

Chem 1220
Midterm 1
100 points
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Name _____

Instructions:

This is a closed book, closed notebook test. You may not discuss this exam with anyone, either during or after the exam, until it has been graded and returned to you in class. You may not use any outside materials - including Periodic Tables - on this exam, except a single 3" x 5" index card and an English-foreign language dictionary if necessary. You may use a calculator.

Each question is worth 5 points. All questions are of equal value. Select the best single answer of those available.

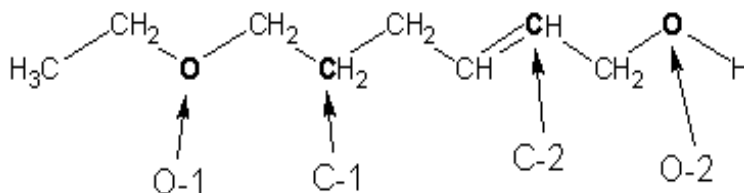
- Which of the following atoms is most likely to form a polar covalent bond with carbon?
 - C
 - H
 - Na
 - S
 - O
- Which functional group does not contain oxygen?
 - Alcohol
 - Amine
 - Carboxylic acid
 - Ester
 - Ketone
- Which family of organic compounds does not contain any multiple bonds?
 - Alkyl halides
 - Acyl halides
 - Alkenes
 - Alkynes
 - Aldehydes
- Given the molecule 2,4-dimethylhexane, C-2 is a _____ carbon atom.
 - Primary
 - Secondary
 - Tertiary
 - Quaternary
 - None of the above answers is correct
- Which of the following molecules is an isomer of 3-methylhexane?
 - 2-methylpentane
 - 4-methylhexane
 - n-octane
 - 2-methylhexane
 - 2,2-dimethylbutane

6. The term unsaturated refers to a molecule
- A. Which has the maximum number of carbon-hydrogen bonds possible
 - B. With a specific six-membered ring structure
 - C. Which contains one or more multiple bonds between two or more carbon atoms
 - D. Which can react by taking up one or more water molecules
 - E. Which is formed from the breakdown of natural fat molecules
7. A compound has the molecular formula $C_6H_{14}O$. What is the name of this compound if it contains four methyl groups and no t-butyl ($(CH_3)_3C-$) group?
- A. 2,3-dimethylpropyl-2-butyl ether
 - B. 2-ethoxybutane
 - C. Ethyl isopropyl ether
 - D. 1,1-dimethylmethoxy-2-butane
 - E. Diisopropyl ether
8. The product of the reaction of 2-pentyne with an excess of chlorine gas is
- A. 2,3-dichloro-2-pentene
 - B. 2,3-dichloropentane
 - C. 2,2,3,3-tetrachloro-2-pentene
 - D. 2,2,3,3-tetrachloropentane
 - E. None of the above
9. Which one of the following molecules can have cis-trans isomers?
- A. $CH_3CH=C(CH_3)_2$
 - B. $(CH_3)_2C=CHCH_3$
 - C. $(CH_3)_2C=C(CH_3)_2$
 - D. $CH_3CH=CHCl$
 - E. $CH_3CH=CCl_2$
10. According to Markovnikov's rule when hydrogen chloride reacts with 2-methyl-2-butene the major product will be
- A. 2-chloro-3-methylbutane
 - B. 2-chloro-2-methylbutane
 - C. 2,3-dichloro-2-methylbutane
 - D. 1-chloro-2-methylbutane
 - E. 1,2-dichloro-2-methylbutane

11. When an alkene undergoes a hydration reaction the product is an

- A. Ether
- B. Alkane
- C. Acid
- D. Alcohol
- E. Hydroxylated hydrocarbon

12. Given the following molecule, what is the hybridization of the atoms in boldface type?



- | | O-1 | C-1 | C-2 | O-2 |
|----|------------------------------|------------|------------|------------|
| A. | sp^3 | sp^3 | sp^2 | sp^3 |
| B. | sp^3 | sp^3 | sp | sp^3 |
| C. | sp^3 | sp^2 | sp^2 | sp^3 |
| D. | sp^2 | sp^3 | sp^2 | sp^2 |
| E. | None of the above is correct | | | |

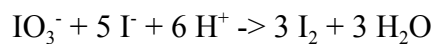
13. Saponification reactions involve _____ hydrolysis of an _____ with the resulting formation of a(n) _____ and a(n) _____.

- A. Acid-catalyzed, amide, acid, amine
- B. Base-catalyzed, amide, acid, amine
- C. Acid-catalyzed, ester, acid, amine
- D. Base-catalyzed, ester, acid, alcohol
- E. Base-catalyzed, ester, amine, alcohol

14. The hybridization of a carbonyl oxygen atom is

- A. sp
- B. sp^2
- C. sp^3
- D. dsp^3
- E. None of the above answers is correct

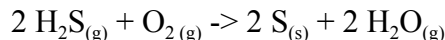
15. For the reaction



the rate of disappearance of iodide at a particular time and concentration is $5.0 \times 10^{-3} \text{ M s}^{-1}$. What is the rate of appearance of iodine in molar units per second?

- A. -5.0×10^{-3}
 - B. 1.0×10^{-3}
 - C. 3.0×10^{-3}
 - D. 5.0×10^{-3}
 - E. 6.0×10^{-3}
16. The rate law for the reaction between nitric oxide and hydrogen is “rate = $k[\text{NO}]^2[\text{H}_2]$.” The overall reaction order is
- A. 4
 - B. 3
 - C. 2
 - D. 1
 - E. 0

17. From a consideration of the following reaction it can be concluded that



- A. The reaction is second order in hydrogen sulfide and first order in oxygen
 - B. The reaction is first order in hydrogen sulfide and second order in oxygen
 - C. Rate = $k[\text{H}_2\text{S}]^2[\text{O}_2]$
 - D. Rate = $k[\text{H}_2\text{S}][\text{O}_2]^2$
 - E. None of the conclusions are justified
18. If the rate law for a reaction is “rate = $k[\text{ClO}_3^-][\text{I}^-][\text{H}^+]^2$ ” what are the units of k when time is in seconds and concentration is expressed in moles per liter?
- A. mol/Ls
 - B. Ls/mol
 - C. $\text{mol}^2/\text{L}^2\text{s}$
 - D. $\text{L}^2/\text{mol}^2\text{s}$
 - E. $\text{L}^3/\text{mol}^3\text{s}$

19. Nitric oxide and chlorine react to produce nitrosyl chloride (NOCl). Tripling the concentration of both reactants increases the rate of the reaction by a factor of 27. If only the concentration of chlorine is tripled, the reaction rate increases by a factor of three. The order of this reaction with respect to nitric oxide is

- A. 3
- B. 2
- C. 1
- D. 1/2
- E. 0

20. For the reaction $aA + bB + cC \rightarrow dD + eE$ the following data were obtained:

initial concentrations (mol/L)			
[A]	[B]	[C]	initial rate (mol/LGmin)
0.40	0.40	0.20	160
0.20	0.40	0.40	80
0.60	0.10	0.20	15
0.20	0.10	0.20	5.0
0.20	0.20	0.40	20
0.20	0.20	0.20	20

The orders for each reactant, A, B, and C, are, respectively

- A. 1, 2, 0
- B. 0, 2, 1
- C. 0, 1, 1
- D. 1, 2, 1
- E. 1, 1, 1

Answers Chem 1220 MT1

1. E
2. B
3. A
4. C
5. D
6. C
7. E
8. D
9. D
10. B
11. D
12. A
13. D
14. B
15. C
16. B
17. E
18. E
19. B
20. A