



Zoology Legends

Bio303

Current Final Term Papers 2023

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Zoology Legends



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Current Final Term Quiz

- 1)Cycle allow seeds to use lipids source.
(glycoxylate)
- 2) ΔS has a +ve sign when entropy..... **(increase)**
- 3) If ΔG is negative the reaction will occur.....
(spontaneously)
- 4) Equilibrium constants are..... **(multiplicative)**
- 5) Compounds that contain two phosphate or phosphoryl groups attached at different positions in the molecule are named **bisphosphates**
- 6) FMN and FAD co enzymes catalyze oxidation reduction reactions**(Flavoproteins)**



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- 7) During preparatory phase..... Molecules of ATP are invested before the cleavage of glucose into 2, three carbon compounds. **(2)**
- 8) *Aspergillus Niger* and *Lactobacillus* are the microbes used to commercially produce citric acid and lactic acid. The production take place in.....
(batch fermenter)
- 9) In eukaryote TCA cycle takes place in
.....**mitochondria**
- 10) The rate of any reaction is determined by the concentration of the..... **(reactants)**
- 11) RNA is a polymer of..... **(ribonucleotides)**
- 12) Primary Structure of RNA defined as the number and sequence of in the RNA chain.
(ribonucleotide)



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- 13) Pepsin is a digestive enzymes in the stomach is maximally active at ph..... **(2)**
- 14) ligand binds at a site on the protein called the... **(binding site)**
- 15) Mannose 6-phosphate is isomerized by phosphomannose isomerase to yield fructose 6-phosphate, an **intermediate** of glycolysis.
- 16) Rate equation V° is the.... Reaction velocity. **(initial)**
- 17) The velocity of reaction is the rate of Formation. **(product)**
- 18) Reversible inhibitors bind to enzyme through Bonds. **(Non covalent)**
- 19) The Inhibition in effects lower the concentration of the active site. **(noncompetitive)**



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20) Neutral lipid are stored in **(Adipocytes)**

21) The starting point for either the forward or the reverse reaction is called the... **(ground state.)**

22) The force driving the system toward equilibrium is defined as the..... **(standard free-energy change)**

23) The substrate concentration at which V_0 is..... is K_m _____ **($\frac{1}{2} V_{max}$)**

24) Since V_{max} and K_m are both constants, their ratio is **(constant)**

25) What will be the pH of 0.1 M HCl?____ **(1)**

26) At the beginning of the titration, the acetic acid is..... ionized. **(Slightly)**

27) Citric Acid Cycle discovered by... (**Hans Krebs**)



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- 28) Pyruvate, the product of glycolysis, is converted to... **(acetyl-CoA)**
- 29) Fatty acid entry into via the acyl-carnitine/carnitine transporter. **(Mitochondria)**
- 30) When a substrate attach to an enzyme is causes... changes. **(conformational)**
- 31) Reflects the affinity of enzyme for substrate. **(Km)**
- 32) When the enzyme is activated by **dephosphorylation** (by a specific phosphatase), isocitrate enters the citric acid cycle and ATP is produced.
- 33) Fatty acid consist of an alkyl chain and.... **(carboxylic acid)**



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- 34) The solution is said to be **Neutral pH** when there are exactly equal concentrations of positive and negative ions.
- 35) Chylomicrons transport dietary to tissues.
(cholesterol)
- 36) In citric acid cycle the NADH is released by the formation of **(oxaloacetate)**
- 37) Which coenzyme is not used in pyruvate dehydrogenase complete. **(GTP)**
- 38) Energetic cost of activating fatty acid is equivalent to Molecules of ATP. **(2)**
- 39) In general, irreversible inhibitors bind to enzymes through **covalent bonds.**
- 40) Carboxylation of pyruvate by CO₂ to form oxaloacetate, catalyzed by **pyruvate carboxylase.**



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41) Serves as the universal energy currency in all living cell____**ATP**

42) Carbon in the fermentation medium .. can be obtained from._**Upstream Processing**

43) Glycolysis and gluconeogenesis are_____ **Reciprocally regulated**

44) In nonoxidative phase, ribulose 5-phosphate is first epimerized to **xylulose 5- Phosphate**

45) DNA forms RNA by transcription whereas the process by which RNA form DNA is called **reverse transcription**

46) **Lyasis** are the enzyme which do not catalyzed the reaction by oxidation.

