

Name: Answer Key

Lab Section _____

State University College at Oneonta
Chem. 226: Elementary Organic chemistry
Spring 2013

Exam 1

February 13, 2013 at 10:00am-10:50am

Attempt all questions within the spaces provided. Show your work and steps clearly for any partial credit

1. [C] If the Cl-Cl bond length is 1.98\AA and the C-C bond length is 1.54\AA , what would you expect the bond length of Cl-C to be?

A) 0.74\AA
B) 1.54\AA
C) 1.76\AA

D) 1.98\AA
E) 3.52\AA

C-Cl
will be intermediate between C-C and Cl-Cl bonds

2. [A] Given the following electronegativity values, predict the most polar covalent bond below:

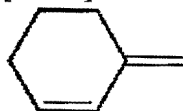
F 4.0
Cl 3.0
O 3.5
C 2.5
H 2.1

A) C-F
B) C-Cl
C) C-O
D) C-H
E) C-C

most polar bond will have the most electronegativity difference.

$$\text{C-F} \cdot (4.0 - 2.5) = \underline{1.5}$$

3. [E] What is the molecular formula for the following structural formula?



A) C_7H_{16}
B) C_6H_{14}
C) C_7H_{14}

D) C_6H_{12}
E) C_7H_{10}

4. [C] What is the approximate H-C-H bond angle in methane?

A) 60°
B) 90°
C) 109.5°

D) 120°
E) 180°

CH₄
↑
sp³ hybridized
tetrahedral shape

5. [B] What is the molecular formula of an alkane that has fourteen carbon atoms?

A) $\text{C}_{14}\text{H}_{28}$
B) $\text{C}_{14}\text{H}_{30}$
C) $\text{C}_{14}\text{H}_{32}$

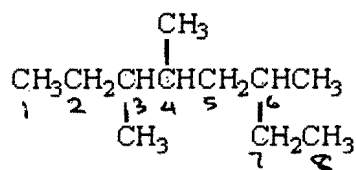
D) $\text{C}_{14}\text{H}_{34}$
E) $\text{C}_{14}\text{H}_{26}$

$$\text{C}_n \text{H}_{2n+2}$$

$$\text{C}_{14} \text{H}_{2(14)+2} = \text{C}_{14} \text{H}_{30}$$

12

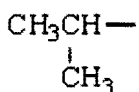
6. [C] The correct IUPAC name for the following molecule is:



3,4,6-trimethyloctane

- A) 6-ethyl-3,4,-dimethylheptane
B) 2-ethyl-4,5-dimethylheptane
C) 3,4,6-trimethyloctane
D) 3,5,6-trimethyloctane
E) none of these

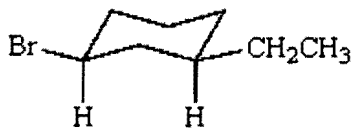
7. [C] The name of the alkyl group below is:



isopropyl group.

- A) ethyl
B) propyl
C) isopropyl
D) butyl
E) isobutyl

8. [E] What is the correct name for the following cycloalkane?

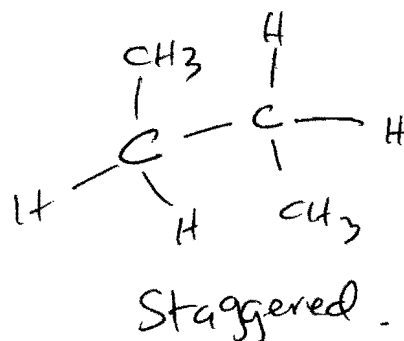


1,3 and they are e,e. hence
cis-1-bromo-3-ethylcyclohexane

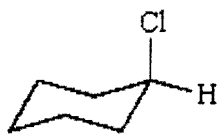
- A) bromoethylcyclohexane
B) trans-1-ethyl-3-bromocyclohexane
C) cis-3-bromo-1-ethylhexane
D) 1-bromo-3-ethylcyclohexane
E) cis-1-bromo-3-ethylcyclohexane

9. [A] The most stable conformation of butane is:

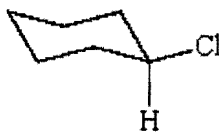
- A) staggered
B) chair
C) planar
D) eclipsed
E) boat



