name (LAST NAME IN CAPITALS, then first name): _____

MEZL'S PART, ANSWERS ARE ON THE END number : _____

BCH 2333A AND BCH2333B

FINAL EXAM

20 April 2011

Professors: Bennett, Mezl, Poitras

Length : 3 hours

Material needed: A computer answer sheet
This exam

CLOSED BOOK EXAM

NO MODELS ALLOWED

Faculty of Science approved calculators permitted.

INSTRUCTIONS

Part A Answer **ONE** of the two A numbered questions directly on the exam (10 % of grade)

Part B (60%) Choose the **BEST** answer for each of the **60 multiple choice questions** and fill it in on the computer answer sheet

Part C (10 %) Answer **ONE** of the two C numbered questions directly on the exam

Part D (10 %) Answer **ONE** of the two D numbered questions directly on the exam

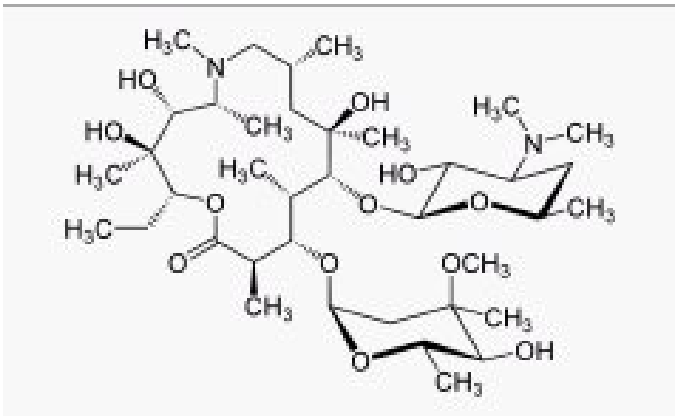
Part E (10 %) Answer **ONE** more essay question (either A, C or D)

EXTRA QUESTIONS WILL NOT BE CORRECTED

AT THE END: - Check that your name and student number are on the computer sheet **and on the exam.**

Question A1

The structure on the right is the antibiotic Azithromycin.
Use words to describe the two sugar rings on the right of the big ring an unambiguous manner.
Don't worry about the configurations at the big ring on the left but do state the type of bond the little sugars make with the ring.
The big ring on the left has an O in it.
What type of bond is this?



Question A2

1) Draw, as 3'-phosphates, a G-C base pair in Watson-Crick DNA. In addition to the hydrogen bonds, your figure should show the configuration at each position of the sugar and ALL the atoms and double bonds of the bases. 2) Use your figure to explain the relative position of the next base pair that would be found above the one that you have drawn (No drawing of this base pair is necessary). 3) Draw the enol form of guanine.

1.When CO_2 is reduced by plants the reducing groups come from

A) H_2O B) O_2 C) sunlight
D) ATP E) Lipids in the chloroplast membrane

2.Which of the following is approximately equal to the osmotic pressure in your cells ?

A) 30 mM KCl B) 60 mM KCl C) 100 mM KCl D) 150 mM KCl E) 300 mM KCl

3.The dielectric constant is ..... to the dipole moment.

A) related B) inversely related
C) proportional D) inversely proportional
E) not related

4. At pH 10, the ratio of H^+ to OH^- is about: :

A) 1 / 10,000 B) 1 / 100,000 C) 1 / 1,000,000 D) 1 / 10,000,000 E) 1 / 100,000,000

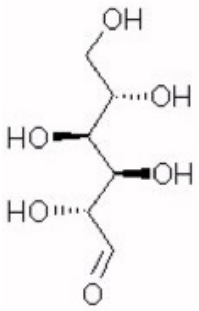
5.A weak acid, called Testic acid is in solution. The pH is 4. The concentration of Testate is 0.1 mM. The concentration of Testic acid is 100 mM. What is the dissociation constant?