47) A ligand bind at a site on the protein called.....**Binding Site**



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- 48) The **noncompetitive** inhibition is effects the concentration of the active enzyme.
- 49) **Noncompetitive** inhibitors do not interfere with the binding of substrate to enzyme.
- 50) Reversible inhibitors bind to enzyme through.....
Covalent Bonds.
- 51) Reflect the efficient of the enzyme for the substrate. **K_m**
- 52) Mass action ratio is depicted by..... **Q**
- 53) Neutral lipid are stored in **adipocytes**
- 54) Fatty acid consist of an alkyl chain and
Carboxylic acid
- 55) Sine V_{max} and K_m are both constant their ratio is **Constant**



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56) Enzyme..... System is described in terms of free energy. **Biological System**

57) Ionization of water can be measured by it
Electrical conductivity

58) The rate or velocity of a reaction (v) is the number of substrate molecules converted to product per unit time; ____**Reaction Velocity.**

59) Oxidation of Odd-numbered fatty acids: Fatty acids with an odd number of carbons are found in the lipids of many **plants and marine organisms.**

60) This cycle allows seeds to use lipids as a source of energy to form the shoot during germination.____
Glyoxalate Cycle-2

61) If the non-protein moiety is a metal ion such as Zn and Fe it is called.....**Cofactor**



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62) High effective catalyst commonly reaction rate by a factor of **10^5 to 10^{17}**

63) Reaction velocity denoted by..... **V**

64) The rate of any reaction is determined by the concentration of the..... **reactants**

65) Pepsin a digestive enzymes in the stomach is maximally active at pH..... **2**

66) Initial velocity is denoted by.... **V_0**

67) Unequal electron sharing.....**two electric dipoles**

68) H_3O^+ migrate towards the..... **Cathode**

69)Cycle allow seeds to use lipids source.

(Glycoxylate cycle -2)

70) ΔS has a +ve sign when entropy..... **(increase)**

71) If ΔG is negative the reaction will occur.....
(spontaneously)



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72) Equilibrium constants are..... **(multiplicative)**

73) FMN and FAD co enzymes catalyze oxidation reduction reactions.....**(Flavoproteins)**

74) Gluconeogenesis occurs in the

- a. Plant
- b. Animals
- c. Microorganisms

d.All

75) Utilization of glucose the hydrolysis of ATP produced the mc thy

A) water + glucose

B) Water + pi

C) glucose + pi

D) ADP + pi

76) Glycolysis is the_____ **Exergonic**



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- 77) **Beta oxidation**— The repetitive four-step process, by which fatty acids are converted into acetyl-CoA called **Beta oxidation**.
- 78) In eukaryote, TCA cycle takes place in**mitochondria**
- 79) The last step in glycolysis is the transfer of the phosphoryl group from phosphoenolpyruvate to ADP, catalyzed by **pyruvate kinase**, which requires K^+ (potassium ions) and either Mg^{+2} or Mn^{+2} .
- 80) The free energy of the system is plotted against the progress of the **reaction $S \rightarrow P$** .
- 81) A buffer system consists of a **weak acid (the proton donor)** and its conjugate base (the proton acceptor).



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- 82) If K_{eq} of a reaction is greater than 1.0, ΔG° is negative, **forward direction is favored**
- 83) If K_{eq} is less than 1.0, ΔG° is positive, **reverse direction is favored**
- 84) Secondary structure involves **coil formation** of the polyribonucleotide chain.
- 85) 3-D arm: It contains the base **dihydrouridine**.
- 86) **K_m** reflects the affinity of the enzyme for the **substrate**.
- 87) Liver peroxisomes do not contain the enzymes of the citric acid cycle and cannot **catalyze the oxidation** of acetyl-CoA to CO_2 .
- 88) **Nucleophiles**: functional groups rich in and capable of donating electrons



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89) ΔS has a +ve sign when entropy **increase** and _-
-ve when entropy **decreases**

90) In the intestinal mucosa they are reconverted to triacylglycerols and packed with dietary cholesterol and specific proteins into lipoprotein aggregates called **chylomicrons**.

