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.

__________________________  .
Signature

PERIODIC TABLE OF THE ELEMENTS

1A 2A 3B 4B 5B 6B 7B 8B 8B 1B 2B 3A 4A 5A 6A 7A 8A

1 2

1 H 1.008

3 Li 4 Be 6.939 9.012

11 Na 12 Mg 22.99 24.31

19 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)

22 H 4.003

5 B 6 C 7 N 8 O 9 F 10 Ne

13 Al 14 Si P S Cl Ar

26.98 28.09 30.97 32.07 35.45 39.95

11 K Ca Sc Ti V Cr Mn Fe Co Ni Cu Zn Ga Ge As Se Br Kr

37 Rb Sr Y Zr Nb Mo Te Ru Rh Pd Ag Cd In Sn Sb Te I Xe

55 Cs Ba La Hf Ta W Re Os Ir Pt Au Hg Tl Pb Bi Po At Rn

87 Fr Ra Ac Unq Unp Unh UnS UnO UnH (223)
1. (5 points) Which of the following amino acids is best described as polar?
   1) Arg  2) Lys  3) Asn  4) Leu  5) Phe

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

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. (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

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

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
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

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

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

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

```
A → B → C → D
```

1) Enzyme E₃ binds to reactant A, preventing its reaction with enzyme E₁
2) Enzyme E₃ is redirected to generate product A, rather than product D
3) Enzyme E₃ binds to and inhibits enzyme E₁
4) Binding of product D to enzyme E₁ inhibits the enzyme
5) Binding of product D to enzyme E₃ inhibits the enzyme

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

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

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’
```
15. (5 points) Which of the following atoms in adenosine are sp<sup>2</sup> 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'

16. (5 points) What is the course number of this class?
   1) 111  
   2) 250  
   3) 496  
   4) 728

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)  

1)  
2)  
3)  
4)  

**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).

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.

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.