A) $1\ 10^{-3}$ B) $2\ 10^{-4}$ C) $1\ 10^{-5}$ D) $2\ 10^{-6}$ E) $1\ 10^{-7}$

6.A 1 L solution contains a 30 mM pH7 buffer. The pK of the weak acid is 7. You add 5 mL of 1 M base. The new pH is about :

A) 6.7 B) 7.15 C) 7.3 D) 7.45 E) 7.6

7.This structure is:



A) D-Glucose
B) D-Mannose
C) L-Mannose
D) An L sugar but not one to know by heart
E) A D sugar but not one to know by heart

8.The key difference between amylopectin and glycogen is the:

A) anomer used
B) bond that makes the branches
C) spacing of the branches
D) types of sugar used
E) conformation of the sugar dimer that is the subunit

9.Penicillin inhibits the synthesis of

A) protein B) RNA C) DNA
D) the cell wall E) a storage form of carbohydrate

10.A histone is

A) an amino acid found in collagen
B) a key sugar in photosynthesis
C) a key enzyme in lipid metabolism
D) a protein associated with DNA
E) a mucopolysaccharide that prevents blood coagulation

11.Visible light has a wavelength between

A) 100 - 400 nm B) 200- 600 nm C) 400-700 nm
D) 600-1000nm E) 800 nm-1.2 μm

12.A box is 155 cm long, 95 cm wide and 20cm thick. If it was entirely full of water it would weigh about :

A) 30 kg B) 300kg C) 600 kg D) 1.5 t E) 3 t

13.Sorbitol is

A) glucose reduced at C1
B) glucose oxidized at C1
C) glucose linked to galactose
D) glucose linked to fructose
E) a non reducing storage form of sugar found in plants

14.This element gives a negative charge to some mucopolysacharides :

A) P B) Cl C) I D) N E) S

15.A lactone is

A) more reduced than an aldehyde
B) an ester
C) a molecule that contains an aldehyde group linked to an alcohol group
D) a molecule that contains an aldehyde group linked to two alcohol groups
E) a hidden ketone

16.Hydrogen bonds that join the bases in Watson-Crick DNA:

A) O-H···N B) N-H···N C) O-H···O
D) A and B E) A, B and C

17.When you heat a solution of mRNA to a denaturing temperature it has an absorbance of 0.5 When you let it cool down the absorbance will be about

A) 0.8 B) 0.6 C) 0.5 D) 0.4 E) 0.2

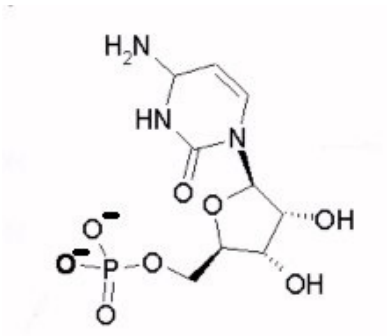
18.For a piece of your DNA that is 1000 base pairs long, the linkage number is :

A) 120 B) 110 C) 100 D) 90 E) 80

19. 28S and 18S are

A) limiting substrate concentrations on the Michaelis-Menten curve
B) lipids
C) rRNAs
D) important double bonds on lipids
E) important sugars in photosynthesis

20. A book shows this structure for CMP:



A) The structure is right
B) A configuration on the sugar is wrong
C) The base is too reduced
D) The base has the wrong substituents
E) The structure of the phosphate is wrong

21. .... has a methyl group.

A) Adenine B) Cytosine C) Guanine D) Thymine E) Uracil

22.In DNA, for the sugar, the ratio of β-anomer to α-anomer is about:

A) 1 : 0 B) 3 :1 C) 1 :1 D) 1 : 3 E) 0 : 1

23.The enol form of guanine has ..... double bonds.

A) 1 B) 2 C) 3 D) 4 E) 5

24. ..... is a nucleoside

A) Adenine B) Cytosine C) Guanine D) Thymidine E) Uracil

25.If you took all the DNA in 10^5 of your cells and stretched it out as a Watson Crick helix it would stretch about :

A) 9 km (Height of Mont Everest) B) 300 km (earth to orbit)
C) 10,000 km (North pole to equator) D) 400,000 km (earth to moon distance)
E) 50,000,000 km (earth to Venus)

26.The amount of DNA in your average chromosome is about ..... base pairs.