91) The concentration terms in this equation express the effects commonly called mass action, and the term $\frac{[C]^c[D]^d}{[A]^a[B]^b}$ is called the **mass-action ratio, Q**.

92) Too much alcohol drinking reduce **niacin** absorption from the intestine

93) The binding of a protein and ligand is often coupled to a **conformational change** in the protein that makes the binding site more



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complementary to the ligand, permitting tighter binding called **induced fit**.

94) The ionization of water can be measured by its **electrical conductivity**

95) The **first step** in glycolysis is phosphorylation of glucose at the hydroxyl group on C-6 by a family of enzymes called **hexokinases** to form glucose-6-phosphate (G6P). • step 2: The D-glucose 6-phosphate thus formed is converted to D-f

96) Chylomicrons (transport dietary **cholesterol** to tissues)

97) The rate of an enzyme catalyzed reaction increases with substrate concentration until a **maximal velocity**



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- 98) Some rearrangement reactions, such as that catalyzed by **DNA photolyase**— **Free-Radical reactions**
- 99) There is a **linear relationship** between reaction rate and enzyme concentration (at constant substrate concentration).
- 100) Acetyl-CoA derived from fatty acids thus enters a final common pathway of oxidation with **the acetyl-CoA** derived from glucose via glycolysis and pyruvate oxidation.
- 101) Enzyme is not rigid, changes shape with **substrate**.
- 102) The substrate concentration at which V_0 is half maximal is K_m , the **Michaelis constant**.



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- 103) This change in conformation when the substrate binds is induced by **multiple weak interactions** with the substrate
- 104) One simplifying approach in kinetics experiments is to measure the **initial rate (or initial velocity)**, designated V_0 , when $[S]$ is much greater than the concentration of enzyme, $[E]$.
- 105) In general, **irreversible** inhibitors bind to enzymes through **covalent bonds**.
- 106) **Reversible** inhibitors typically bind to enzymes through **non-covalent bond**
- 107) The PDH complex is composed of multiple copies of three enzymes: • Pyruvate dehydrogenase, • **E1, E2 and E3**
(E4 is not included)



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108) When there are exactly equal concentrations of H^+ and OH^- , as in pure water, the solution is said to be at **neutral pH**.

109) The **noncompetitive inhibitor**, in effect, lowers the concentration of the active enzyme and therefore decreases the V_{max} of the enzyme

110) The tendency of any acid (HA) to lose a proton and form its conjugate base (A^-) is defined by the **acid dissociation constant (K_a)** for the reversible reaction.

111) **Buffer Solutions**: Buffers are aqueous systems that tend to resist changes in pH when small amounts of acid (H^+) or base (OH^-) are added.



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- 112) Lineweaver-Burk plot, has the great advantage of allowing a more accurate **determination of V_{max}** ,
- 113) “Warburg effect” The German biochemist Otto Warburg first observed in 1928 that tumors_____ **Cancer**
- 114) Fatty acids catabolism causes the oxidation beta carbon to form____ **Glycerol**.
- 115) ____Inhibitors binds at site disconnect from the substrate binding site ____ **Non-Competitive**
- 116) At the beginning of the titration acetic acid is ____ionized____ **Slightly**
- 117) In organic chemistry, the acryloyl is form of ____ **Enone**
- 118) The binding of enzyme to the substrate moulds the active site of ____ **Enzyme**



