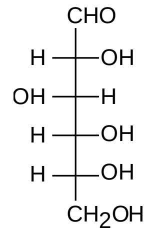
Chem 250 **Answer Key** In-class Quiz #3v2

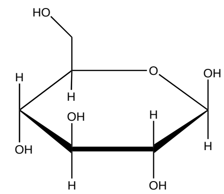
This exam is composed of **20** questions. Please scan them all before starting.

As discussed in the course syllabus, honesty and integrity are absolute essentials for this class. In fairness to others, dishonest behavior will be dealt with to the full extent of University regulations.

I hereby state that all answers on this exam are my own and that I have neither gained unfairly from others nor have I assisted others in obtaining an unfair advantage on this exam.



D-glucose



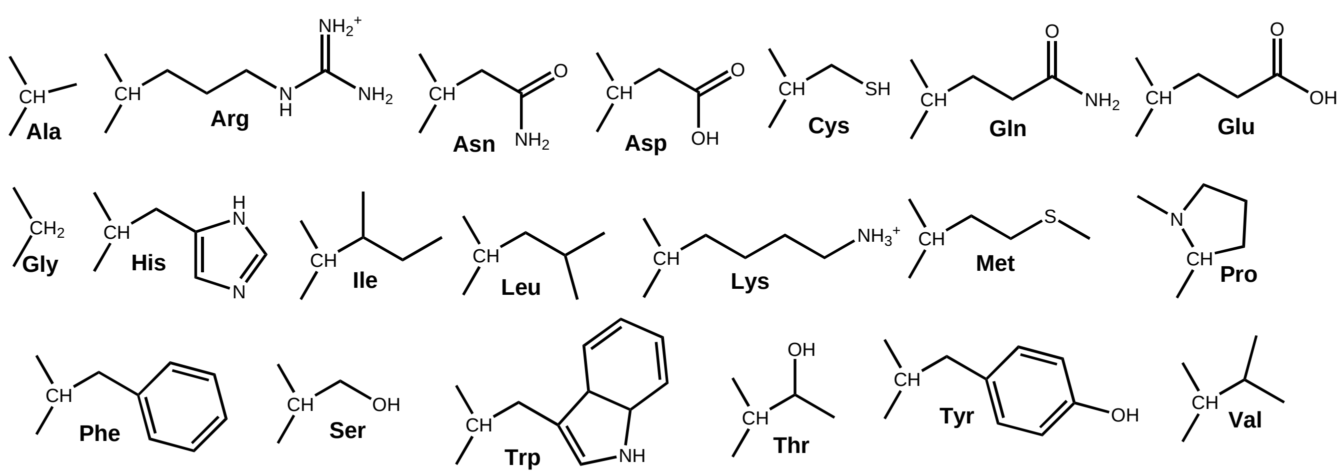
β-D-Glucose

______________________________________ ..

Signature

PERIODIC TABLE OF THE ELEMENTS

1A	2A	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	3A	4A	5A	6A	7A	8A
1 **H** 1.008																	2 **He** 4.003
3 **Li** 6.939	4 **Be** 9.012											5 **B** 10.81	6 **C** 12.01	7 **N** 14.01	8 **O** 16.00	9 **F** 19.00	10 **Ne** 20.18
11 **Na** 22.99	12 **Mg** 24.31											13 **Al** 26.98	14 **Si** 28.09	15 **P** 30.97	16 **S** 32.07	17 **Cl** 35.45	18 **Ar** 39.95
19 **K** 39.10	20 **Ca** 40.08	21 **Sc** 44.96	22 **Ti** 47.90	23 **V** 50.94	24 **Cr** 52.00	25 **Mn** 54.94	26 **Fe** 55.85	27 **Co** 58.93	28 **Ni** 58.71	29 **Cu** 63.55	30 **Zn** 65.39	31 **Ga** 69.72	32 **Ge** 72.61	33 **As** 74.92	34 **Se** 78.96	35 **Br** 79.90	36 **Kr** 83.80
37 **Rb** 85.47	38 **Sr** 87.62	39 **Y** 88.91	40 **Zr** 91.22	41 **Nb** 92.91	42 **Mo** 95.94	43 **Tc** (99)	44 **Ru** 101.1	45 **Rh** 102.9	46 **Pd** 106.4	47 **Ag** 107.9	48 **Cd** 112.4	49 **In** 114.8	50 **Sn** 118.7	51 **Sb** 121.8	52 **Te** 127.6	53 **I** 126.9	54 **Xe** 131.3
55 **Cs** 132.9	56 **Ba** 137.3	57 **La** 138.9	72 **Hf** 178.5	73 **Ta** 181.0	74 **W** 183.8	75 **Re** 186.2	76 **Os** 190.2	77 **Ir** 192.2	78 **Pt** 195.1	79 **Au** 197.0	80 **Hg** 200.6	81 **Tl** 204.4	82 **Pb** 207.2	83 **Bi** 209.0	84 **Po** (209)	85 **At** (210)	86 **Rn** (222)
87 **Fr** (223)	88 **Ra** 226.0	89 **Ac** 227.0	104 **Unq** (261)	105 **Unp** (262)	106 **Unh** (263)	107 **Uns** (262)	108 **Uno** (265)	109 **Une** (266)									