A) $600\ 10^6$ B) $150\ 10^6$ C) $50\ 10^6$ D) $20\ 10^6$ E) $8\ 10^6$

27.A ..... analysis will allow you to see if a gene is expressed equally in two tissues

A) Northern blot B) Southern blot C) restriction enzyme
D) melting curve E) hyperchromic shift

28.Ethidium bromide:

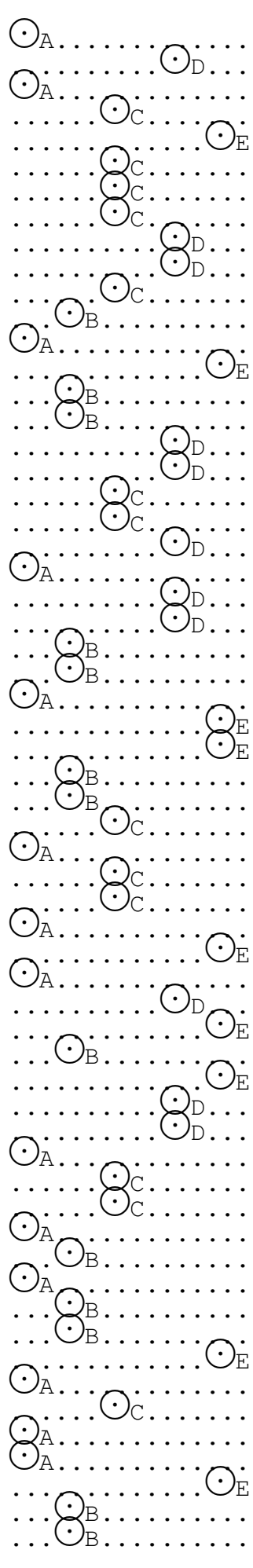
A) cuts a sugar between two adjacent OHs
B) classifies sugars as reducing sugars or non reducing sugars
C) is a reagent to visualize unsaturated fatty acids
D) is a reagent to visualize proteins
E) is a reagent to visualize nucleic acids

29.You acidify a sample that contains both DNA and RNA.

A) The acid will hydrolyze the DNA
B) The acid will hydrolyze the RNA
C) The RNA will precipitate and the DNA will remain in solution .
D) The DNA will precipitate and the RNA will remain in solution .
E) The RNA and the DNA will precipitate.

30.The B structure of DNA has two grooves while the Z structure has only one groove. This difference can be explained by the fact that in Z DNA :

A) the nucleotides are held together by a 5'-2' bond
B) the bases are towards one side of the axis of the helix
C) the phosphates are towards one side of the axis of the helix
D) the phosphates fill the area that would have been the minor groove
E) the sugars fill the area that would have been the minor groove



10-10/ 10-4
10-4 * 10-4/0.1
pH= 7 + log [(15+5)/(15-5)]
oosL

a mattress! 1.5 x 1 x 0.2= 0.3m3= 0.3 t
= 300kg

=0.5 - about 30%
(1000/10)+(-2 x 1000/200)=

0.3 10-9 m/bp x 6 10*9 bp =2m/cell   x
10*5= 200 000m

\1feAnsShtwComs 110420

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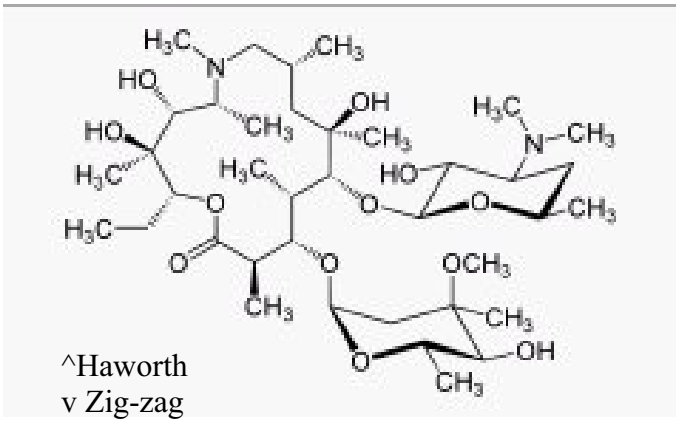
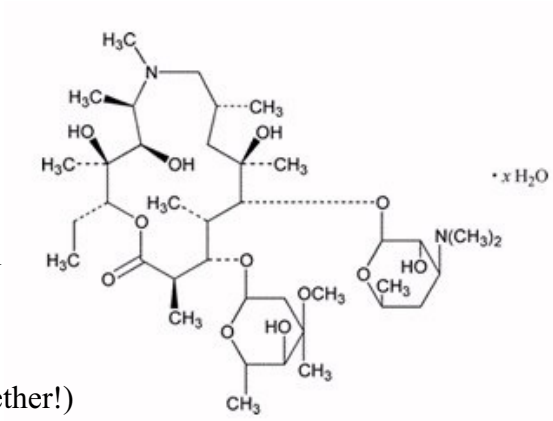


^Haworth
v Zig-zag

The big ring on the left has an O in it.
What type of bond is this?

