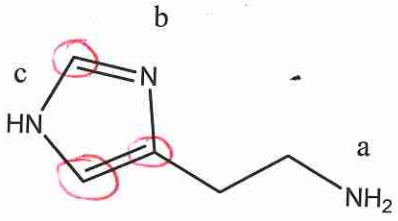
Organic 211 Test # 1 (A1, B1) September 3, 2020

Name:_____

1) Given below is the free base of histamine with the amines labeled. Use the drawing for the following questions. The pKa values for protonated a is 9.5. The pKa value for either protonated b or protonated c (you have to choose) is 6.0. (4 pts. each)



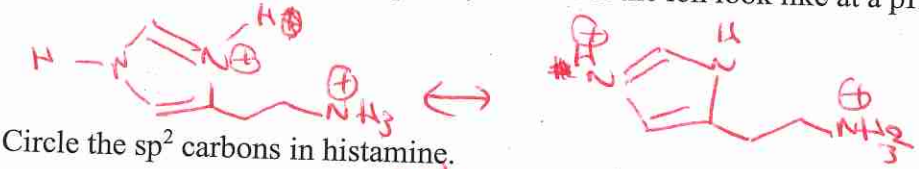
a) Give the ion formed at a pH of 12.0

as above (no amine protonated)

b) Which amine, b or c, would be the amine that would be protonated first after a protonates)? Explain your answer.

if given an atom with a double bond and single bond to the same carbon (b + c) add to the doubly bound atom (b!) due to more resonance structures of the conjugate acid.

c) Using the amine you chose in part b, what does the ion look like at a pH of 4.5?



d) Circle the sp^2 carbons in histamine.

See above! 3 sp^2 carbons!

3 – 4 pts
4 – 3 pts
5 – 2 pts
6 – 1 pts.

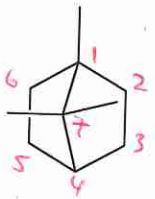
e) How many degrees of unsaturation does histamine have?

3° (two double bonds and a ring)

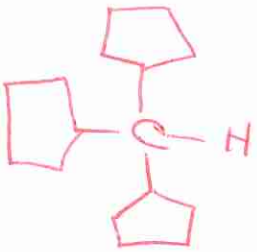
2) Give the name if given the structure or the structure if given the name for the following molecles. (4 pts. each)

a) 6-ethyl-5-isopropyl-2,4-dimethyloctane

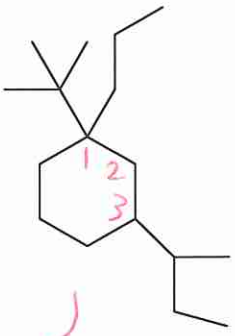
b)



1,7,7-trimethylbicyclo[2.2.1]



c)Tricyclopentylmethane



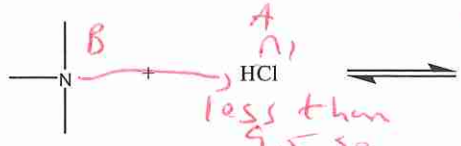
d)

3-sec-butyl-1-tert-butyl-1-n-propylcyclohexane

3) Work the following three reactions. If the equilibrium lies toward the reactants, draw the products and write Keq <1. If the equilibrium lies toward the products, draw the products and write Keq > 1. If no reaction is possible, indicate this fact. (4 pts. each)

a) 

Keq > 1

b) 

less than 9.5 so more acidic

Keq > 1

c) 

Keq < 1

4) Do electrons "resonate" between different resonance contributors? (4 pts.)

electrons do not resonate between contributors. Lewis Dot Structures make us localize electrons even though they are delocalized. The actual molecule is a resonance hybrid.

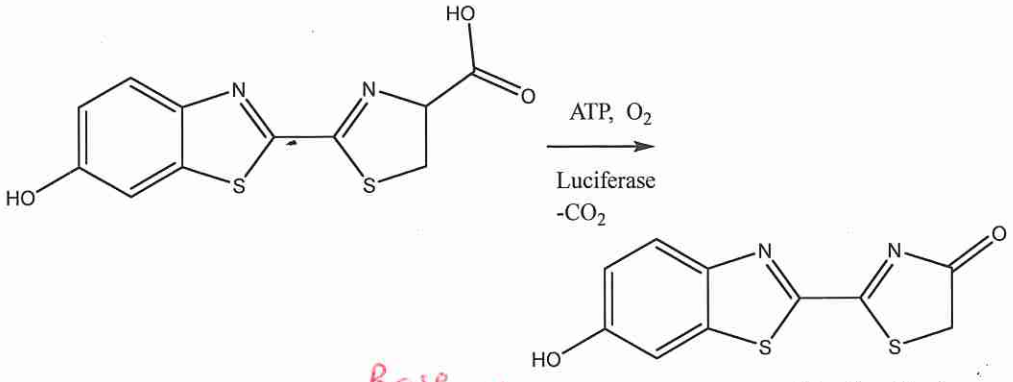
5) Give two reasons why a carboxylic acid is more acidic than an alcohol. (4 pts.)

resonance and induction.

