1) What is an enzyme? (4 pts)

An organic catalysts that enhances the speed or likelihood of a bio-chemical reaction by lowering the energy of activation.

2) What are the two major molecular types of enzymes found in living cells (2 pts)

1) Protein and 2) Ribozyme type

3) How many moles of substrate can an enzyme turn over per minute? (2 pts)

One mole of enzyme may interact with 10,000 to 1,000,000 molecules of reactant per minute at a specific temperature, pH, and salinity concentration

4) When an enzyme loses structural shape this happenstance is called Denature and can be brought about due to extremes in  a) Temperature, 

                        b) pH and/or  c) Salinity concentration. (4 pts)

5) Enzymes are named according to the starting material or chemical group the act upon. What suffix is added to most enzyme: ase. (1 pts)

6) Hydrolase enzymes is a class of protein molecule that break polysaccharides down to their monomer structures. (1 pts)
7) Draw out and label the steps in an enzyme substrate product catalyzed biochemical reaction. (8 pts).

![Figure 6.13 Enzyme and Substrate]

Enzyme + Substrate ⇄ EnzymeSubstrate complex ⇄ Enzyme + Product

8) Draw out and label an enzyme velocity graph compared to a non-enzymatic biological reaction. (6 pts)

![Figure 6.16 Enzymes Speed Up Reaction Rates]
9) What affects the velocity rate of the initial part of an exergonic enzyme catalyzed reaction (2 pts)

The velocity of the enzymatic rate increases with increasing substrate concentration.

10) What affects of the latter part of this same enzymatic catalyzed reaction? (2 pts)

Once the enzyme is saturated by the available substrate, the reaction rate becomes independent of the substrate concentration. Other controlling factors include pH, temperature, and salinity.

11) Draw a diagram for the exergonic energy of activation (E_a) type graph while on the same graph drawing a comparison with an un-catalyzed reaction. Label all parts of the graph. (10 pts)

11 c) Amphibolic reactions are metabolic reactions that can proceed toward catabolism or toward anabolic depending on the needs of the cell (1 pt)
12) Describe the function of co-enzymes while providing an example of at least two such co-enzymes that function respiratory pathway. (2 pts)

A cofactor is a non-protein chemical compound that is bound to a protein and is required for the protein's biological activity. These proteins are commonly enzymes, and cofactors can be considered "helper molecules" that assist in biochemical transformations.

The function of co-enzymes act as partner in the oxidation reduction reaction of such enzyme found in the Kreb’s cycle. Examples include:

<table>
<thead>
<tr>
<th>Oxidize</th>
<th>Reduced</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAD⁺,</td>
<td>NADH</td>
</tr>
<tr>
<td>FAD,</td>
<td>FADH₂</td>
</tr>
</tbody>
</table>

13) The break down of glucose to CO₂ during aerobic respiration occurs by a series of oxidative reductive bio-chemical reactions all controlled by enzymes. Draw out a molecular model of an oxidized (labeled as figure “A”) next to a reduced form (labeled as figure “B”) of nicotine-adenine-dinucleotide (NAD). (Label each part of these molecules correctly). (8 pts)
13 b) What subatomic particles does NAD provide to the respiratory biochemical pathway? (2 pts)

(1) __**Electrons**________________________ (2)______**Hydrogen Ions**________________________

13) Enzyme use a form of _____**Product**_____ or _____**Feed back**_____ to control or inhibit catalyzed biochemical reaction. (2 pts)

14) Two such forms enzyme inhibition are called: a) __**Competitive inhibitors**______
b) ____**Non competitive inhibitors**______ (2 pts)

15) The first form of this inhibition can be reversed by saturating the enzyme-inhibitor with copious amounts of substrate. However, the second form of this inhibit is not affected by substrate concentration. Where does the first and second form of inhibition take place across an enzyme? (4 pts)

A) Competitive inhibitors are shaped such that they fit into an enzyme’s active site and prevent normal substrate from binding to this active site.

B) Non competitive inhibitor do not bind to the active site but bind to an allosteric site located else where on the enzyme resulting in a conformational (structural) change in the enzyme closing the active site to substrate binding.

16) Substrate-level phosphorylation can best be described as:(2 pt)

Substrate-level phosphorylation is a type of chemical reaction that results in the formation and creation of adenosine triphosphate (ATP) or guanosine triphosphate (GTP) by the direct transfer and donation of a phosphoryl (PO₄) group to adenosine diphosphate (ADP) or guanosine diphosphate (GDP) from a phosphorylated reactive intermediate. By convention, however, the phosphoryl group that is transferred is referred to as a phosphate group.

17) The pentose phosphate pathway is primarily used to produce: ____**precursors such as ribose**______ necessary for nucleic acid bio-synthesis and 12 _____**NADPH**______

energy co-enzyme carrier. (2 pts)
18) On the other hand, the Entner-Doudoroff provides one of each energy molecules. These are:

1: _NADPH __________, 1: _NADH __________, and 1: _ATP __________

compared to the pentose phosphate pathway (3 pts)

19) The amount of ATP yield from aerobic respiration by a prokaryote is ___38 ATP _________ (1 pt)

b) The amount of ATP yield from anaerobic respiration by a prokaryote is ___32- 36 ATP ___________ (1 pt)

c) The amount of ATP yield by facultative anaerobic respiration by a prokaryote is ___2 ATP ___________ (1 pt)

20) Unlike _aerobic_ bacteria that require oxygen as a _final electron acceptor_ as part of the respiratory pathway, _obligate anaerobic_ bacteria use either a: _NO_3⁻ __________ b: _SO_4⁻² __________ or c: _CO_3⁻² __________ as their final electron acceptor (3 pts).

21) On the other hand, facultative anaerobic bacteria use ________an _organic molecule such as pyruvate _________ as their final electron acceptor producing alcohol, lactic acid or many other types of end products. (1pt)