

CHEMISTRY 326

NAME \_\_\_\_\_ KEY \_\_\_\_\_

Summer 2005

EXAM 3

1. (10pts) Identify each of the following CoE and the vitamin from which it is derived.

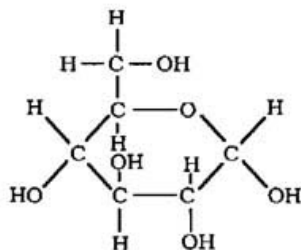
	<u>Vitamin</u>	<u>CoE</u>
a. The conversion from pyruvate to lactate	Niacin	NAD <sup>+</sup>
b. Carrier of carbon dioxide	Biotin	Biocytin
c. Accepts or donates 2 hydrogen atoms	Riboflavin	FAD
d. donates or accepts a hydride ion	Niacin	NAD <sup>+</sup>
e. works by a Schiff's base mechanism	Pyridoxal	PLP/PMP

2.(10pts) Identify the composition and linkage for each of the following :

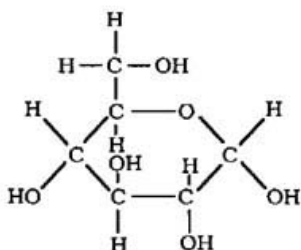
	Composition	Linkage
a. lactose	Gal & glc	$\beta$ (1 to 4)
b. hyaluronic acid	Glucuronate & NAG NAG to Glucuronate	$\beta$ (1 to3) $\beta$ (1 to4)
c. amylose	Glc units	$\alpha$ (1 to 4)
d. cellobiose	Glc units	$\beta$ (1 to 4)
e. glycogen	Glc units	$\alpha$ (1 to 4)

3.(10pts) Draw the structure for each of the following:

a. (2pts) The anomer of  $\beta$ -D-glucopyranose



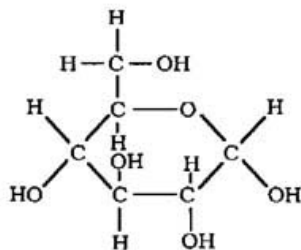
b. (4pts) Two aldoses whose configuration at Carbon 3, 4, 5 matches that of D-fructose



c. (2pts) A ketone that has no chiral centers



d. (2pts) An epimer of D-galactose that is also an epimer of D-mannose



4. (10pts) Describe the relationship that exists between the reduction potential of the components of the electron transport chain, the order in which they function and the generation of ATP.

The std reduction potentials range from the most negative to most positive. The more neg the potential the greater the tendency to loss electrons. The more positive the greater the tendency to accept electrons. The electrons flow according to an increase in the reduction potential that is the electrons flow from the more neg to the more positive component that is in the direction of greater reduction potential.

5. (10pts) Briefly explain the chemiosmotic theory.

Mitchell's theory states that protons are moved across the inner membrane to create a proton gradient since the inner membrane is impermeable to Hydrogen ions. This generates a proton-motive force that generates ATP.

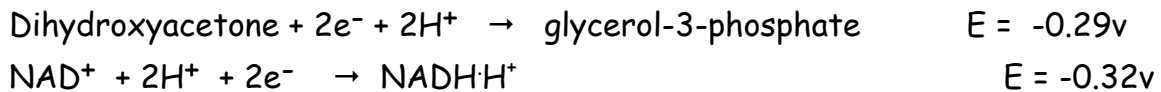
6. (10pts) A compound 2,4-dinitrophenol was briefly used as a weight loss drug. People who took the drug lost weight and experienced an increase in body temperature. Explain these 2 phenomena in biochemical terms.

2,4DNP is an uncoupler which allows redox thru the ETC but not the generation of ATP subsequently the energy is released as heat (increase in body temperature) and the body tries to compensate for the decrease in ATP by increasing metabolism. This also creates an increase in body temp. The increase in metabolism eventually mobilizes fat and the individual losses weight.

7. (10pts) Glycerol-3-phosphate dehydrogenase catalyzes the following reversible reaction:



Given the following information indicate the amount energy will be generated for the reaction, proceeding from the left to right. Show all work. (F = 96.48KJ/mol)



$$\begin{aligned} \Delta G &= -nF\Delta E \\ &= -(2)(96.48)(\text{Red-Oxid}) \\ &= -(2)(96.48)(-0.32 - (-0.29)) \\ &= -(2)(96.48)(-0.03) \\ &= -(-5.7) \\ &= 5.7\text{kJ} \end{aligned}$$

8. (5pts) One of the "goals" of fermentation is to recycle NAD so that it (NAD) can be used again in the early stages of glucose metabolism (known as glycolysis). NAD enters the fermentation process in a reduced form, so the process of fermentation is designed to convert the NAD to its oxidized form (which can then be "re-used" in glycolysis). Which one of the following must therefore describe the reaction NAD undergoes during fermentation?

- A. NADH ----> NAD<sup>+</sup> + H<sup>+</sup> + 2e<sup>-</sup>
- B. NAD + 2H ----> NADH + H<sup>+</sup>
- C. NADH + ADP + P<sub>i</sub> (inorganic phosphate) ----> NAD<sup>+</sup> + ATP
- D. NAD + 2H ----> NADH<sub>2</sub>

9.(10pts) Select one component from the ETC that best defines each of the following:

FMN or CII\_CoQ\_\_\_\_\_1. Accepts and carries 2 protons

cytochrome oxidase(CIV)AA3\_\_2. Transfers electrons DIRECTLY to oxygen

CI or oxidoreductase\_\_\_\_\_3. Has FMN as a CoE

Cyto b, c1 or C or AA3\_\_\_\_\_4. Has iron as an electron carrier

AA3 or CIV\_\_\_\_\_5. Has copper as an electron carrier

CoQ or FMN\_\_\_\_\_6. Accepts electrons donated by NADH

Cyto C or CytoC1\_\_\_\_\_7. Has a covalently bound heme group

Cyto b, Cyto AA3\_\_\_\_\_8. Has a non-covalently bound heme group

Cyto b\_\_\_\_\_9. Contains Heme A

Any\_cyto\_\_\_\_\_10. Accepts and donates an electron

10. (10pts) Regarding EMP:

a. Define SLP.

Formation of ATP anaerobically from a high energy substrate

b. In general which steps in EMP are control steps?

Those that are metabolically irreversible

c. At what point in EMP are all the reactions considered doubled?

At the beginning of phase 2 or stage 2 from 3PGAL to Pyruvate

d. Define 'isoenzyme' and give 2 examples in EMP.

Different forms of the same enzyme located in different tissues that catalyze the same reaction with different affinities for the same substrate

Ex: Hk/Gk; LDH

e. What are the metabolic fates of pyruvate?

Ethanol in yeast; lactate in humans; both are anaerobic. Pyruvate aerobic conditions

11. (5pts) Several enzymes seen in EMP fall into classes we have seen before. Describe in ONE sentence the reaction for each of the enzymes listed below.

a. Kinases

Transfer P to a substrate such as glc or ADP

b. Isomerases

Convert aldo keto sugars

c. Dehydrogenases

Redox from PGAL to PGA

d. Mutases

Moves groups such as P within the same molecule for example 3PGA to 2PGA