Biochemistry Lecture (CHM 338) Fall 2016 9/19/16 Monday Dr. Hahn Exam # _____

Name Key (print) Name _____ (sign)

Please show work for partial credit and full credit on the Long Answers and in some of the Short Answer Questions. Multiple choice questions have no partial credit. Please write anything you want graded legibly. If you run out of space, please continue on the empty back pages but clearly label where the remaining answer can be found. (If I can't find your answer or cannot read it, I obviously cannot grade it). Return your entire exam including the seriodic table. (Please count your exam pages and make sure there are 9 real pages + periodic table)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question. (2 pts each, 30 pts total)

BA = bad attempt BBA bad bad attempt

1) The general formula for a carbohydrate is: 1) D

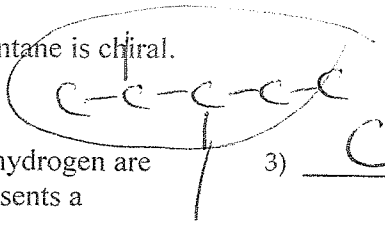
A) $C_n(H_2O)$ B) C_nH_{2n} C) C_nH_{2n+2} D) $C_n(H_2O)_n$

NW = no work

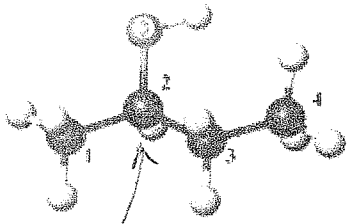
2) Given the compounds 2,3-dimethylpentane and 2,4-dimethylpentane, which of the following is true? 2) B

A) Neither is chiral. B) Only 2,3-dimethylpentane is chiral.

C) Only 2,4-dimethylpentane is chiral. D) Both are chiral.

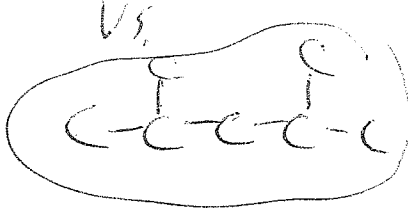


3) Consider the following ball-and-stick model. Atoms other than carbon and hydrogen are indicated by the chemical symbol of the element. Which carbon atom represents a stereocenter? 3) C



C with none same, 4 different

vs.



A) 1

C) 2

B) 3

D) None is a stereocenter.

4) Glycosides are examples of which class of compounds? 4) D

A) esters B) ethers C) hemiacetals D) acetals

5) 1. Which of the following statements is true? 5) C

A) Very few biologically important organic molecules exhibit enantiomerism.

B) Biologically important organic molecules never exhibit enantiomerism.

C) The vast majority of biologically important organic molecules exhibit enantiomerism.

D) All biologically important organic molecules exhibit enantiomerism.

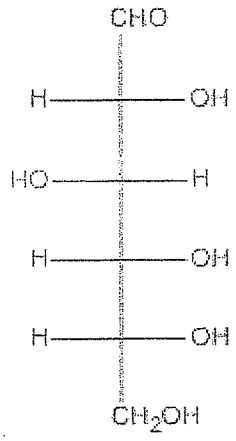
no partial credit MC

6) The configuration at which carbon atom determines if a monosaccharide is D or L? 6) C

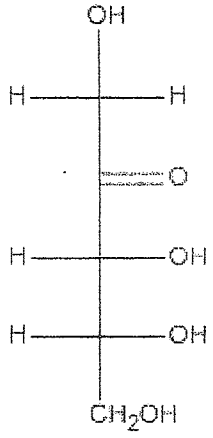
A) The carbon of the primary alcohol group
B) The chiral carbon closest to the aldehyde or keto group
C) The highest numbered chiral carbon
D) The lowest numbered chiral carbon

7) Which of these molecules is an aldopentose? 7) C

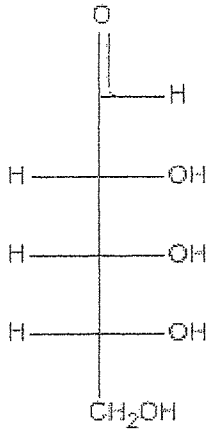
A)



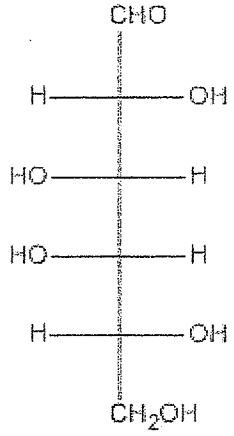
B)



