CHM 3352 Exam 2

TUD Department of Chemistry

#1-#8 ten points each

Summer 2019

Multiple choice 2 points each with 2 free misses

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1) a) Write the Michaelis-Menten equation.

b) Write the Lineweaver-Burke equation.

c) Define K_m

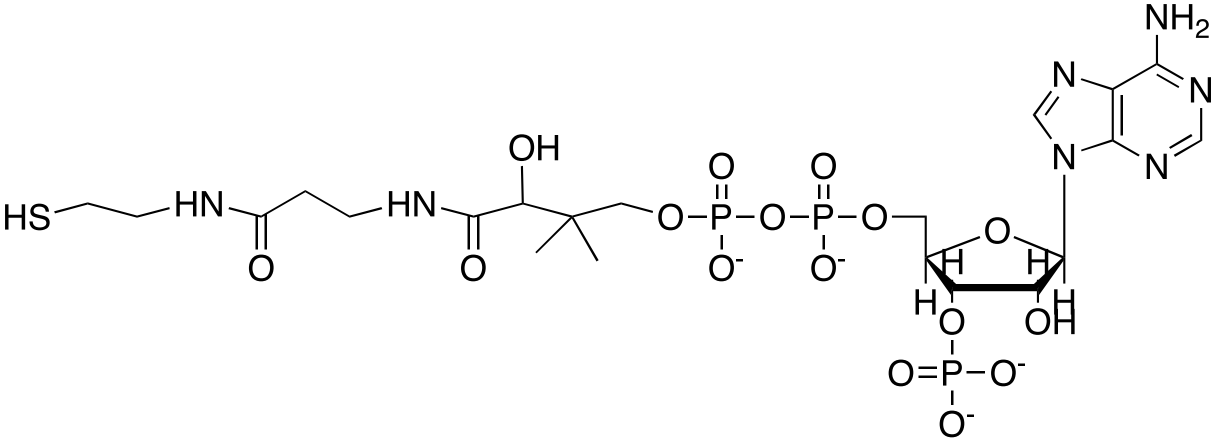
d) Give a brief definition for the word “zymogen”

e) List three types of reversible enzyme inhibition and state the effect that each has on v_{max}

f) What are the three amino acid residues present in the active site of chymotrypsin that are responsible for the enzyme’s catalytic activity?

2) a) Draw the structure of either NAD^+ or SAM. State the purpose of the cofactor that you chose to draw.

b) Below is the structure of Coenzyme A. Circle the ß-alanine group and place a square box around the portion of the molecule that is responsible for binding acyl groups.



3) Complete hydrolysis of a heptapeptide gave an amino acid composition of Asp, Leu, Lys, 2 Met, Phe and Tyr.

Treatment with Sanger's reagent and hydrolysis gave DNP-Phe.

Digestion of the heptapeptide with trypsin had no effect.

Chymotrypsin treatment of the heptapeptide yielded a dipeptide, a tetrapeptide, and a free amino acid. The tetra peptide contained Leu, Lys, and Met.

Cyanogen bromide treatment of the heptapeptide gave a dipeptide, a tetrapeptide, and free Lys

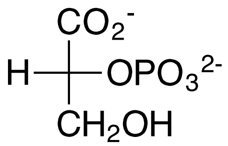
Two point bonus: Draw the structure of Sanger's reagent

Questions 4-8 refer to glycolysis

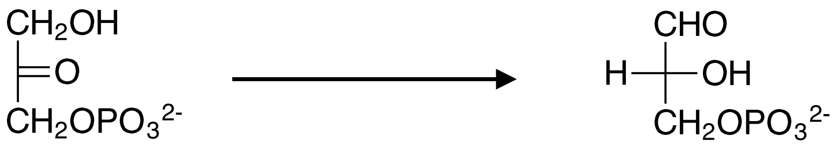
4) What enzyme(s) use(s) NAD/NAD$^+$ as cofactors?

5) Draw the structure of the product that results when glyceraldehyde-3-phosphate dehydrogenase acts on glyceraldehyde-3-phosphate.

6) Name the structure shown below:



7) What enzyme catalyzes the transformation shown below?



8) Draw the structure of fructose-6-phosphate.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1) In peptide bonds, the bonds between 1) ________
A) C and N are shorter than typical C–N bonds.
B) C and O are shorter than typical C=O bonds.
C) C and O are longer than typical C=O bonds.
D) C and N are longer than typical C–N bonds.
E) Both A and C

2) The hydrophobic cleft in globular proteins which bind substrate molecules is called the ________. 2) ________
A) substrate pocket
B) modulator site
C) activity site
D) oligomeric site
E) active site

3) The initial velocity of an enzyme reaction (v_0) describes 3) ________
A) the concentration of the enzyme at maximal velocity.
B) the concentration of substrate at maximal velocity.
C) the rate of the reaction at when the substrate and enzyme are first mixed.
D) the concentration of both at the start of the reaction.

4) It is difficult to determine either K_m or V_{max} from a graph of velocity vs. substrate concentration because 4) ________
A) the points on the graph are often not spread out on the hyperbola.
B) the graph is sigmoidal.
C) an asymptotic value must be determined from the graph.
D) too much substrate is required to determine them.

5) The reason to rewrite the Michaelis–Menten equation (such as the Lineweaver–Burk plot) is to 5) ________
A) calculate catalytic proficiency.
B) calculate V_{max} and K_m.
C) visualize reactions better.
D) form enzyme kinetic data as a hyperbolic curve.

6) In the Lineweaver–Burk plot of an enzyme reaction, the K_m is given by the ________. 6) ________
A) reciprocal of the y–intercept
B) negative reciprocal of the x–intercept
C) x–intercept
D) y–intercept

7) An inhibitor binds to a site other than the active site of the enzyme. Which statement below correlates with this observation? 7) ________
A) It must be a competitive inhibitor.
B) It could be noncompetitive or uncompetitive inhibition.
C) The inhibition must be irreversible.
D) It could be irreversible, competitive, noncompetitive or uncompetitive. The data do not relate to the type of inhibition.

8) The substrate specificity of serine proteases is primarily due to — 8) ________

A) distinct backbone conformations of the individual proteins.
B) a specificity pocket in the protein.
C) the positions of specific side chains of serine, histidine, and aspartate.
D) A and B
E) A, B and C

9) The role of ser–195 in chymotrypsin cleavage of a peptide bond is that of a(n) — 9) ________

A) proximity effector. B) acid catalyst.
C) weak nucleophile. D) strong nucleophile.

10) Active holoenzymes are formed from ________ in the presence of ________. — 10) ________

A) apoenzymes; inactive holoenzymes
B) apoenzymes; proteins
C) proteins; cofactors
D) cofactors; proteins
E) apoenzymes; cofactors

11) What is the role of the magnesium ion in kinases that require the magnesium–ATP complex to donate phosphoryl groups? — 11) ________

A) promote ionization of bound water
B) produce an electrophilic attack on the substrate
C) produce ionization of the substrate to be phosphorylated
D) maintain the configuration of the holoenzyme
E) shield the charged phosphate groups of ATP

12) How many ATP molecules are consumed in glycolysis for every one molecule of glucose? — 12) ________

A) 0; ATP is produced, not consumed, by glycolysis
B) 1
C) 2
D) 3
E) 4