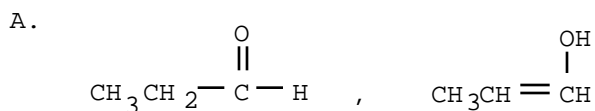


C

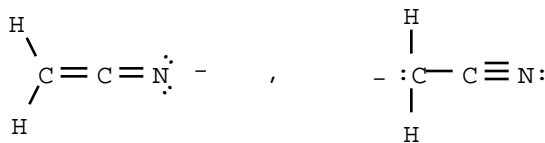
- A. A only
 B. B only
 C. C only
 D. Both A and C
 E. All of the above
2. The formal charge on nitrogen in the compound below is _____.



- A. +2 B. +1 C. 0 D. -1 E. -2
3. Which of the following choices represent(s) a pair of resonance structures?

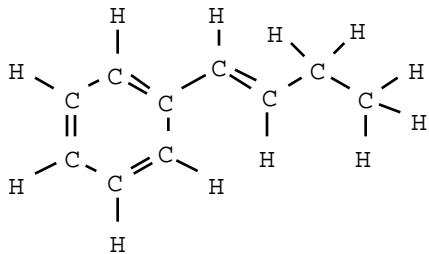


C.



- D. Both a and c
 E. Both b and c

4. Draw an acceptable line angle formula for the compound shown below.



5. Rank these compounds in order of increasing acidity (1 being least acidic, 3 being most acidic):

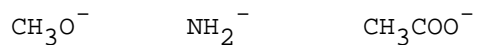


6. Draw either a correct Lewis or line-angle structure for $(\text{CH}_3)_2\text{CHCOOH}$.

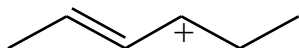
7. Use the curved arrow formalism to show the movement of electron pairs in the following reaction.



8. Rank these ions in order of increasing basicity (1 being least basic, 3 being most basic):



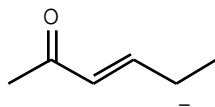
9. Draw the important resonance structures of:



10. In the reaction below, label each reactant as a nucleophile or an electrophile.



11. Draw the important resonance forms for the structure shown below, and circle the one that makes the largest contribution to the actual hybrid.

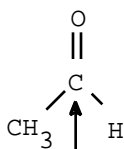


12. Which of the following statements about π molecular orbitals is/are correct?
- A. π molecular orbitals are cylindrically symmetric.
 - B. Most of the electron density in a π molecular orbital is centered above and below the internuclear axis.
 - C. When two atoms are connected by a double bond, both of these bonds are π bonds.
 - D. Both statements b and c are correct.
 - E. Statements a, b, and c are all correct.

13. Triethylamine $[(\text{CH}_3\text{CH}_2)_3\text{N}]$ is a molecule in which the nitrogen atom is _____ hybridized and the CNC bond angle is _____.

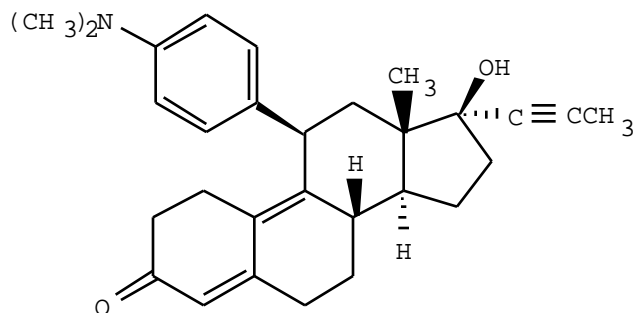
- A. sp^2 , 109°
- B. sp^2 , 120°
- C. sp^3 , 120°
- D. sp^3 , 109°
- E. sp , 109°

14. Choose the correct hybridization for the atom indicated in the molecule below, and write in the bond angle.



- A. sp
- B. sp^2
- C. sp^3
- D. none of the above

15. Choose the functional group which is not represented in the structure of the steroid RU-486.

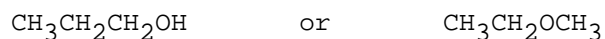


- A. alkyne
- B. ether
- C. ketone
- D. amine
- E. alcohol

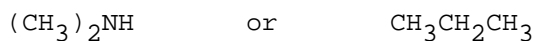
16. Which of the molecules below is an ester?