1. (5 points) Which of the following amino acids is best described as polar?

   1) Arg 2) Lys 3) Asn 4) Leu 5) Phe

   (3) Chptr 22 – the structures are on the first page, evaluate them!

2. (5 points) Which of the following amino acids is most likely to be found in the interior of a protein?

   1) Val 2) Lys 3) Asn 4) Arg 5) Ser

   (1) Chptr 22 – which is nonpolar?

3. (5 points) Which amino acid most restricts the configuration of a peptide backbone?

   1) Arg 2) Asp 3) Gly 4) Pro 5) Ile

   (4) the backbone N is linked in a ring structure, limiting rotation. Chptr 22

4. (5 points) Quaternary structure refers to

   1) covalent modifications of a protein
   2) the association of individually folded peptides
   3) the folding of a peptide into its final structure
   4) four or more amino acids partitioning into the interior of a protein

   (2) basic concept. Chptr 22

5. (5 points) What force is most dominant in driving a protein from an ensemble of unfolded states to a compact globular structure?

   1) hydrophobic collapse 2) hydrogen bonding
   3) disulfide bonding 4) formation of helices
   5) electrostatic attraction between charged amino acid side chains

   (1) Chptr 22– This is a key concept in protein folding. Oil/water et al.

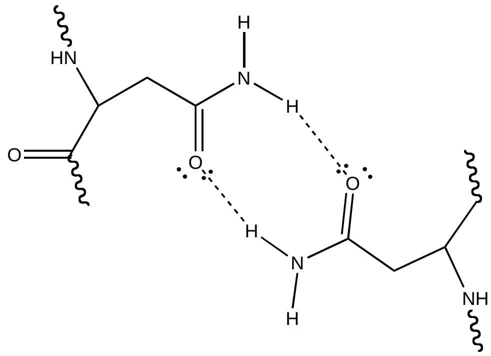
6. (5 points) Which structural element(s) most commonly stabilize polar groups in the interior of a protein (choose the best answer)?

   1) primary structure 2) secondary structure
   3) quaternary structure 4) disulfide bonds
   5) electrostatic interactions

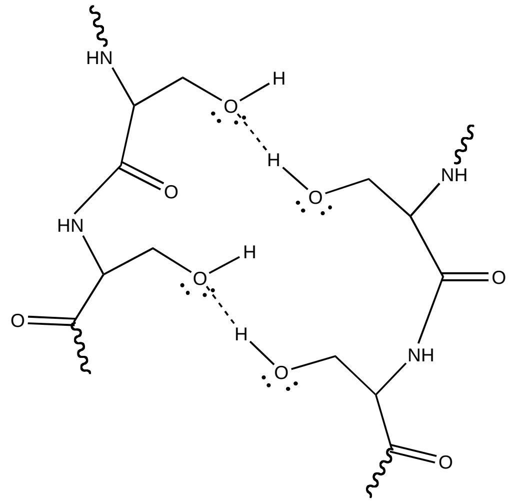
   (2) Chptr 22– This was *the* key concept of secondary structure talked about in class!

7. (5 points) Consider the sets of interactions below

Set #1



Set #2



Which of the above sets of interactions is more stabilizing (lower in energy)?