C)



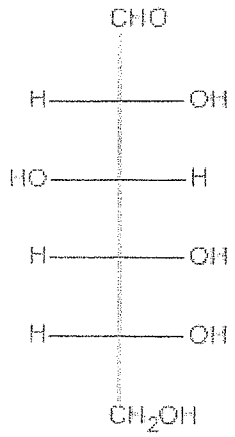
D)



8) The cyclic structures of monosaccharides are which of the following? 8) B

A) acetals B) hemiacetals C) ethers D) esters

9) In the Fisher projection formula shown, how many chiral centers is in the molecule? 9) D



A) 6 B) 3 C) 5 D) 4

10) How many monosaccharides are connected to each other in a disaccharide? 10) B
A) 1 B) 2 C) 3 D) 4

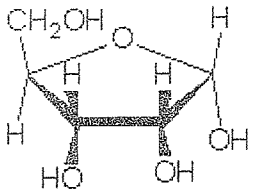
11) The electronegativity of elements on the periodic table increases going _____ a column and to the _____ in each row. (hint: where is F) 11) A
A) up; right B) down; left C) down; right D) up; left

12) What is the correct condensed structural formula for this skeletal structure? 12) A

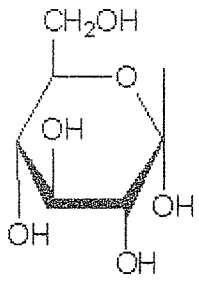
A) $CH_3(CH_2)_7CH_3$
B) $CH_3(CH_2)_8CH_3$
C) $CH_3(CH_2)_6CH_3$
D) $CH_3(CH_2)_5CH_3$

13) Which of the following is a pyranose ring? 13) B

A)



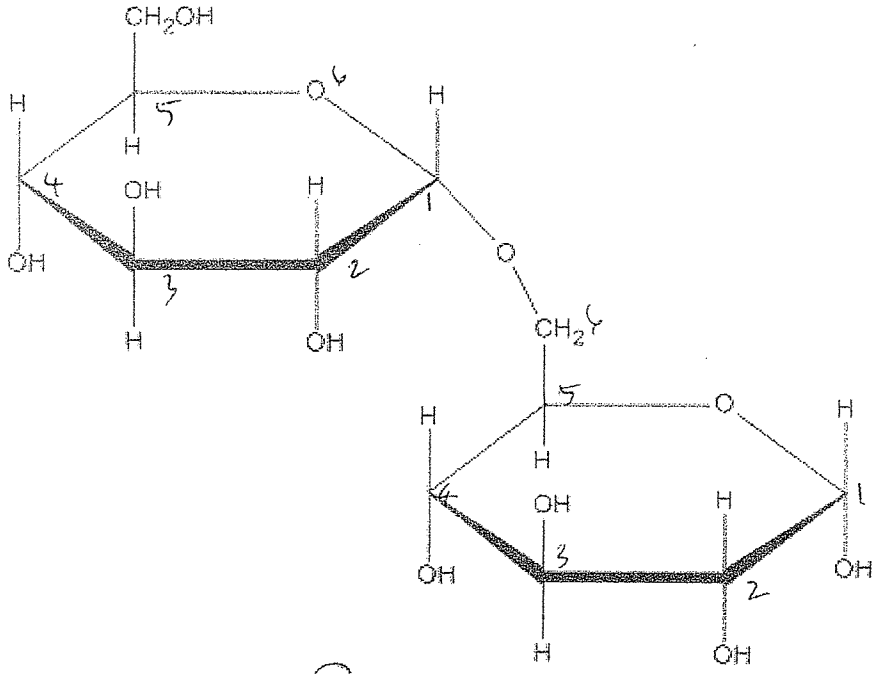
B)



C) Both of these are pyranose rings.

D) Neither of these is a pyranose ring.

14) What type of glycosidic bond is shown here? 14) B



A) α(1–4) B) α(1–6) C) β(1–6) D) β(1–4)

15) Which of the following occurs when a monosaccharide is converted to an amino sugar? 15) A

A) An amino group replaces a hydroxyl group.
B) Any of the above, it depends on the identity of the monosaccharide.
C) An amino group replaces an aldehyde carbonyl.
D) An amino group replaces a ketone carbonyl.