- A. $\text{CH}_3\text{CH}_2\text{CH}(\text{CH}_3)_2$
- B. $\text{CH}_3\text{OCH}_2\text{CH}_2\text{CH}_3$
- C. CH_3COOH
- D. $\text{CH}_3\text{COOCH}_3$
- E. HCCCH_3

17. Which of the molecules below has the higher boiling point?



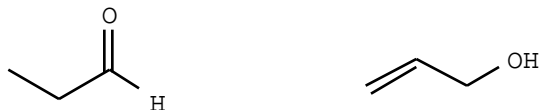
18. Which compound is more soluble in water?



19. Are the two compounds shown below best described as geometric isomers, structural isomers, or not isomeric?



20. Are the two compounds shown below best described as geometric isomers, structural isomers, or not isomeric?



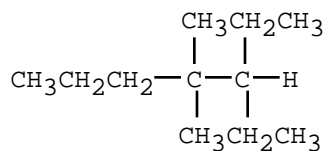
21. Which of the functional groups below contain a carbonyl group as a part of their structure?

- A. aldehyde
- B. ketone
- C. carboxylic acid
- D. ester
- E. a, b, and c
- F. all of the above

22. Draw the structure of all acyclic alkanes which contains 5 carbon atoms.

23. Draw a 3-D picture for all of the atoms in $\text{CH}_3\text{CH}_2\text{CHO}$, including all H's, using the hash/wedge picture convention. (Orbitals need not be shown).

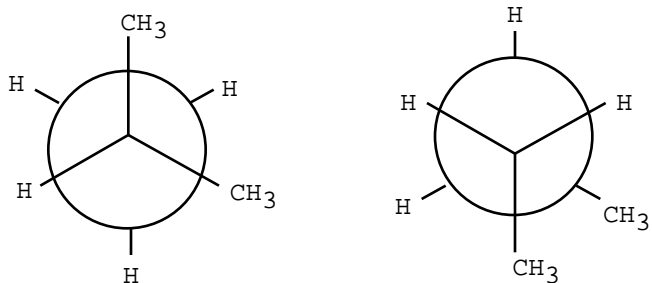
24. Provide an acceptable name for the alkane shown below.



25. Draw an acceptable structure for 4-isopropyl-2-methylheptane.

26. When one compares the densities of n-hexane and water, one finds:
- A. that n-hexane is more dense than water.
 - B. that n-hexane is less dense than water.
 - C. that these two compounds have the same density.
 - D. that the relative densities of two immiscible compounds cannot be measured.

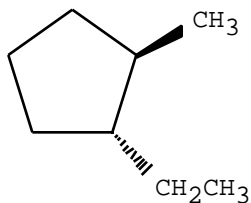
27. The structures below are:



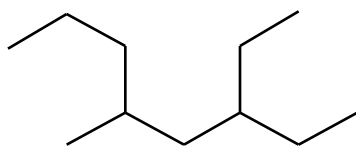
- A. not isomers
 - B. conformational isomers
 - C. geometric isomers
 - D. structural isomers
 - E. both b and d
28. Draw a Newman projection (relative to the C₂-C₃ bond) for the most stable conformation of butane.

29. Among the butane conformers, which occur at energy minima (valleys) on a graph of potential energy versus dihedral angle?
- A. gauche only
 - B. eclipsed and totally eclipsed
 - C. gauche and anti
 - D. eclipsed only
 - E. anti only

