Chemistry 116 Name KEY

Martin Larter

Exam 4A Spring, 2013

Page 3 (17 points)

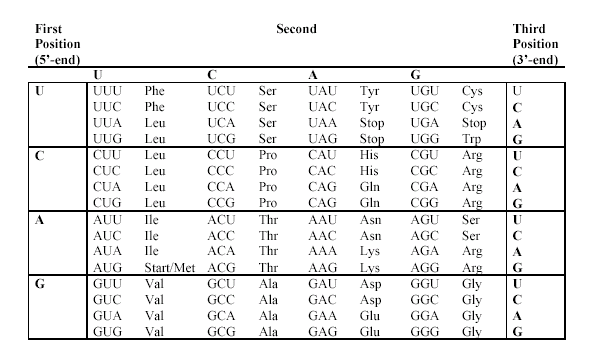
Page 4 (31 points)

Page 5 (22 points)

Page 6 (27 points)

Total (97 points)

Purines Pyrimidines

Grossmont College

Periodic Table

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| IA |  |  |  |  |  |  |  |  |  |  | |  |  |  |  |  | VIIA | NOBLE GASES |
| 1  **H**  1.008 | IIA |  |  |  |  |  |  |  |  |  | |  | IIIA | IVA | VA | VIA | 1  **H**  1.008 | 2  **He**  4.002 |
| 3  **Li**  6.941 | 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**  23.00 | 12  **Mg**  24.30 | IIIB | IVB | VB | VIB | VIIB | VIII VIII VIII | | | | IB | IIB | 13  **Al**  27.00 | 14  **Si**  28.09 | 15  **P**  30.97 | 16  **S**  32.06 | 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**  58.70 | | 29  **Cu**  63.55 | 30  **Zn**  65.38 | 31  **Ga**  69.72 | 32  **Ge**  72.59 | 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**  180.9 | 74  **W**  183.9 | 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  **Rf**  (261) | 105  **Db**  (262) | 106  **Sg**  (263) | 107  **Bh**  (262) | 108  **Hs**  (265) | 109  **Mt**  (266) | 110  **??**  (269) |  | |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 58  **Ce**  140.1 | 59  **Pr**  140.9 | 60  **Nd**  144.2 | 61  **Pm**  (147) | 62  **Sm**  150.4 | 63  **Eu**  152.0 | 64  **Gd**  157.3 | 65  **Tb**  158.9 | 66  **Dy**  162.5 | 67  **Ho**  164.9 | 68  **Er**  167.3 | 69  **Tm**  168.9 | 70  **Yb**  173.0 | 71  **Lu**  175.0 |
| 90  **Th**  232.0 | 91  **Pa**  231.0 | 92  **U**  238.0 | 93  **Np**  (237) | 94  **Pu**  (244) | 95  **Am**  (243) | 96  **Cm**  (247) | 97  **Bk**  (247) | 98  **Cf**  (251) | 99  **Es**  (252) | 100  **Fm**  (257) | 101  **Md**  (258) | 102  **No**  (259) | 103  **Lr**  (260) |

Lanthanide series

Actinide series

1. Draw structures for the following amino acids in the **Fisher form** that show the conditions indicated in parenthesis.
2. (5 pts) D- Glutamic acid (pH is greater than the pI)



1. (3 pts) What is a Zwitterion and how is related to the isoelectric point

Zwitterion is the dipolar form of an amino acid which occurs when H+ ion is transferred from an acid group to an amine group. (A molecule carrying both a positive and a negative charge and thus it has no net charge)

The **isoelectric point** (**pI**), sometimes abbreviated to **IEP**, is the pH at which a particular amino acid carries no net electrical charge.

The isoelectric point is the pH at which the amino acid becomes a Zwitterion

1. (4 pts) How does isopropyl alcohol (rubbing alcohol) act as a disinfectant (denaturing agent) be specific?

The alcohol forms hydrogen bonds with the amino acids of proteins, disrupting their secondary, tertiary and quaternary structures. Isopropyl alcohol disinfects by passing through the cell walls of bacteria, where it denatures their proteins.

1. (2 pts) Identify the secondary structures represented by the following protein structure diagram:

|  |  |  |  |
| --- | --- | --- | --- |
|  | |  |  | | --- | --- | | 1hz6B00 | 🡨 Beta () sheets  🡨 Alpha () helix | |

1. (3 pts) How is a polypeptide held together in an α-helix?

An α-helix is held together by hydrogen bonding between the backbone amide hydrogen in one loop and the backbone carbonyl oxygen on an adjacent loop.