Part II: Short Answers (36 pts)

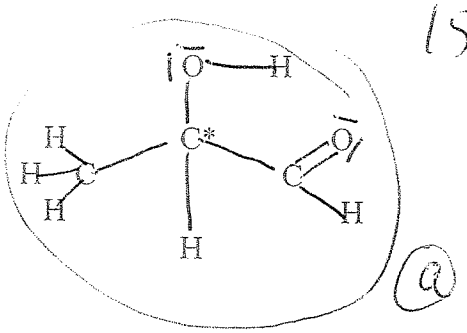
1. (total pts 12) (a) Given the following formula, calculate the number of valence electrons for the molecule. Show work. (6 pts) $C_3H_6O_2$

$3(4e^-) + 6(1e^-) + 2(6e^-) = 30$

C: 1pt; H: 2pt; O: 2pt; + 1/2 each part pts

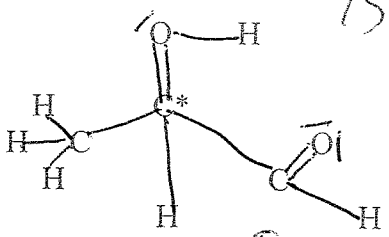
(b) Given the following 2 Lewis Dot structures (for the formula above), circle the correct one. (4 pts)

$15 \times 2 = 30\ e^-$



(a)

$15 \times 2 = 30\ e^-$



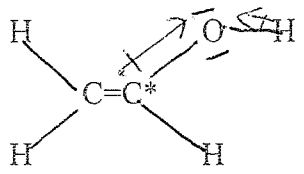
(b)

(c) Explain one reason why the Lewis Dot structure which you did not choose is INCORRECT. (2 pts)

(b) has C with expanded octet

C is in period 2 - only period 3 + higher can expand octet

2. VSEPRT: Given the Lewis Dot structure below complete the following.



a) What is the number of electron domains (VSEPRT electron pairs).around the atom with the * 3
(2 pts each, 12 pts total)

b) How many lone pairs on the atom with the * 0

c) What is the structure of the electron pairs at the atom with the * trigonal planar

d) What is the structure of the molecule at the * trigonal planar

e) Draw in dipole moment arrows in the Lewis Dot structure which you chose above in (2b).

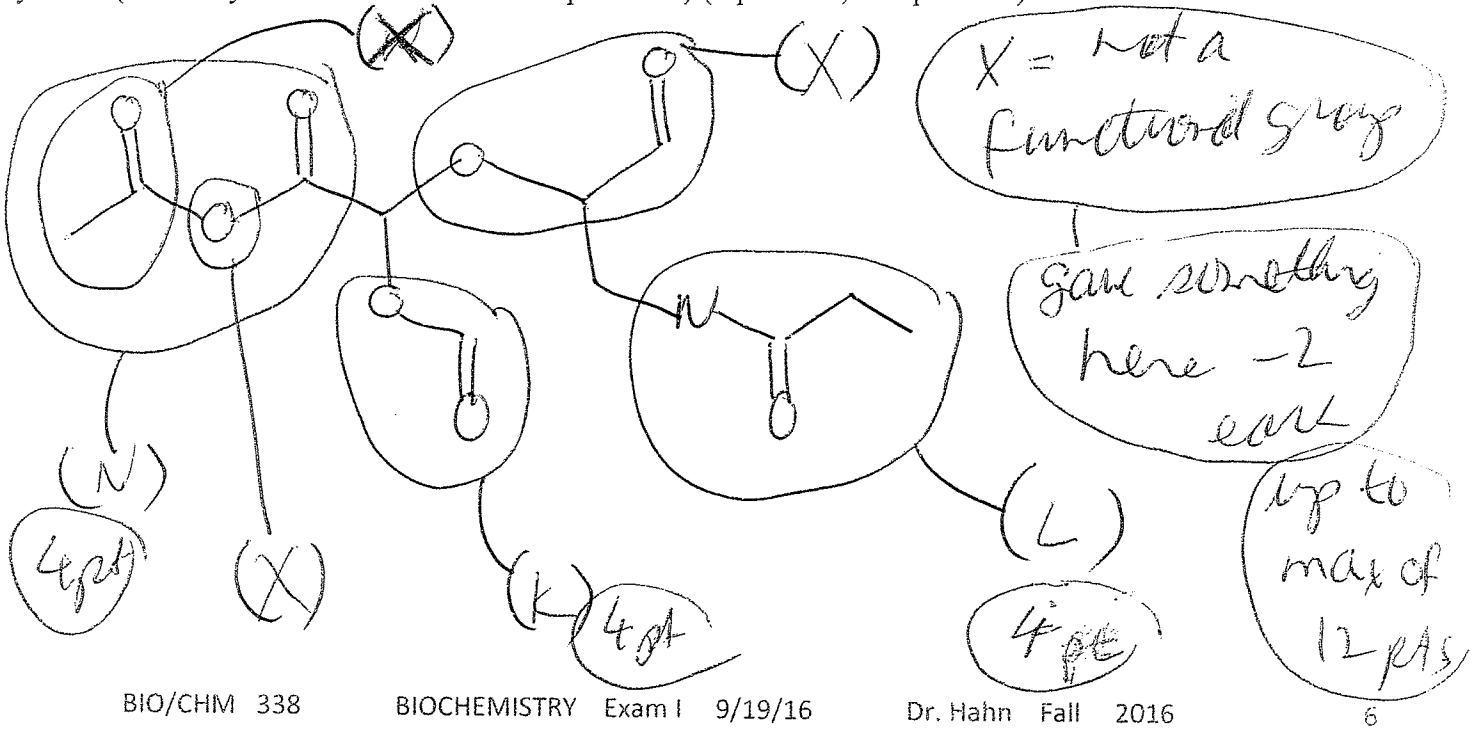
f) Name the intermolecular force for the molecule which you chose above in (2b).

