

Unless otherwise specified, each question is worth 4 points.

1. Draw Lewis structures for each of the following: (2 points each)

a. ethane,  $C_2H_6$

c. methanal (formaldehyde),  $CH_2O$

b. hydrazine,  $N_2H_4$

d. methanol,  $CH_3OH$

2. Using the symbols  $\delta^-$  and  $\delta^+$ , indicate the direction of polarity in each of the following covalent bonds: (1 point each)

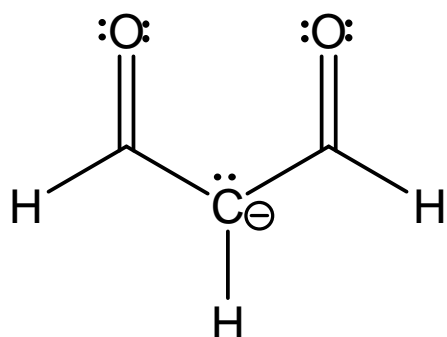
a. C—Cl

c. C—H

b. C—O

d. O—H

3. Draw one more resonance structure for the following. Use the curved arrow conventions to show "movement" of electron pairs.



**Exam #1**

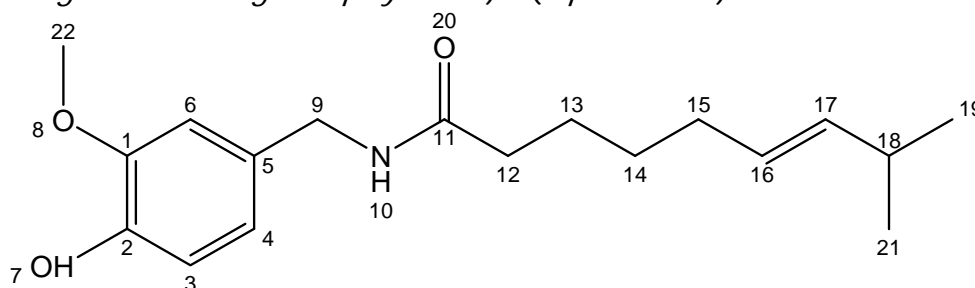
*Intro to Organic Chemistry, 3<sup>rd</sup> ed., Brown & Poon, ch. 1-5*

Wallace

revised 2/05/2009

Unless otherwise specified, each question is worth 4 points.

4. State the hybridization on each indicated atom in capsaicin (*a molecule that stimulates pain-detecting nerve endings in spicy foods*): (1 point each)



#6 = \_\_\_\_\_

#10 (N) = \_\_\_\_\_

#16 = \_\_\_\_\_

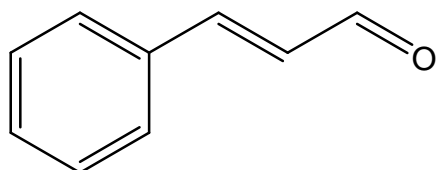
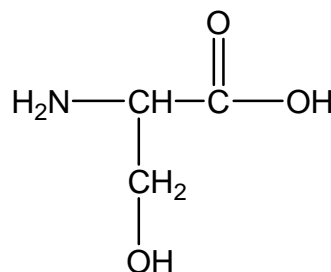
#8 = \_\_\_\_\_

#12 = \_\_\_\_\_

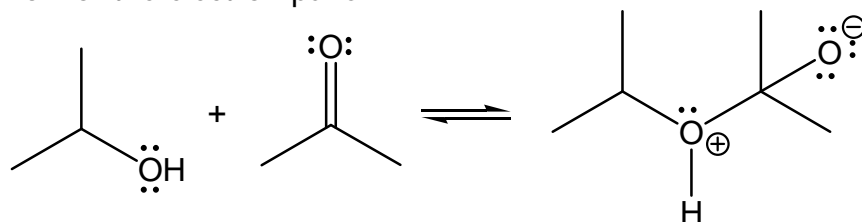
#18 = \_\_\_\_\_

5. Indicate, by circling and labeling, which parts of the following molecules contain the following functional groups. Note that NOT all groups may be present. (1 point each)

- hydroxyl *as an alcohol*
- amino
- carbonyl *as a ketone*
- carbonyl *as an aldehyde*
- carboxyl



6. Identify the Lewis acid and base in the following reaction. Use curved arrows to show the flow of the electron pairs.

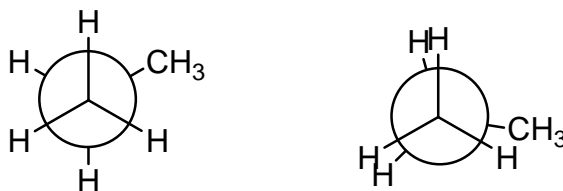


Unless otherwise specified, each question is worth 4 points.

