SAN JOSE CITY COLLEGE
INTRODUCTION TO CHEMISTRY 32B – Spring 2009

Name: _____ ID#: _____
Instructor: Dr. T. Johnson Time Allowed:1h 20 min
March 9, 2009 Chapters 13, 14 and 17
Bettelheim, Brown, March 108 Points

LEARNING FESTIVAL (II)

I hereby affirm that I will abide by the Academic Integrity Code of San Jose City College. That is, I will not cheat on this exam.

Your Signature: _____

Instructions: The exam consists of 22 multiple choice (3 points each=66) and 10 short answer questions (42 points). Indicate your answers to the multiple choice questions by writing the letter choice on a scantron. Write your short answers in the space provided. A periodic table is attached at the end of the exam. The periodic table can be detached.
Answer ALL the questions. Make efficient use of your time. Do the problems which are easy first, and leave the more difficult ones to last. Don't spend too much time on any one problem. Remember to use significant figures when reporting numerical answers.
Note: Partial credit is given where possible if, and only if, you support your answer by detailing your work, including possible/partial structures and/or providing your reasoning. SHOW YOUR WORK!

Select the BEST answer to the multiple choice questions below. Indicate your answers to the multiple choice questions by writing the letter choice on a scantron (You may also place the answer in the space provided in the answer sheet, below, but this will not be graded). (3 pts ea):

1 _B____
2 __D____
3 ___B___
4 ____D__
5 _____B_
6 _D_____
7 __D____
8 ___E___
9 ____A__
10 _____A_
11 C_____
12 _C_____
13 __XXXXX____QUESTION OMITTED
14 A _____
15 _E_____
16 ___E___
17 ___B__
18 _____C_
19 _____B
20 _A_____
21 __A____
22 ___D___

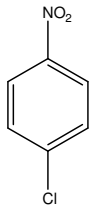
MULTIPLE CHOICE QUESTIONS (66 POINTS)

1. Which compound is a tertiary alcohol?
(a) 2-methyl-1-propanol
(b) 2-methyl-2-hexanol
(c) 3-hexanol
(d) 3-methyl-1-hexanol
(e) 2-methyl-1-hexanol

2. When cyclopentanone is reduced with $NaBH_4$ (sodium borohydride), the product is a(an):
(a) ketone
(b) alkane
(c) aldehyde
(d) alcohol
(e) carboxylic acid

3. Compounds with the –OH group attached to a benzene (also known as aromatic) ring are know as:
(a) hydroxyls
(b) phenols
(c) secondary alcohols
(d) phenyls
(e) benzyls

4. Name the following compound?
(a) para-chloro-nitrobenzene
(b) 4-chloro-nitrobenzene
(c) 1-chloro-nitrobenzene
(d) both a and b
(e) none of these



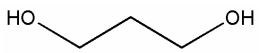
5. Which observation denotes a positive Tollen's test?
(a) a red-brown solution becomes clear and colorless.
(b) a mirror-like deposit forms from a colorless solution.
(c) A red precipitate forms from a blue solution.
(d) A purple solution yields a brown precipitate
(e) A pale yellow solution with an odor of chlorine changes to a purple color.

6. Suppose you have unlabeled bottles of benzene and cyclohexene. What chemical reaction could you use to tell which bottle contains which chemical?
(a) $K_2Cr_2O_7$
(b) H_2/Pd catalyst
(c) $KMnO_4$
(d) Br/CH_2Cl_2
(e) Tollens reagent

7. Name the following Compound $C_6H_5CH_2CH_2CH_2Cl$
(a) 3 phenyl 1 chloro propane
(b) 1 chloro Benzyl propane
(c) Benzyl Chloro propane
(d) 1 Chloro 3 phenyl propane
(e) none of the above

8. Oxidation of a tertiary alcohol will produce a(n)
(a) aldehyde
(b) ketone
(c) alkene
(d) carboxylic acid
(e) no reaction

9. Write the IUPAC name of the following:



(a) 1,3 propane diol
(b) 1,3 dihydroxypropane
(c) hydroxypropanol
(d) a and b
(e) a and c

10. Arrange the following compounds 1-4 from lowest to highest boiling point.
(a) 4,2,1,3
(b) 4,2,3,1
(c) 3,2,1,4
(d) 4,3,2,1

1) $CH_3CH_2CH_2CH_2OH$
2) CH_3CH_2OH
3) $HOCH_2CH_2OH$
4) $CH_3CH_3CH_3$

11. Which pair of compounds can react **together** to form a hemiacetal?
(a) CH_3CH_2CHO and CH_3COOH
(b) CH_3COOCH_3 and CH_3CH_2CHO
(c) CH_3CH_2CHO and $CH_3CH_2CH_2OH$
(d) CH_3COCH_3 and CH_3COOH
(e) CH_3COOH and CH_3CH_2OH