H bonding

graded consistent w/ 2b

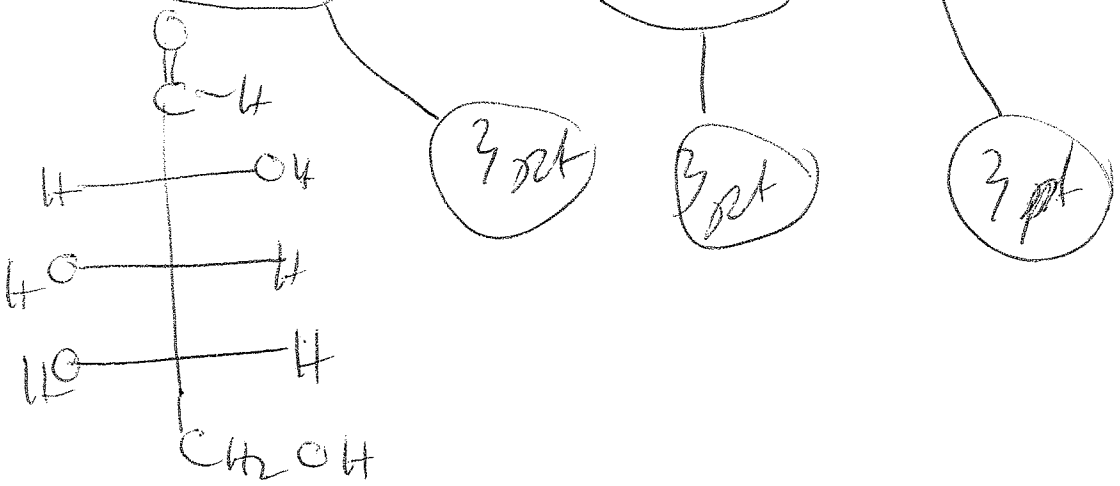
3. Given the following molecule, fill in the parenthesis with the letter of the functional group.

(A) alkene (B) alkyne (C) arene (D) alkyl halide (E) alcohol (F) ether (G) amine (H) aldehyde (I) ketone (J) carboxylic acid (K) ester (L) amide (M) acid halide (N) acid anhydride (You may use the same letter multiple times) (4 pts each, 12 pts total)