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- 119) Fatty acids consists of an alkyl chain and
___**carboxylic Acid**
- 120) Glyoxalate cycle is a variation of ___**TCA**
Cycle.
- 121) The value of G remains positive when
system ___Energy ___**Gain.**
- 122) The payoff phase of the Glycolysis includes
the energy containing step which involves
___**Phosphorylation.**
- 123) All tRNA molecules contain ___main arms or
loops. ___**4**
- 124) **Delta S** has a positive Sign when
entropy___**Increases**
- 125) *Aspergillus niger* and *Lactobacillus* are the
microbes used to commercially produce Citric acid



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and lactic acid. The production take place in

___ **Batch Fermenter.**

126) Which Coenzyme is not used in pyruvate dehydrogenase complete ___ **GTP**

127) The Force driving the system toward the equilibrium is defined as the ___ **Standard Free Energy change.**

128) Carbon in the fermentation obtained from ___ **Beet Molasses**

129) In the cytosol, oxaloacetate is converted to phosphoenolpyruvate by **PEP carboxykinase.**

130) The level of fructose 2,6-bisphosphate is high in the fed state and **low in starvation.**

131) the single strand of RNA is capable of self-folding like a **hairpin**



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- 132) The core of the Escherichia coli enzyme contains **24** copies of E2
- 133) The German biochemist Otto Warburg first observed in 1928 that tumors of nearly all types carry out glycolysis **“Warburg effect”**
- 134) like the saturated fatty acids, enters the **mitochondrial matrix** via the carnitine shuttle
- 135) RNA typically exists as a **single strand** Globular Molecule
- 136) **Both** glycolysis and gluconeogenesis are essentially irreversible processes in cells
- 137) Therefore, at the end of two Citric acid cycles, the products are: two GTP, six NADH, **two FADH₂**, and four CO₂.
- 138) Oxidation of fatty acids to acetyl-CoA. This generates **NADH and FADH₂**



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- 139) Acetyl-CoA formed from dietary fiber and Bind Coa Cycle__**Citric cycle**
- 140) **acetyl-CoA** formed in the liver during oxidation of fatty acids can either enter **the citric acid cycle** or undergo conversion to the “ketone bodies,”
- 141) energy in **biological systems** is described in terms of **free energy, G'^0**
1. In animals TCA cycle take place in
 - a. Cytosol
 - b. Endoplasmic reticulum
 - c. Mitochondria**
 - d. Cytoplasm
 2. Rate equation V^0 is the Reaction velocity
Initial
 3. Velocity of reaction is rate of (is ki statement kuch differ thi)
 - a. Product**
 - b. Substrate
 - c. Enzymes
 - d. All of these



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4. What will be the PH of 0.1M HCL? 1
5. At the beginning of titration ACETIC ACID is ionized
- a. Slightly
 - b. Completely
 - c. Either 2 depend on pressure
6. Neutral lipids are stored in Adipocytes
7. The starting point of either forward or reverse reaction called (that's also differ statement)
- Ground state
8. V_{max} and K_m are both constant at
- a. 1.1
 - b. 0
 - c. 2.2
 - d. None of above
9. Reflects the affinity of enzyme for substrate is
- a. V_{max}
 - b. K_m
 - c. K_W
 - d. None
10. line weaver Burke plot is determined by
- a. K_w
 - b. V_{max}
 - c. K_m
 - d. None



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11. In citric Acid cycle how many NADH are produced
- a. 3
 - b. 4
 - c. 5
 - d. No NADH
12. In fatty acid formation how many ATP molecules are formed
- a. 2
 - b. 3
 - c. **4**
 - d. 6
13. Exergonic processenergy
- a. Gain
 - b. Release
 - c. Store
 - d. None
14. Formation of DNA from RNA by
- a. Transcription
 - b. Translation
 - c. Reverse transcription
 - d. None
15. Mg^{+} cofactor mainly used as process
- a. All biological process
 - b. Catabolic
 - c. Anabolic
 - d. None