1) Set #1 2) Set #2 3) they have the same energy

(1) Is lower in energy for two reasons. First, formation of the first H-bond restricts the second severely (in the other set, they are less closely linked structurally). Second, alternate resonance forms, as discussed in class, make for better H-bonds. Chptr 22

8. (5 points) Enzymes increase the rate of reactions by

1) raising the local kinetic energy of the substrate atoms
2) lowering the energy of the transition state of the reaction
3) lowering the energy of the products
4) magic

(2) THE fundamental concept – understand this one! Chptr 23

9. (5 points) You are measuring the rate of an enzyme catalyzed reaction. Addition of increasing amounts of an inhibitor leads, at the highest concentrations of the inhibitor, to complete inhibition of the reaction. The inhibitor is

1) competitive 2) noncompetitive 3) complementary 4) noncomplementary

(1) Chptr 23

10. (5 points) “Lock and key fit” refers to

1) the binding of an activator unlocking an active site

2) the complementary structures of the substrate and an enzyme active site

3) inhibition by an inhibitor complementary in structure to the substrate

4) activation by an allosteric cofactor

(2) Chptr 23

11. (5 points) In the reaction below, “feeback control” refers to:

$$A \xrightarrow{E_1} B \xrightarrow{E_2} C \xrightarrow{E_3} D$$

1) Enzyme E_3 binds to reactant A, preventing its reaction with enzyme E_1

2) Enzyme E_3 is redirected to generate product A, rather than product D

3) Enzyme E_3 binds to and inhibits enzyme E_1

4) Binding of product D to enzyme E_1 inhibits the enzyme

5) Binding of product D to enzyme E_3 inhibits the enzyme

(4) Chptr 23.6. I gave partial credit for (5), although that is more technically called “product inhibiton.” Feeback inhibition works at least one step back in a series of reactions.

12. (5 points) Which process below is NOT used to regulate enzyme networks?

1) proenzyme synthesis 2) feedback inhibition 3) allosteric regulation

4) homeopathic regulation 5) covalent modification of enzymes

(4) Chptr 23.6

13. (5 points) Which of the following is a correct statement describing the induced-fit model of enzyme action:

Substrates fit into the active site:

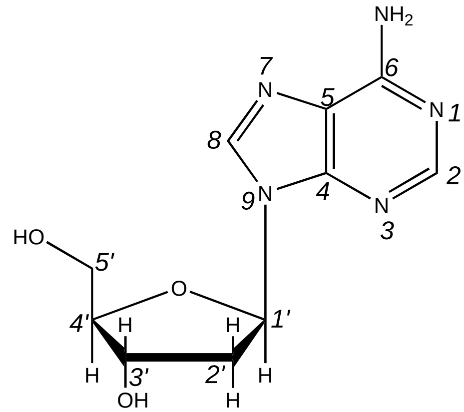
1) because both are exactly the same size and shape

2) by changing their size and shape to match those of the active site

3) by changing the size and shape of the active site upon binding

(3) Chptr 23 (OWL and problem 23.25)

14. (5 points) In adenosine, shown at right, which of the following sugar centers are chiral (note that the sugar atoms are labeled *n'*, while the base atoms are labeled *n*).



1) 1', 2', 3', 4', and 5'
2) 1', 2', 3', 4', and 5'
3) 1', 3', 4', and 5'
4) 1', 3', and 4'
5) 1', 2', 3', and 4'

(4) Chptr 24, 20 and Gen Chem

Identify where C's are. Then remember to fill in H's to complete C's octet. Then ask, are there 4 *different* atoms connected to each C? Yes, for only 1', 3', and 4'. This was on Exam 2!

15. (5 points) Which of the following atoms in adenosine are sp^2 hybridized?

1) 1', 2', 3', 4', and 5'
2) 1', 2', 3', and 4'
3) 1 through 9
4) 1 through 8
5) 1 through 9 and 5'

(3) Chptr 24, 20 and Gen Chem

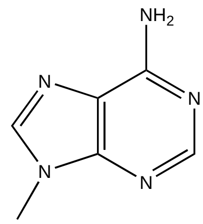
From the last question, you hopefully figured out that the sugar carbons all have four atoms attached. Therefore they are all sp^3. Remember that the ring has resonance forms and that we talked about how the entire ring is flat. This was also on Exam 2!

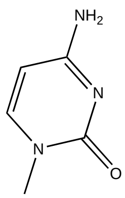
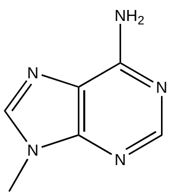
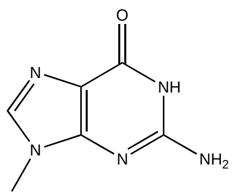
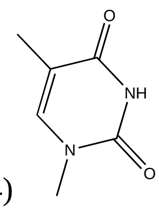
16. (5 points) What is the course number of this class?