1. (6 pts) Draw a structure for the following tripeptide: Asp-Gly-Thr pH 7



1. (2 pt) Which of the amino acids in the tripeptide above is the C-terminal amino acid? \_\_\_\_\_\_Thr\_\_\_\_\_\_\_\_\_\_
2. (6 pts)Using the attached table of amino acids, **list** **the type of side-chain interaction** expected between each of the following pairs of amino acids.
3. serine and tyrosine \_\_\_\_hydrogen bonding\_\_
4. cysteine and cysteine \_\_\_\_\_\_Disulfide bonds (covalent bond)\_\_\_
5. valine and leucine \_\_\_hydrophobic interactions\_\_\_
6. (9 pts) Explain these three ways that the body can regulate enzyme activity.

**zymogens:** enzyme is produced as an inactive enzyme. When needed, enzyme is activated at location of enzyme’s job

**Allosteric regulation:** enzyme has sites (not the active site) where modulators can bind to enzyme to increase or decrease activity. For example, in feedback regulation

**Feedback Control** a type of allosteric regulation, the product of a series of enzyme reactions deactivates the first enzyme in the sequence

1. (8 pts) First Transcribe from DNA, then translate the resulting mRNA (assume no introns).

DNA: 3’-TTCTACAAAATACATATT-5’

mRNA: 5’-AAG**AUG**UUUUAUGUAUAA-3’

protein: f-met-phe-tyr-val

1. (6 pts) The following reactions are part of the biosynthesis of cholesterol. Inhibition of the first step in this sequence is an effective way of controlling cholesterol levels in the blood. Classify the enzymes that catalyze the reactions A-B from among the list: oxidoreductase, transferase, hydrolase, lyase, isomerase, ligase.



A: \_oxidoreductase\_ B: \_ligase\_\_\_\_\_\_\_\_\_

1. (16 pts) Below is a replication fork of a DNA molecule. Describe DNA replication.



1. Label the leading and lagging strands
2. Name the **three main enzymes** used in replication and their function

**Topoisomerase**: enzymes that regulate the overwinding or underwinding of DNA. DNA becomes overwound ahead of a replication fork. If left unabated, this tension would eventually halt DNA replication.

**DNA Helicase:** DNA helicases are essential during DNA replication because they separate double-stranded DNA into single strands allowing each strand to be copied.

**DNA polymerase:** catalyze the polymerization of deoxynucleotides into DNA. They invariably work in a 5'-3' direction adding deoxynucleotides onto the 3'-OH group.

**Primase** is an enzyme that creates a short RNA sequence, called a primer, on a DNA template strand so that DNA polymerase can make a copy of that DNA strand.

**DNA Ligase** c lose nicks in the phosphodiester backbone of DNA.  Biologically, DNA ligases are essential for the joining of Okazaki fragments during replication,

1. Draw the two new strands of DNA labeling their 3’and 5’ ends correctly’, showing and label primers, Okazaki fragments, and the direction they go using the origin of replication as a referen
2. (6 pts) The optimal temperature for the action of lactate dehydrogenase is 36°C. What happens to the enzyme at 85°C (discuss it activity and structure), What happens to the enzyme at 10°C (discuss it activity and structure)

At lower temperatures, reaction rates are slowed because there is not enough energy available to surpass the activation energy thus not at the maximum overlap of tertiary and quaternary structure. At higher temperatures, the enzyme is denatured and completely loses activity; too much energy breaks the secondary, tertiary and quaternary structure. Thus, activity falls off more quickly above the ideal temperature than below it.

1. (6 pts) Draw the following nucleotide: deoxycytidine 5’-diphosphate



1. (9 pts) What are the three main types of RNA and what are their basic functions?

Ribosomal RNA is the main component of ribosomes, where proteins are synthesized.

Messenger RNA brings the code from DNA in the nucleus to ribosomes in the cytoplasm, to be translated into proteins.

Transfer RNA carries amino acids to the ribosomes for synthesis of proteins.

1. (2 pts) A section of a gene that codes for a protein is called a/an \_\_\_Exon\_\_.
2. (2 pts) Which model of enzyme activity suggests that an enzyme’s active site can become modified to accommodate the substrate?

\_\_\_\_\_induced fit model\_\_\_

1. (2 pts)What type of reversible inhibition can be completely overcome by increasing the concentration of substrate in an enzyme-catalyzed reaction?

\_\_\_\_\_\_competitive inhibition\_\_\_\_\_\_\_\_\_\_\_



**Scratch Paper**