	top ring	bottom ring
.5 (for both rings)	aldo-	aldo-
.5 (for both rings)	hexose	hexose.
.5 (for both rings)	pyranose	pyranose
.5 (for both rings)	glycoside	glycoside bond
1	D	L
0.5	β*	α
1	C2= right, C3=left	C4= left, C4=left
.5	C2= dimethylamine	C3= methoxy AND methyl
.5	C4 & C6= deoxy	C2 & C6= deoxy
5.5 = total-top		3.5 total bottom



1 for saying bond in big ring is lactone (0 & -0.5 if they say ether!)

accept configurations given as same/op or D/L
top= β, same, opposite, D or β,D,L,D, etc
* only 0.25 if correct config is given w/o saying type of anomer
Bottom Line for structures: if their VERBAL description is good enough so that somebody else in this class could draw it from the description, give them at least 6/9 for structures (assuming no stupidities...)

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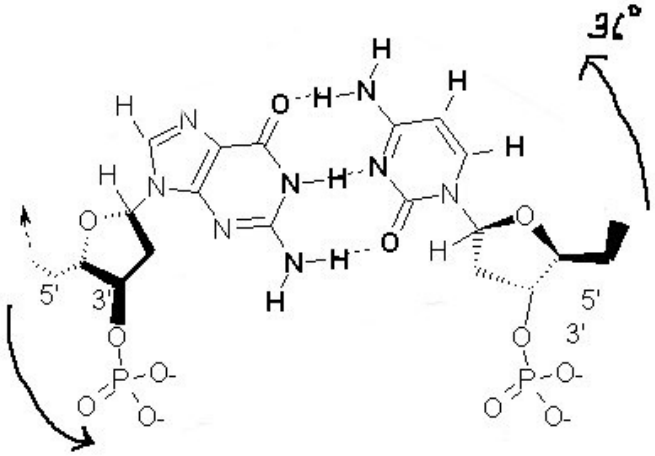

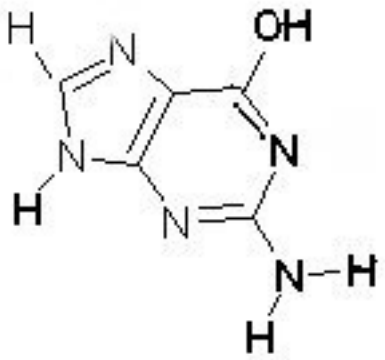

Principle: One of the bases can be drawn in the standard presentation- the other has to be flipped over. Student does not have to draw sugars in perspective or give numbering

2 for G	1 for just atoms of base, 0.5 for Hs (missing these is the most common error, 0.5 for double bonds
2 for C	1 for just atoms of base, 0.5 for Hs (common error), 0.5 for double bonds
1.5 for H bonds	0.5/each. only 1 if orientation of H bonds is wrong -1 for every really stupid hydrogen bond!

give only 1 of the 1.5 marks for drawing negligence that shows : $O^{\cdots}NH_2$, -0.4 if just 1 bond is like this

1.5 sugar (0.5 ring, 0.5 configurations, 0.5 attachment to base- Anomeric bond must be β
-0.5 if C5 of sugar missing, -0.5 if sugar is ribose, 0 if sugar is creative

1.0 for phosphate (0.5 for structure, 0.5 attachment point to sugar)
we will accept diesters, i.e, one charge is replaced w bond to next sugar...
-0.3 If gives both 5' and 3' p

1 part 2: anything that SHOWS about 36 +/-10 degrees or states it. No penalty for direction of turn. Bonus of +0.5 if they get into this and do nice explanation. Only 0.7/1: If they say it but don't use figure at all! If they are verbal yet not semi-quantitative, ("slightly twisted, slightly rotated") or badly wrong on angle give 0.6/1. If they say directly above, don't give this mark. No marks for extensive discussions of bonding - question asked for position!

1 part 3: 0.5 for the double bond, 0.5 for the OH (H must go from the N to the O to get this 0.5) No penalty for other missing hydrogens or if they draw guanosine instead, but all double bonds must be visible. View that they draw (if flipped over) is not important. 0 if other OHs appear..

10 = total

Special cases : total stupidity in terms of putting together a base pair. Give only 3/10 for whole question even if basic structures are right, i.e., the ones that draw a GC chain!

H-bonds are perfect but one phosphate joins together sugars of G and C! Give 4/10 max!