7. In each pair, identify the stronger acid: (circle the stronger acid in each pair) (1 point ea)

- a.  $\text{CFH}_2\text{COOH}$                        $\text{CH}_3\text{COOH}$   
b. ethanol ( $\text{p}K_a=16$ )                  ethane ( $\text{p}K_a=51$ )  
c. HCl                                         $\text{CH}_3\text{COOH}$   
d. 2-propanol ( $K_a=10^{-17}$ )          ethanol ( $K_a=10^{-16}$ )

8. Circle the more stable conformation. Label each conformation as staggered or eclipsed. (2 points total)



9. Write the molecular formula for each of the following line-bond (line-angle) structures: (1 point each)

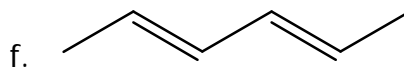
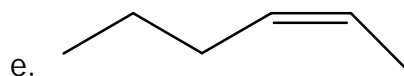
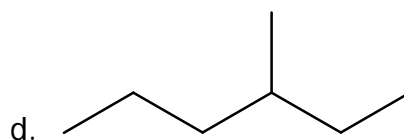
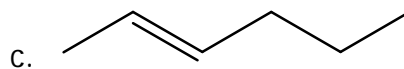
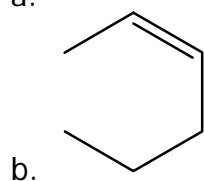
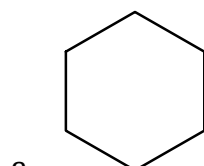
- a. .....  $\text{C}_6\text{H}_{14}$
- b. .....
- c. .....
- d. .....
- e. .....

Unless otherwise specified, each question is worth 4 points.

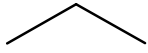
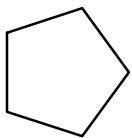
10. Identify sets of compounds that are... (6 points total)

...constitutional isomers..... \_\_\_\_\_


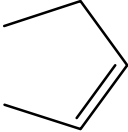
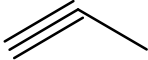
...the same compound..... \_\_\_\_\_



11. Complete the following table: (2 points each)

	NAME	FORMULA
A		
B	3-methyloctane	
C		
D	<i>trans</i> -1,4-diisopropylcyclohexane	

Unless otherwise specified, each question is worth 4 points.

	NAME	FORMULA
E		CH <sub>4</sub>
F	<i>cis</i> -2-butene	
G		
H	2-methyl-3-propyl-1-heptene	
I		
J	( <i>E</i> )-1-chloro-1-fluoro-1-butene	
K		

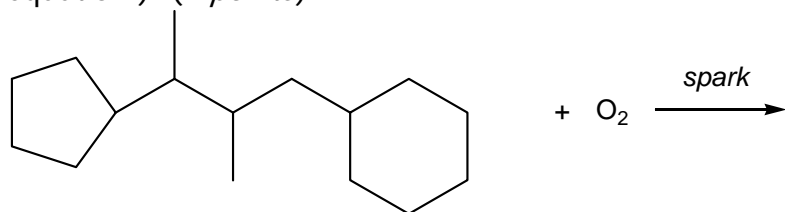
*Unless otherwise specified, each question is worth 4 points.*

12. Draw the most stable conformation of isopropylcyclohexane.

13. Which of the following compounds has the highest boiling point? (2 points)

- a. octane
- b. 3-methylheptane
- c. 2,2-dimethylhexane
- d. 2,2,3,3-tetramethylbutane

14. What are the products of the following reaction? (Do not worry about balancing this equation.) (2 points)

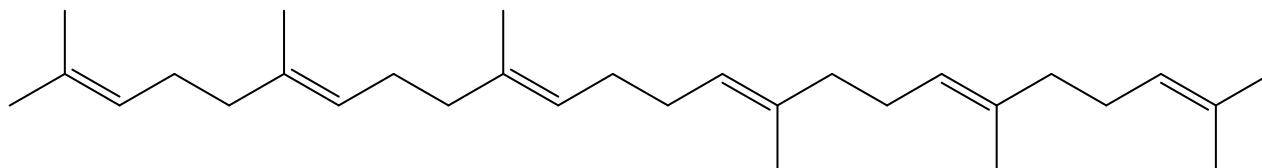


15. Circle any of the following compounds that could exhibit cis-trans isomerism. (3 points; this problem is worth a total of THREE points exactly.)