30. Give the IUPAC name for the cycloalkane shown below.



31. Which of the following correctly ranks the cycloalkanes in order of increasing ring strain per carbon?
- A. cyclopropane < cyclobutane < cyclohexane < cyclopentane
 - B. cyclohexane < cyclopentane < cyclobutane < cyclopropane
 - C. cyclohexane < cyclobutane < cyclopentane < cyclopropane
 - D. cyclopentane < cyclopropane < cyclobutane < cyclohexane
 - E. cyclopropane < cyclopentane < cyclobutane < cyclohexane
32. Draw the most stable conformation of cis-1,2-dimethylcyclohexane. Which is more stable, cis- or trans-1,2-dimethylcyclohexane?
33. Which of the statements below correctly describes the chair conformations of trans-1,3-diethylcyclohexane.
- A. The two chair conformations are equal in energy.
 - B. The higher energy chair conformation contains two axial ethyl groups.
 - C. The higher energy chair conformation contains two equatorial ethyl groups.
 - D. The lower energy chair conformation contains two axial ethyl groups.
 - E. The lower energy chair conformation contains two equatorial ethyl groups.
34. Draw the most stable conformation of trans-1-tert-butyl-3-methylcyclohexane. (abbreviate the tert-butyl group as "tBu").
35. Provide the name for the following structure.



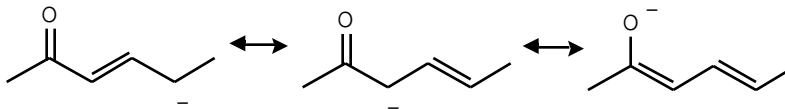
Answer Sheet for Test "Test1-350-PracticeV2", 9/11/3

Chapter/ Question	Test Question	Correct Answer
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1-34 (-,b,-)	10	BH ₃ , electrophile
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CH₃SCH₃, nucleophile

1-38 (-,c,-)	11	
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2-2 (-,c,-)	12	B
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2-6 (-,b,-)	13	D
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2-10 (-,b,-)	14	B
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2-17 (-,a,-)	15	B
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2-19 (-,a,-)	16	D
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2-20 (-,b,-)	17	CH ₃ CH ₂ CH ₂ OH has the higher boiling point since it is capable of intermolecular hydrogen bonding.
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2-23 (-,b,-)	18	(CH ₃) ₂ NH is more soluble in water since it can hydrogen bond with water. Alkanes are not capable of hydrogen bonding with water.
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2-28 (-,b,-)	19	geometric isomers
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2-29 (-,b,-)	20	structural isomers
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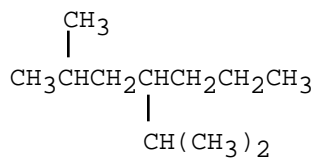
2-34 (-,a,-)	21	F
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2-36 (-,b,-)	22	CH ₃ CH ₂ CH ₂ CH ₂ CH ₃ (CH ₃) ₂ CHCH ₂ CH ₃ C(CH ₃) ₄
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2-66	23	No Answer Supplied
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3-5 (-,e,-)	24	3-ethyl-4,4-dimethylheptane
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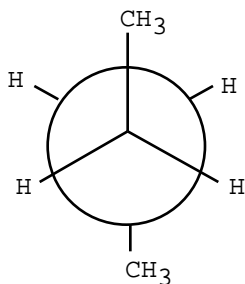
3-8 (-,a,-)	25	
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3-10 (-,a,-)	26	B
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3-12 (-,e,-)	27	D
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3-13 (-,f,-)	28	
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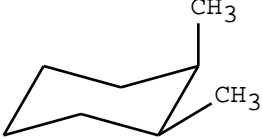
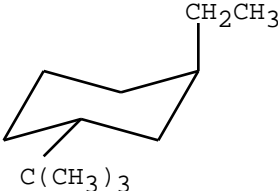


3-15 (-,f,-)	29	C
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3-16 (-,a,-)	30	trans-1-ethyl-2-methylcyclopentane
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3-18 (-,e,-)	31	B
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Answer Sheet for Test "Test1-350-PracticeV2", 9/11/3

<u>Chapter/ Question</u>	<u>Test Question</u>	<u>Correct Answer</u>
3-22 (-,e,-)	32	 CH ₃ CH ₃
3-24 (-,e,-)	33	A
3-26 (-,e,-)	34	 CH ₂ CH ₃ C(CH ₃) ₃
3-44	35	3-Ethyl-5-methyloctane (note: 1. ethyl before methyl for alphabetical reasons 2. Longest possible chain 3. Number from the end nearest substituent)