12. Tollen's Test (or reagent) is used to?
(a) Reduce aldehydes
(b) Reduce ketone
(c) Distinguish aldehydes from ketones
(d) Distinguish alcohols from ketones
(e) Distinguish alcohols from aldehydes

13. Give the name of the alkene(s) from which 2- butanol can be formed?
(a) 1-butene
(b) 2-butene
(c) 3-butene
(d) both a and b
(e) both a and c

14. Classify the following compound $CH_3OCH_2OCH_3$ by the proper name as a:
(a) Acetal
(b) Hemiacetal
(c) both a and b
(d) neither a and b

15. Which property of thiols makes them useful as additives to natural gas?
(a) flammability
(b) solubility
(c) color
(d) boiling point
(e) odor

16. What is the name of the reaction when a primary alcohol is transformed to an alkene?
(a) hydration
(b) halogenation
(c) nitration
(d) hydrogenation
(e) none of the above

17. Which of the following is a use of formaldehyde?
(a) flavoring
(b) preservative
(c) hormone
(d) sweetener
(e) nutrient

18. The reaction conditions which would result in formation of disulfides from thiols are
(a) gentle heat
(b) weak acidification
(c) mild oxidizing **p.375**
(d) mild reducing
(e) none of the above

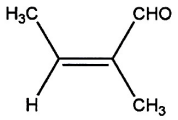
19. For $(CH3)_2CHCH(OH)CH_3$ classify the proper name of the alcohol as ?
(a) primary
(b) secondary
(c) tertiary
(d) none of the above

20. Draw the product formed by the treatment of butanal with H_2 and a metal catalyst
(a) $CH_3CH_2CH_2CH_2OH$
(b) $CH_3CH_2CH_2CH_2CHO$
(c) $CH_3CH_2CH_2CH_2COOH$
(d) $CH_3CH_2CH_2CH{=}CH_2$
(e) none of the above

21. Which phrase most accurately describes the structure common to all aromatic compounds?
(a) a six-membered ring with 3 double and 3 single bonds.
(b) a ring described as 1,3,5-hexatriene.
(c) identical bonds between all 6 carbon atoms, with 6 electrons moving freely.
(d) a six-membered ring with easily broken carbon-carbon bonds.
(e) none of the above.

PRACTISE EXAM

22. Write the IUPAC name for the following:



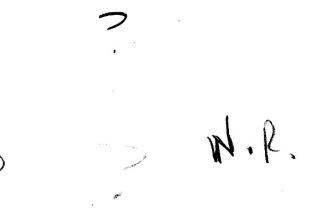
(a) trans 2 methyl -2 butene
(b) cis 2 methyl -2 butene
(c) trans 2 methyl -2 butenal
(d) cis 2 methyl -2 butenal
(e) none of the above

SHORT ANSWER QUESTIONS (51 points)

1. Draw the structures of the starting material and product of oxidation (O_2 or $K_2Cr_2O_7$) of the following compounds. If no reaction occurs, write NR. (6 pts)

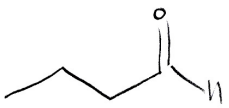
(a) structure of starting material ? cyclohexanone → [oxidation] ?

1pt



1pt

(b) structure of starting material ? 1-butanal → [oxidation] ?



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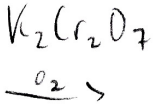

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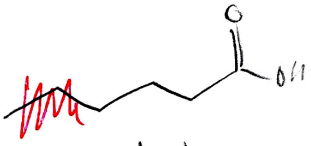
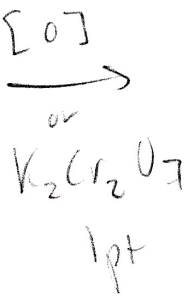


1pt

(c) structure of starting material ? 1-cyclopentanol→ [oxidation] ?

1pt



1pt

1pt

6/6

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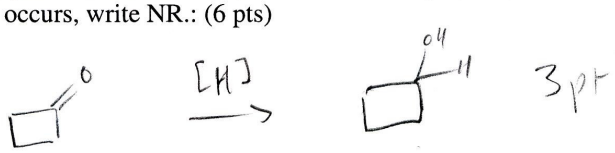
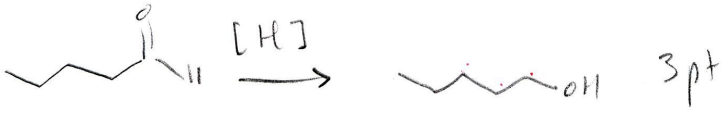
2. Draw the structure of the product of reduction (H_2 w/ Metal catalyst) of the following compounds. If no reaction occurs, write NR.: (6 pts)

(a) cyclobutanone →



(b) 1-pentanal →



3. Explain the experimental results in the following table. (i.e. why is the B.P. of compound **2 << 1**, and why is the B.P. of **3 > 1?** [4 pts]

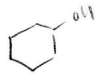
Compound	Molecular weight	Boiling Point (degrees Celsius)
1. CH_3CH_2OH	46	78
2. $CH_3CH_2CH_3$	44	-42
3. $CH_3CH_2CH_2OH$	60	97