- a. 1,2-diethylcyclohexane
- b. 1-butene
- c. 2-butene
- d. 2-pentene
- e. 2-pentane

*Unless otherwise specified, each question is worth 4 points.*

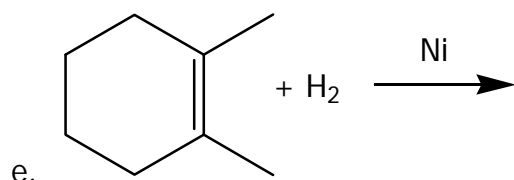
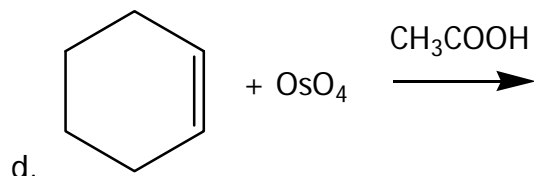
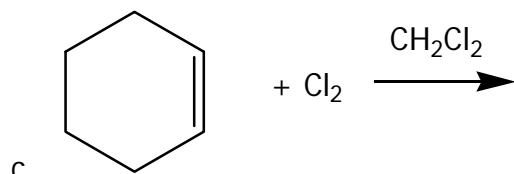
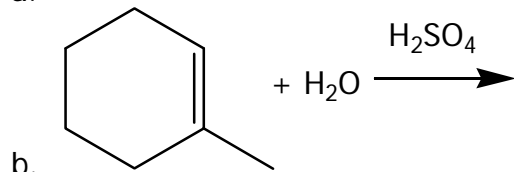
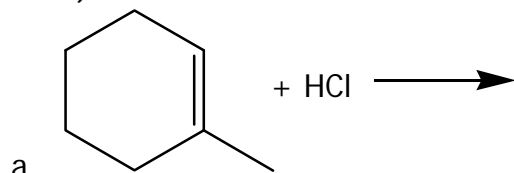
16. How many isoprene units are in squalene (shark liver oil), as shown below? Clearly indicate each isoprene unit on the overall structure.



17. Draw an energy diagram for a one-step reaction that is fast and endothermic. Indicate the position of the (a) reactants, (b) transition state(s), (c) intermediate(s), and (d) products, if any or all of these are applicable.

Unless otherwise specified, each question is worth 4 points.

18. Draw the structure of the major product for each of the following reactions: (2 points each)

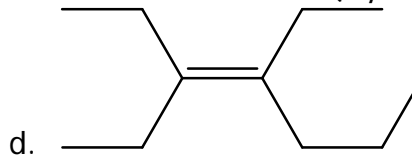


19. List the following compounds from lowest to highest melting points: (2 points)

- 1-butene
- cis*-3-hexene
- propene
- trans*-3-hexene

20. Which of the following molecules would you expect to be most reactive? (2 points)

- H<sub>2</sub>C=CH<sub>2</sub>
- H<sub>2</sub>C=CHCH<sub>3</sub>
- H<sub>2</sub>C=C(CH<sub>3</sub>)<sub>2</sub>



NAME: \_\_\_\_\_

CHM 201  
101 points; 2 hrs 15 mins

Winter 2009  
week 6

**Exam #1**

*Intro to Organic Chemistry, 3<sup>d</sup> ed.*, Brown & Poon, ch. 1-5

Wallace

*revised 2/05/2009*

*Unless otherwise specified, each question is worth 4 points.*

Unless otherwise specified, each question is worth 4 points.

**Abbreviated Periodic Table of the Elements**

1 1A																		18 8A
1 H 1.008	2 2A												13 3A	14 4A	15 5A	16 6A	17 7A	2 He 4.00
3 Li 6.94	4 Be 9.01												5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	3 3B	4 4B	5 5B	6 6B	7 7B	8 8B	9 8B	10 8B	11 1B	12 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95	
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3	
55 Cs 132.9	56 Ba 137.3	57 La* 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)	
87 Fr (223)	88 Ra 226	89 Ac** (227)	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub							