

Chemistry 203 Lg (Fall '09) Exam #2

Last Name: _____

October 20, 2009; 11:00-11:50 a.m.

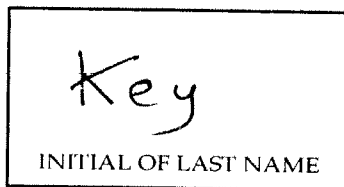
First Name: _____

Prof. Matthew Pratt

USC ID: _____

Prof. Richard Brutchey

T.A: _____



Please do not open this exam until you are told to do so.

Write legibly to avoid confusion.

GOOD LUCK !!

Question #	Maximum Points	Score	Grader
1 - 7	28		
8 - 14	28		
15 - 22	32		
23 - 25	12		
Bonus	4		
TOTAL	104		

I will observe the rules of Academic integrity while taking this exam.

Student Signature

Circle the most nearly correct answer. (4 points each)

- (1) To be effective, a drug taken orally must:
- a) Be absorbed through the intestinal walls
 - b) Resist stomach acid
 - c) Resist enzymes in saliva
 - d) All of the above
- (2) DNA is organized into macromolecular structures in cells called:
- a) Genes
 - b) Chromosomes
 - c) Transcription factors
 - d) Nucleotides
- (3) Which of the following statements about genes is true?
- a) It is the basic unit of hereditary information
 - b) It can be stored in DNA and RNA
 - c) More advanced organisms always have more genes
 - d) Both a & b
- (4) What is most responsible for the specificity of DNA base pairing?
- a) Van der Waals contacts
 - b) Phosphate backbone interactions
 - c) Hydrogen bonds
 - d) Base stacking
- (5) A series of drug analogs X, Y, and Z had partition coefficient (P) values of: X = 10; Y = 1; Z = 0.1. The effective concentrations (C) for activity were: X = 0.05; Y = 100; Z = 0.01. These *particular* results show that:
- a) The more hydrophilic analogs have greater biological activity
 - b) The more hydrophobic analogs have greater biological activity
 - c) A plot of $\log(1/C)$ vs. $\log(P)$ will have a positive correlation
 - d) The hydrophobicity of the drugs has no correlation on their activity

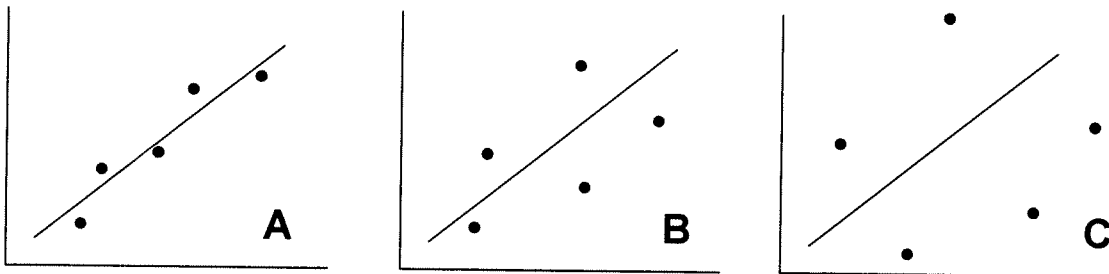
- (6) A drug **does not** need to be hydrophobic in order to pass through:
- a) The blood brain barrier
 - b) The distal tubule in the kidneys to re-enter the blood supply
 - c) Capillaries to leave the blood supply
 - d) Cell membranes
- (7) The process of turning DNA into RNA in a cell is called what?
- a) Translation
 - b) Transfection
 - c) Transformation
 - d) Transcription
- (8) The experiment performed by Frederick Griffith, which proved that inheritable genetic material exists, is called what?
- a) The bacterial mixing theory
 - b) The DNA hypothesis
 - c) The gene conjecture
 - d) The transforming principal
- (9) What is the complimentary DNA strand to 5'-CCGATGGTC-3' ?
- a) 5'-CTGGTAGCC-3'
 - b) 3'-CTGGTAGCC-3'
 - c) 5'-GGCTACCAG-3'
 - d) 3'-GGCTACCAG-5'
- (10) In QSAR plots, the relationship between $\log(1/C)$ and $\log(P)$ is:
- a) Always linear
 - b) Always nonlinear
 - c) Always a positive correlation
 - d) None of the above are true
- (11) Very hydrophobic drugs will likely be:
- a) Trapped in fat deposits
 - b) Readily soluble in blood
 - c) Unable to pass through the placental barrier
 - d) Excreted directly without being metabolized

- (12) A prodrug:
- a) Is an inactive form of the drug that is converted into an active drug in the body
 - b) Is a highly polar or ionic derivative of a less polar drug
 - c) Is an active drug that is converted into an inactive drug in the body
 - d) Is a toxic form of the drug
- (13) Arrange the following into the correct chronological order for typical drug development:
- i) Discover bioactivity in crude extract
 - ii) Synthesis of analogs
 - iii) Find natural product
 - iv) Structure determination of lead compound
- a) iii, i, iv, then ii
 - b) iv, ii, iii, then i
 - c) i, ii, iv, then iii
 - d) iii, iv, i, then ii
- (14) Which of the following is NOT true about the ribosome
- a) It is made of both protein and RNA
 - b) It can correct its mistakes (proofread)
 - c) It has two subunits
 - d) It makes phosphodiester bonds
- (15) During the process of creating protein from RNA, which of the following is true?
- i) mRNA provides the code for the protein
 - ii) tRNA is part of the ribosome
 - iii) Each amino acid is encoded by three nucleotides
 - iv) The protein that does the chemical transformation is called polymerase
- a) Only i
 - b) i and iii
 - c) iii and iv
 - d) All of the above