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16. Equilibrium constant described by
- a. K'
 - b. K'_{eq}
 - c. Both k' or k'_{eq}
 - d. None of these
17. All tRNA molecule contain arms and loops
- a. 3
 - b. 4
 - c. 2
 - d. 5
18. Commonly used name for most enzymes followed by suffix
- a. -ose
 - b. -ase
 - c. -yse
 - d. -ses
19. The Value of G remains +ve when it energy
- a. Lose
 - b. Gain
 - c. Remain same
 - d. zero
20. Glyoxalate cycle is variation of
- a. TCA
 - b. Urea
 - c. Nitrogen
 - d. Carbon



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21. The carnitine shuttles a mechanism by which long chain fatty acids are transported in to
- a. Mitochondrial matrix
 - b. Nucleus
 - c. Cytosol
 - d. Endoplasmic reticulum
22. Beta oxidation leads to
- a. Fatty acid degranulation
 - b. Protein degradation
 - c. Nucleic acid degranulation
 - d. Glycogen degranulation
23. Reversible inhibitor binds to enzyme bond
- a. hydrogen
 - b. Non-covalent
 - c. Vander Waal forces
 - d. All of these
24. Chyrmnins transport dietary tissues
- a. Triglycerides
 - b. Cholesterol
 - c. Proteoglycans
 - d. Amino acids
25. In citric Acid Cycle NADH released by
- a. Alpha-ketogultrate
 - b. Oxaloacetate
 - c. Succinyl-Co A
 - d. All of these



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These 25 Mcqs are Solved and Composed By M.k

Thanks to Her

Last Mid Term Quiz 2023

- 142)are single strands globular molecules.____ **tRNA**
- 143) Animals convert the chemical energy of fuels into **motion and heat** and In a few organisms such as fireflies chemical energy is converted into **light**
- 144) A ligand bind at a site on the protein called the____ **binding site.**
- 145) Gluconeogenesis is a process____ **Synthesis glucose**
- 146) Cori cycle take place in____ **liver**
- 147) Conversion of glucose 6__phosphate of fructose 6__phosphate requires enzymes____ **phosphohexose isomerase**
- 148) Standard reduction is denoted by____ **E°**



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- 149) Pyruvate is oxidized, with loss of its carboxyl group as **CO₂**, to yield the acetyl group of **acetyl-coenzyme A**;
- 150) Chemicals reaction in which the reactions and products same phase_____ **homologous chemical reactions**
- 151) Covalent bond are also called_____ **molecular bond**
- 152) It is in the form of a loop and carries specific sequences of **three bases** which constitute the anticodon.
- 153) Secondary structure involves **coil formation** of the polyribonucleotide chain.
- 154) It is defined as the number and sequence of ribonucleotides in the RNA chain._____ **Primary Structure of RNA**
- 155) Separation of the two strands of the double helix when hydrogen bonds between the paired bases are disrupted_____ **DNA Denaturation**
- 156) In **non-oxidative phase**, ribulose 5-phosphate is first epimerized to xylulose 5- phosphate
- 157) In the cytosol, oxaloacetate is converted to phosphoenolpyruvate by **PEP carboxykinase**.



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158) The important precursors of glucose in animals are **three-carbon compounds** such as lactate, pyruvate, and glycerol, as well as certain amino acids

159) We take the example of *Aspergillus niger* and *Lactobacillus* are the microbes used to commercially produce **citric acid and lactic acid**, respectively. **(Both Fermentation)**

160) Lactic acid fermentation is done by some **fungi, some bacteria** like in yogurt, and sometimes by our muscles.

161) Compounds with two phosphates linked together as a pyrophosphoryl group are named **diphosphates**;

162) Compounds that contain two phosphate or phosphoryl groups attached at different positions in the molecule are named **bisphosphates (or bisphospho compounds)**;

163) The energy gain comes in the **payoff phase of glycolysis**

164) Note that during preparatory phase, **2 molecules** of ATP are invested before the cleavage of glucose into two three-carbon pieces.