6) Which is the stronger acid, H_2O or H_2S? Explain. (4 pts.)

H_2S is more acidic (∴ stronger). Bond strength of atom to H decreases as you go down periodic table. This makes proton easier to remove so more acidic.

7) Bioluminescence in fireflies is a result of the conversion of chemical energy (in ATP) to light energy. Specifically, ATP, O_2, and enzyme luciferase cause luciferin (~ 9 mg can be collected from about 15,000 fireflies) to be oxidatively decarboxylated to an electronically excited oxyluciferin. Relaxation of the latter to its ground state is accompanied by the emission of light. Draw the two resonance structures of the conjugate base of oxyluciferin in which either oxygen bears the negative charge. (5 pts.)



Oxyluciferin

Base

8) You need 300. mLs of a 5.00 M solution of histidine (a solid) in water. How much histidine would you add? How much water? SHOW YOUR WORK. (5 pts.)

should read histamine.

bad question!

9) a) How many degrees of unsaturation does a molecule with a molecular formula $C_{19}H_{30}O_5$ contain? SHOW YOUR WORK. (4 pts.)

$C_{19}H_{30}O_5$ translates to

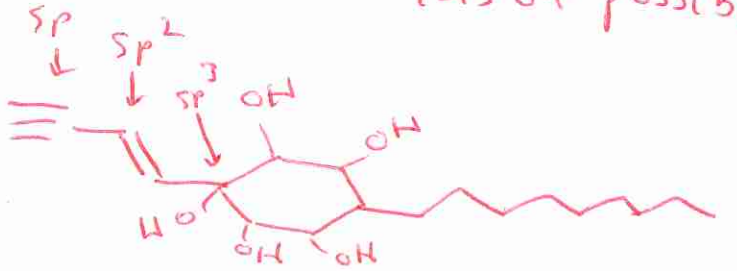
$C_{19}H_{40}$

$C_{19}H_{30}$

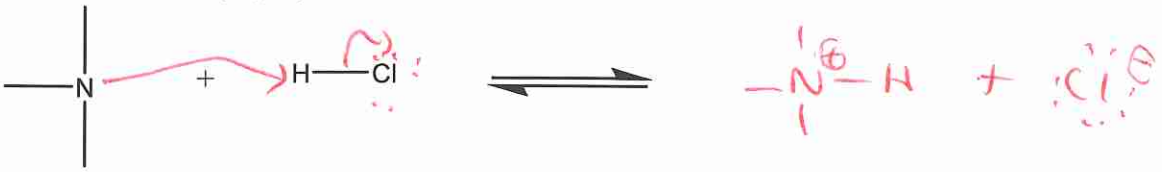
$10/2 =$ 5°

b) Give a molecule that contains the molecular formula $C_{19}H_{30}O_5$ and has an sp carbon, an sp^2 carbon and a sp^3 carbon. (4 pts.)

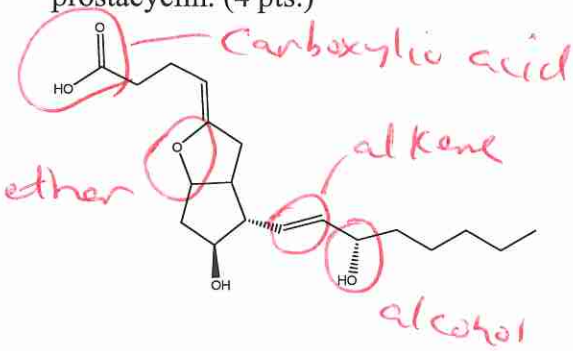
lots of possibilities



10) Push the arrows for the following reaction to indicate how the conjugate base and conjugate acid are formed. (4 pts.)



11) Prostacyclin (below) is a platelet aggregation inhibitor. Identify four functional groups inside prostacyclin. (4 pts.)



12) Draw a Lewis Dot structure for CH_2N_2. Show your work. (5 pts.)

C 1 X 4 = 4
H 2 X 1 = 2
N 2 X 5 = 10
16 electrons

13) Put the following molecules in order of boiling point. (lowest boiling point = 1) (4 pts.)

n-pentane	neopentane	isopentane	n -heptane
3	1	2	4

14) Give something that you studied that was not asked on this test. (5 pts.)