1) 111
2) 250
3) 496
4) 728

(2)

17. (5 points) Consider the base at right. With which of the following bases below will it form the lowest energy base pair?

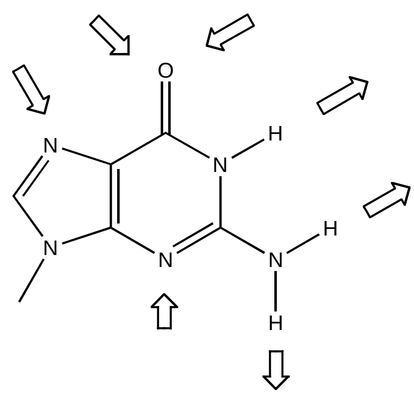


1)  2)  3)  4) 

(4) Chptr 24. Draw the arrows and look for at least a "two-fer" set of interactions. (4) is the partner in normal duplex DNA, but other answers were acceptable on this one. In retrospect, this question was easier than I had intended…

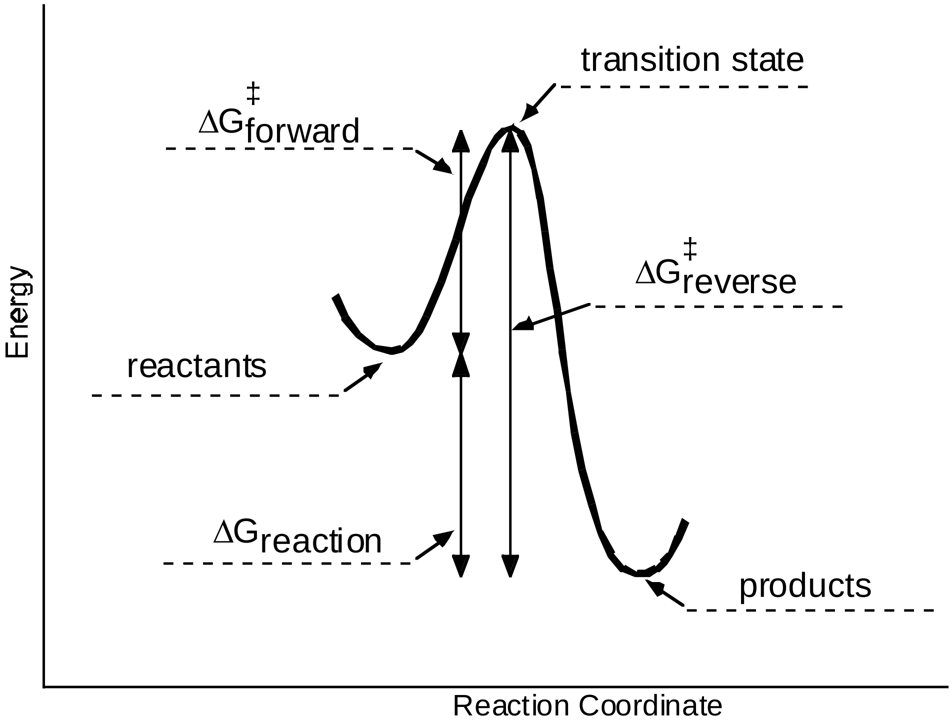
**** Answer questions 18-20 directly on this sheet, in the spaces provided ****

18. (5 points) In the molecule at right, using arrows, mark each of the hydrogen bond donors (pointing out) and hydrogen bond acceptors (pointing in).



Chptr 24. Answer is above. You should be able to do this for any base, even unnatural ones you haven't seen before!

19. (5 points) Shown below is the reaction coordinate diagram for thermodynamically favorable, enzyme-catalyzed reaction. Briefly (one or two words) describe each of the indicated items. Place your answers, from the list at right, clearly on the dotted lines.



reactants

products

transition state

$\Delta G_{reaction}$

$\Delta G^{\ddagger}_{forward}$

$\Delta G^{\ddagger}_{reverse}$

Chptr 23. Answers above.

20. (5 points) In 15 words or less, explain why adenosine and thymine form stable base pairs in a DNA duplex, but do not pair when in solution as isolated nucleotides.

Two bases coming together in solution have no way to bury their hydrophobic faces.

Longer explanation: remember that H-bonding is mostly “a wash.” The bases would just as happily H-bond with water as with each other. It’s only the added benefit of hydrophobic face burial that makes base pairing within a helix a net favorable interaction.