165) **NAD and NADP** are soluble electron carriers that act with dehydrogenase enzymes

166) Waste products from other industrial processes, such as molasses, cheese whey and corn steep liquor, after modifying with the



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incorporation of additional nutrients, are used **as the substrate** for many industrial fermentation

167) • A high level of **AMP** indicates that the energy charge is low

168) High levels of **ATP and citrate** indicate that the energy charge is high

169) In 1910 Chaim Weizmann (later to become the first president of Israel) discovered that the bacterium *Clostridium acetobutyricum* ferments starch to **butanol and acetone.**

170) Biological Reactions required energy _____ **endergonic.**

171) Actual free-Energy changes depend on **Reactant and Product** Concentrations

172) The binding of a protein and ligand is often coupled to a **conformational change** in the protein

173) All tRNA molecules contain **4** main arms or loops.



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- 174) Most biochemical reactions occur near **pH 7**
(buffered)
- 175) beer and wine, alcohol are produced by **fermentation**
- 176) In some plant tissues and in certain invertebrates, protists, and microorganisms such as yeast, **pyruvate** is converted under hypoxic or anaerobic conditions to **ethanol and CO₂**, a process called ethanol (alcohol) fermentation
- 177) Under **Aerobic conditions**, the pyruvate formed in the final step of **glycolysis** is oxidized to acetate (acetyl- CoA), which enters the citric acid cycle and is oxidized to CO₂ and H₂O.
- 178) Dehydrogenase meaning **Removal of Hydrogen**
- 179) **Galactokinase** deficiency **galactosemia** high conc. are found in blood and urine.
- 180) Messenger RNA (mRNA) Size **500-6000 nucleotides**
- 181) The rate of **re-association** depends upon the concentration of the **complementary strands**.



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- 182) **Pyruvate** is the **end product** of the second phase of glycolysis
- 183) Tri carbocyclic acid cycle (TCA) or **Kreb's cycle**
- 184) Kreb's cycle same as **Acetyl Co-A**
- 185) The enzyme **phosphohexose isomerase** (phosphoglucose isomerase) catalyzes the reversible isomerization of glucose 6- phosphate, an aldose, to fructose 6- phosphate, a ketose.
- 186) Unshared electrons are represented by **Dot**.
- 187) Similar to DNA, RNA polymer also has **polarity**
- 188) Too much alcohol drinking $\diamond$ reduce **niacin** absorption from the **intestine**
- 189) **Oxalo acetic acid (OAA)** produced in **mitochondria** is impermeable through mitochondrial membrane
- 190) **Lipid-soluble quinones:** ubiquinone and plastoquinone act as **electron carriers** and proton donors in the non-aqueous environment of membranes



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- 191) **NAD** is a lipid soluble electro carriers.
- 192) In the **surface techniques**, the microorganisms are cultivated on **the surface of a liquid** or solid substrate.
- 193) In the **submersion processes**, the microorganisms grow **in a liquid medium** provided with the substrate
- 194) **Lyases** are included in a separate class because they catalyze these reactions by means other than **hydrolysis or oxidation.**
- 195) **Nucleophiles:** functional groups rich in and capable of donating electrons
- 196) The **electron-donating** molecule in an oxidation-reduction reaction is called the **reducing agent or reductant**
- 197) The electron-**accepting** molecule is the **oxidizing agent or oxidant.**
- 198) **Photosynthetic organisms** make glucose by first reducing atmospheric **CO₂ to trioses**, then converting **the trioses to glucose.**



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199) **NAD, NADP** are water soluble coenzymes.

200) The payoff phase of glycolysis includes the energy-conserving **phosphorylation steps**

201) RNA typically exists as a **single strand Molecules** whereas DNA exists as a **double-stranded** helical molecule.