10. [D] The compounds represented by the structures below are:



and



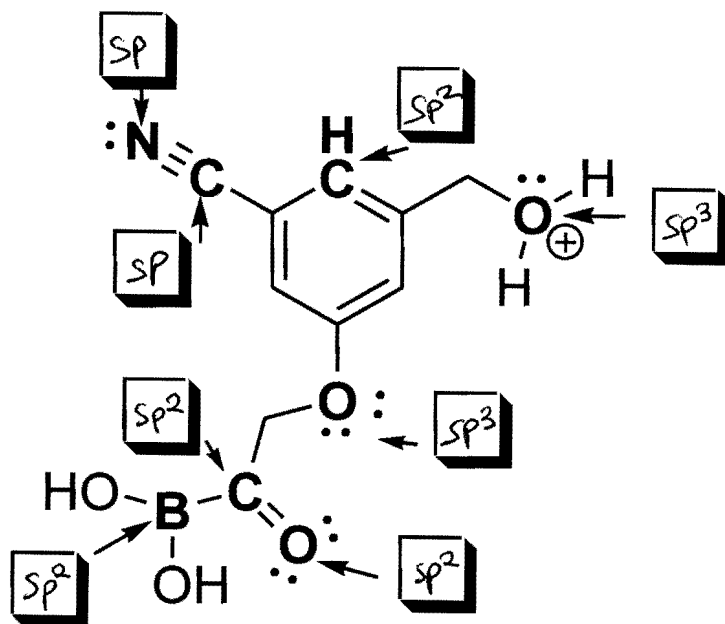
These are actually the same molecule/compound in different conformations

- A) structural isomers.
- B) different compounds.
- C) *cis-trans* isomers.

- D) conformers.
- E) constitutional isomers.

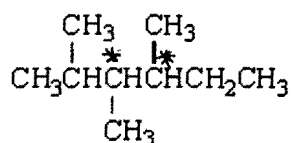
Part 2: Short Answer Questions

11. Indicate the hybridization for the indicated elements in the picture below.



12. Chiral molecules that have nonsuperimposable mirror images are called: Enantiomers

13. How many stereogenic centers are present in the following molecule? 2

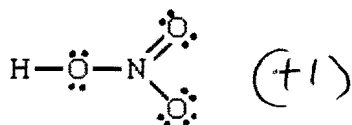


14. What is the number of electrons in the valence shell of sulfur is? 6 (group VI A)

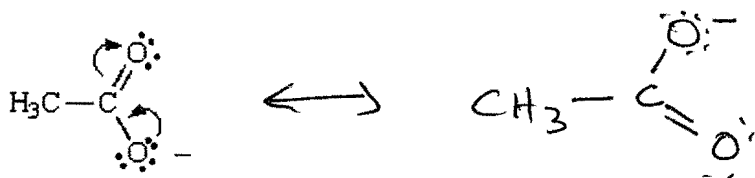
15. The observed rotation for 100 mL of an aqueous solution containing 1 g of sucrose, placed in a 2-decimeter sample tube, is $+1.33^\circ$ at 25°C . Calculate the specific rotation of sucrose?

$$[\alpha]_D^{25} = \frac{\alpha}{c \times L} = \frac{+1.33^\circ}{0.01 \text{ g/mL} \times 2 \text{ dm}} = \underline{+66.5^\circ}$$

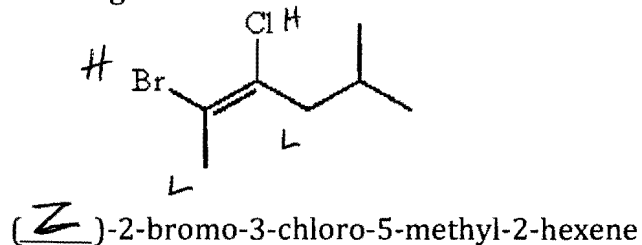
16. What is the formal charge of N in HNO_3 , as seen below? _____



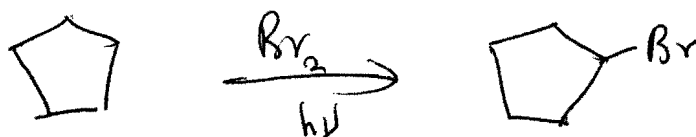
17. The curved arrows in the resonance structure for the acetate ion are shown below. Draw the alternative resonance structure for the acetate ion:



18. The correct IUPAC name for the following molecule is provided without the E-Z notation. Assign the correct E-Z notation for the name

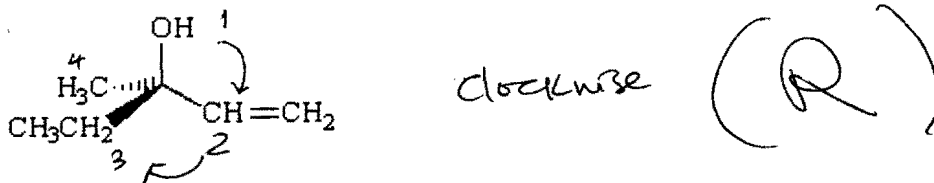


19. How many monobrominated product(s) may be obtained by the reaction of bromine with cyclopentane in the presence of sufficient light? 1 (one)