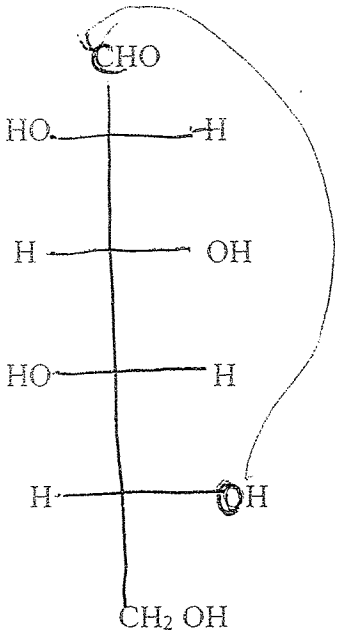


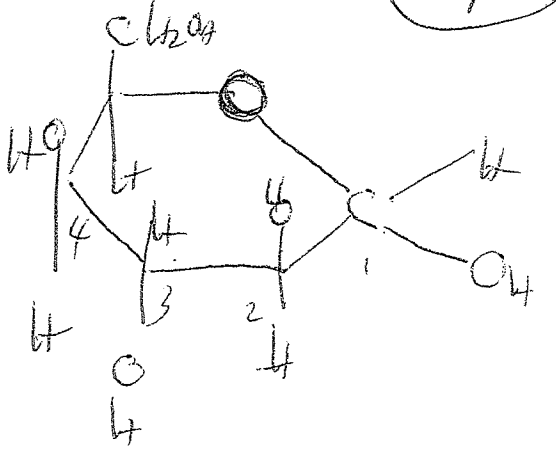
Part III: Long Answers (34 pts)

1. Draw any 5 carbon aldose monosaccharide as an L orientation Fisher projection formula. (10 pts)



2. a. Cyclize the following Fisher to the α form of the pyranose as a Haworth formula.. (10 pts)



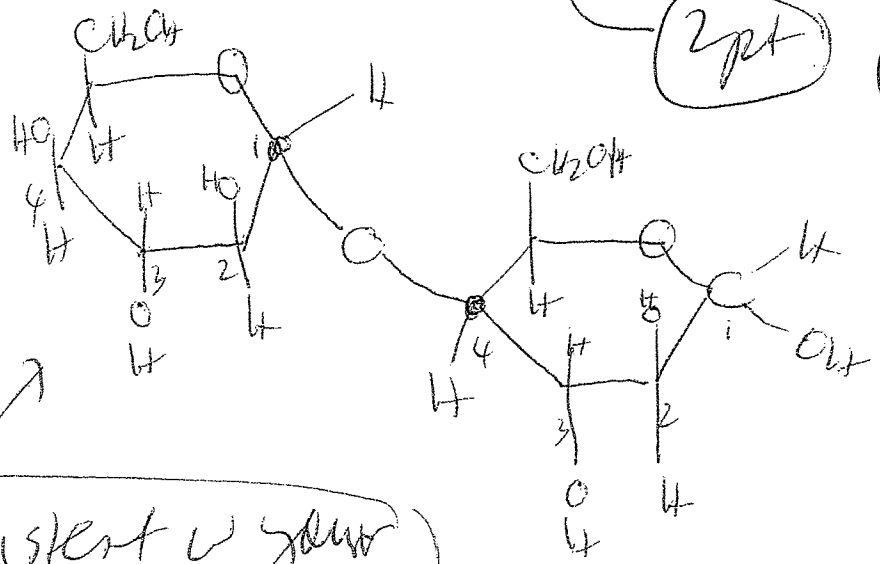


-2pt

each C wrong -1pt

BA -4pt

b. Draw a disaccharide showing an α 1,4 glycosidic link between the sugar in part (2 a) with itself (7 pts)



2pt

not 2 -2pt

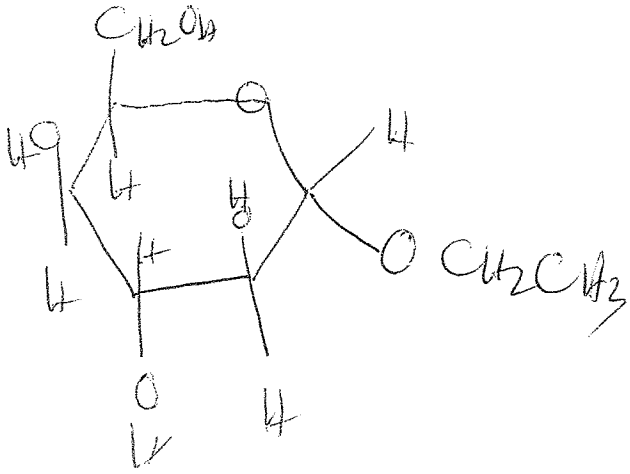
not 1,4 -2

Consistent w your # @ OK. no pts off for structure here

BA -3 1/2

c. What is the product of the cyclized sugar above in (2 a) with ethanol ($CH_3CH_2\text{-}OH$) (10 pts) (7 pts)

(draw the structure)



1 pt each C

Consistant w your @ base sugar drawing

-10 pts off

BA - 3 pts

identical to your own @ or (b) - no points counted as not attempted