- (16) A drug is tested and found to (apparently) increase the lifespan of AIDS patients in a sample group. The t value calculated from the data is 2.6. The approximate probability that the drug is effective is:
- a) 95% if 5 people participated
 - b) 97.5% if 6 people participated
 - c) 99% if 11 people participated
 - d) 99.5% if 3 people participated

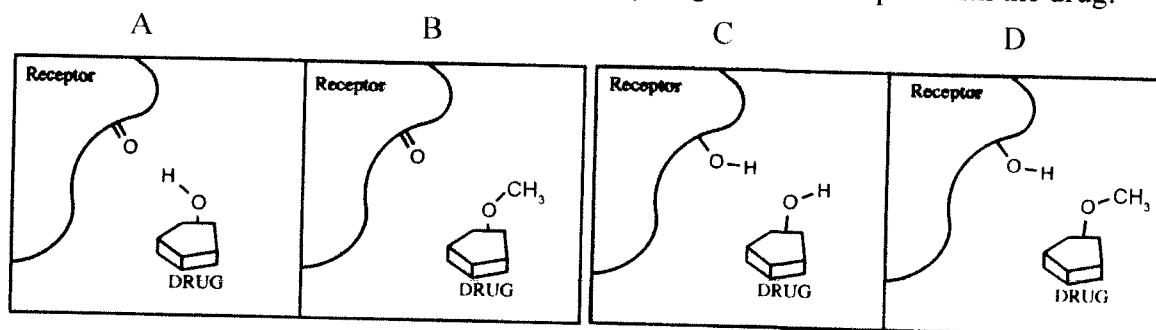
- (17) Which reaction type of the following does not occur as part of metabolism:
- a) Hydrolysis
 - b) Dehydration
 - c) Reduction
 - d) Oxidation

- (18) Which trend line has the largest r^2 value:



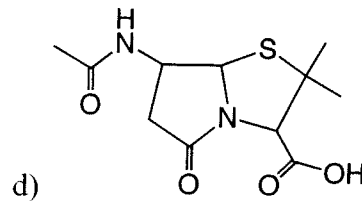
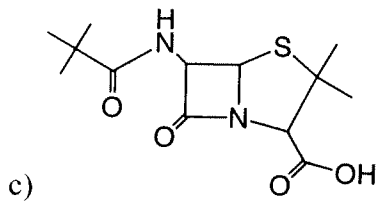
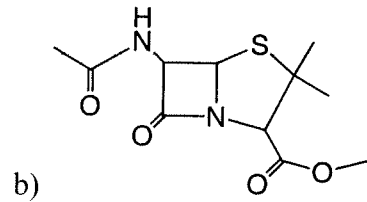
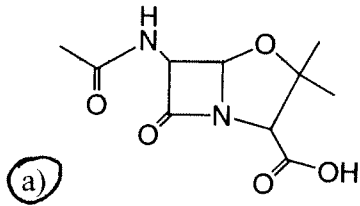
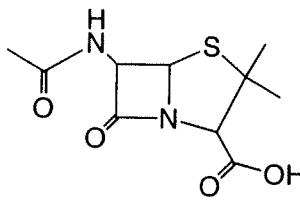
- a) A
- b) B
- c) C
- d) The r^2 values are all about the same

- (19) The figure below shows four hypothetical drug-receptor interactions. In which hydrogen bonding scenario(s) can the receptor act as a hydrogen bond acceptor with the drug:



- a) A only
 b) C only
 c) A and C
 d) A, B, and C
- (20) DNA is made of four bases called Adenine (A), Cytosine (C), Guanine (G), Thymine (T). RNA is different from DNA in one of these bases. What is the difference?
 a) Adenine (A) to Inosine (I)
 b) Thymine (T) to Uracil (U)
 c) Adenine (A) to Uracil (U)
 d) Cytosine (C) to Methyl-cytosine (5MC)
- (21) Which of the following areas apply to the study of pharmacokinetics:
 i) drug metabolism
 ii) drug adsorption
 iii) drug toxicity
 iv) drug efficacy
 a) all of the above
 b) i, iii, and iv
 c) iii and iv
 d) i and ii
- (22) Which of the following is not one of Lipinski's Rule of Five:
 a) A molecular weight less than 600
 b) No more than 5 H-bond donor groups
 c) No more than 10 H-bond acceptor groups
 d) A partition coefficient less than 5

(23) Which of the following analogs is an isostere of the drug shown below:



(24) Fill in the blanks: Life on earth uses ___ amino acids and therefore requires a 3 base codon. If another form of life used the same DNA to RNA to protein machinery but only had 10 amino acids, it would have to use a minimum of ___ bases for a codon.

- a) 24 amino acids; 2 base codon
- b) 20 amino acids; 2 base codon
- c) 20 amino acids; 3 base codon
- d) 22 amino acids; 3 base codon

(25) Given the following information, what 3 amino acid peptide does the DNA sequence 5'-ATGCCTGCA-3' encode for?

3'-TACGGACGT-5'

ATG = Methionine

GTA = Valine

GCA = Alanine

TCC = Serine

CCT = Proline

ACG = Threonine

- a) Valine - Serine - Threonine
- b) Threonine - Serine - Valine
- c) Alanine - Proline - Methionine
- d) Methionine - Proline - Alanine

BONUS (4 extra points)

What scientist was famously not recognized with a Nobel Prize for their contributions to solving the structure of the DNA double helix?

- a) James Watson
- b) Francis Crick
- c) Maurice Wilkins
- d) Rosalind Franklin