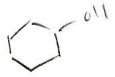
Quiz 2

- H-Bonding for 1 > 2 (2pt)
- 3 > 1 b/c ↑ M.W. (2pt

4. Show how to convert cyclohexanol to the following, list all reagents. (4pts)

Chpt 14

(a)  1pt $K_2Cr_2O_7$ / 1pt H_2SO_4 → Cyclohexanone 

(b)  1pt H_2SO_4 / 1pt Heat → Cyclohexene 

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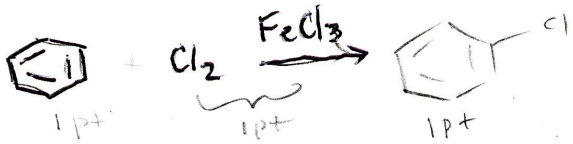
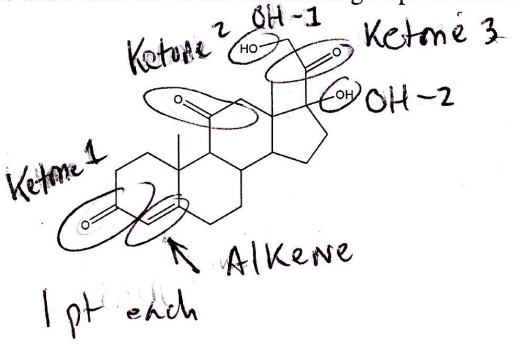
5. Draw the structures and reagent(s) necessary to convert benzene to chlorobenzene. [3 pts]



6. Circle and Name all of the functional groups in steroid Cortisone. (6 pts)



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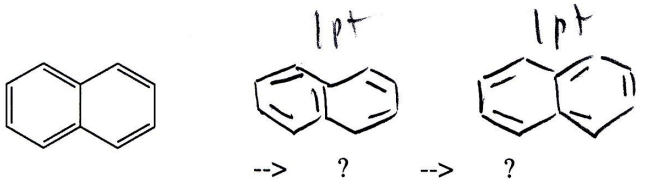
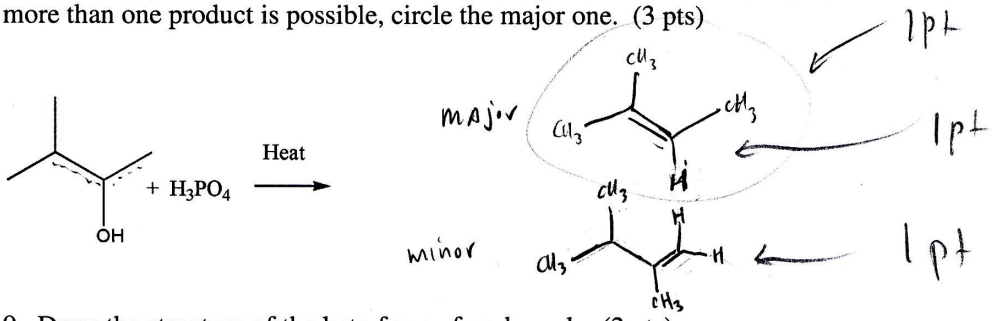
7

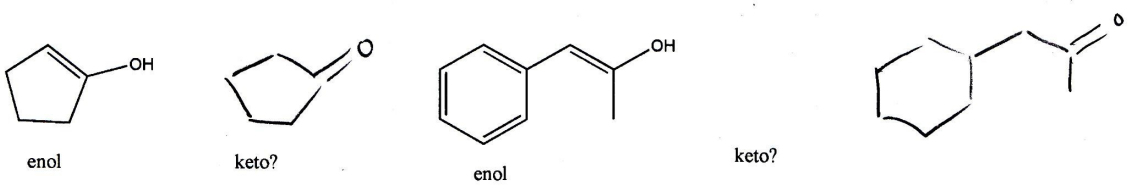
7. Draw the other two resonance structures for Napthalene below. (2 pts)



8. Draw the product(s) when $(CH3)_2CHCH(OH)CH_3$ is treated with H_3PO_4 at 140 °C. If more than one product is possible, circle the major one. (3 pts)

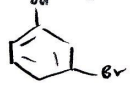


9. Draw the structure of the keto form of each enol. (2 pts)



EXTRA Credit (6pt)

10. For the following organic compounds below, write the IUPAC names of the structures or the structure for the name (6 pts):

(a) 3-bromophenol 

meta Bromo phenol

(b) $CH_3CH_2CH(SH)CH_2CH_2CH_2CH_2CH_3$

3-OCTANthiol

(c) $CH_3CH_2CH_2CH_2COCH_2CH_2CH_3$

4-OCTANONE

13/13

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Note: Ia = 1
IIa = 2
IIIa = 3
IVa = 4
Va = 5
VIa = 6
VIIa = 7