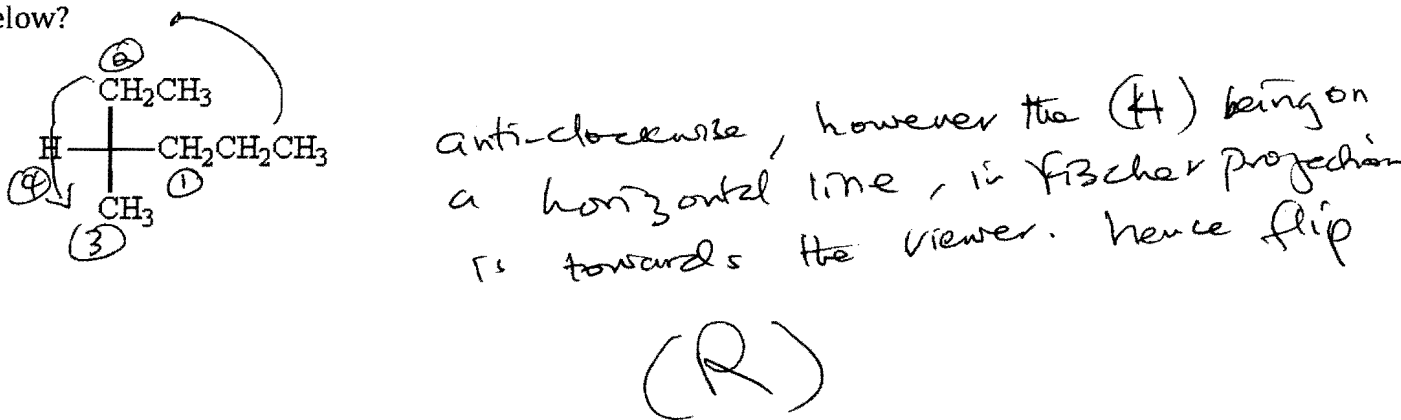




20. What is the absolute configuration for the stereogenic center in the following molecule?



21. What is the absolute configuration around the stereogenic center of the molecule below?



hydrogen 1 H 1.00794																	helium 2 He 4.002602	
lithium 3 Li 6.941	beryllium 4 Be 9.0122											boron 5 B 10.811	carbon 6 C 12.011	nitrogen 7 N 14.007	oxygen 8 O 15.999	fluorine 9 F 18.998	neon 10 Ne 20.180	
sodium 11 Na 22.990	magnesium 12 Mg 24.305											aluminum 13 Al 26.982	silicon 14 Si 28.086	phosphorus 15 P 30.974	sulfur 16 S 32.065	chlorine 17 Cl 35.453	argon 18 Ar 39.948	
potassium 19 K 39.098	calcium 20 Ca 40.078	scandium 21 Sc 44.956	titanium 22 Ti 47.867	vanadium 23 V 50.942	chromium 24 Cr 51.996	manganese 25 Mn 54.938	iron 26 Fe 55.845	cobalt 27 Co 58.933	nickel 28 Ni 58.693	copper 29 Cu 63.546	zinc 30 Zn 65.39	gallium 31 Ga 69.723	germanium 32 Ge 72.61	arsenic 33 As 74.922	selecnium 34 Se 78.96	bromine 35 Br 79.904	krypton 36 Kr 83.80	
rubidium 37 Rb 85.468	strontium 38 Sr 87.62	yttrium 39 Y 88.906	zirconium 40 Zr 91.224	niobium 41 Nb 92.906	molybdenum 42 Mo 95.94	technetium 43 Tc [98]	ruthenium 44 Ru 101.07	rhodium 45 Rh 102.91	palladium 46 Pd 106.42	silver 47 Ag 107.87	cadmium 48 Cd 112.41	indium 49 In 114.82	tin 50 Sn 118.71	antimony 51 Sb 121.76	tellurium 52 Te 127.60	iodine 53 I 126.90	xenon 54 Xe 131.29	
cesium 55 Cs 132.91	barium 56 Ba 137.33	* 57-70	lutetium 71 Lu 173.07	hafnium 72 Hf 178.49	tantalum 73 Ta 180.95	tungsten 74 W 183.84	rhenium 75 Re 186.21	osmium 76 Os 190.23	iridium 77 Ir 192.22	platinum 78 Pt 195.08	gold 79 Au 196.97	mercury 80 Hg 200.59	thallium 81 Tl 204.38	lead 82 Pb 207.2	bismuth 83 Bi 208.98	polonium 84 Po [209]	astatine 85 At [210]	radon 86 Rn [222]
francium 87 Fr [223]	radium 88 Ra [226]	** 89-102	lawrencium 103 Lr [262]	rutherfordium 104 Rf [261]	dubnium 105 Db [262]	seaborgium 106 Sg [266]	bohrium 107 Bh [264]	hassium 108 Hs [269]	meitnerium 109 Mt [268]	unnilium 110 Uun [271]	ununium 111 Uuu [272]	unbibium 112 Uub [277]	unseptennium 114 Uuq [289]					

* Lanthanide series

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
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** Actinide series

actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]
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