202) The process of synthesis of **glucose from non-carbohydrate** sources is known as **Gluconeogenesis** (abbreviated GNG)

203) **Which is correct about Exponential Phase?**

- 1) The second phase in the fermentation process
- 2) The cells have adjusted to their environment and rapid growth takes place
- 3) Cell growth rate is highest in this phase

4) All

204) This reannealing process is also referred to as **hybridization.**



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- 205) Since the RNA molecule is a **single strand** **complementary** to only one of the two strands of a gene,
- 206) miRNA is a type of **ncRNA**
- 207) When the amount of ATP is high in cell, glucose is converted into **Glycogen**.
- 208) Reactions in which system gains free energy is called **Endergonic**.
- 209) Phosphoenolpyruvate is an **Enol Form**.
- 210) A phosphoryl group ($-\text{PO}_3^{2-}$) from ATP is transferred to an alcohol ($\diamond$ forming a **phosphate ester**)

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- LEGENDS -



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Final term Short & Long

Define pH and write its equation to calculate pH with reference to pH of water at 25/C

The pH of a solution is defined as the logarithm to the base 10 of the reciprocal of the $[H^+]$, i. e, the negative logarithm of the $[H^+]$

$$\begin{aligned} \text{pH} &= \log 1/[H^+] \\ &= -\log [H^+] \end{aligned}$$

The pH of water at 25°C, in which H^+ and OH^- ions are present in equal numbers, is 7.0

$$\text{pH} = -\log [1 \times 10^{-7}] = 7$$

The symbol p denotes "negative logarithm of" . For each pH unit less than 7.0, the (H^+) is increased tenfold; For each pH unit above 7.0, it is decreased tenfold.

Competitive and noncompetitive inhibitors

- The two most commonly encountered types of reversible inhibition are;
- **Competitive and • noncompetitive.**



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- **Competitive** inhibitors resemble the substrate and compete for binding to the active site of the enzyme.
- **Noncompetitive** inhibitors do not bind at the active site. They bind either free enzyme at a site other than active site or the ES complex.

Definition of Energy hill and transition state

The energy required for

- Alignment of reacting groups
- Formation of transient unstable charges
- Bond rearrangements and other transformations

This is illustrated by the **energy “hill”**

- To undergo reaction, the molecules must overcome this barrier and therefore must be raised to a higher energy level. This is called the **transition state**.



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Difference b/w oxidation and reduction

Oxidation	Reduction
Addition of oxygen	Removal of oxygen
loss of electrons	Gain of electrons
Loss of hydrogen	Gain of hydrogen

Types of Enzyme inhibitors

- Enzyme inhibitors are molecular agents that interfere with catalysis, slowing or halting enzymatic reactions.
- Any substance that can diminish the velocity of an enzyme-catalyzed reaction is called an inhibitor.
- Enzymes catalyze virtually all cellular processes, so it should not be surprising that enzyme inhibitors are among the most important pharmaceutical agents known.
- Inhibitors can be classified on the basis of their site of action on the enzyme, on whether they chemically



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modify the enzyme, or on the kinetic parameters they influence.

- **Two broad classes of enzyme inhibitors:**

1. **Reversible**

2. **Irreversible.**

- In general, **irreversible** inhibitors bind to enzymes through covalent bonds.
- **Reversible** inhibitors typically bind to enzymes through non-covalent bonds

Definition of Bulges and loops in RNA... and which structure they form...

Common RNA secondary structures

- **Internal loops:** a short series of unpaired bases in a longer paired helix and
- **Bulges:** regions in which one strand of a helix has "extra" inserted bases with no counterparts in the opposite strand

They form Secondary Structure of RNA.



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Continuous fermentation

- A Continuous fermentation is a process in which fresh medium (substrate) is continuously added in the bioreactor, and biomass or products containing left over nutrients and microorganisms are continuously removed at the same rate to keep the culture volume constant.
- Under these conditions the cells remain in the logarithmic phase of growth

What happened with enzyme kinetics when the substrate concentration is higher than the enzyme concentration?

- The rate of an enzyme catalyzed reaction increases with substrate concentration until maximal velocity (V_{max}) is reached.
- The leveling off of the reaction rate at high substrate concentrations reflects the saturation with substrate of all available binding sites on the enzyme molecules present.



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Which ions are formed when electric current passes through water?

Water molecules have a slight tendency to undergo reversible ionization to yield a hydrogen ion (a proton) and a hydroxide ion, giving the equilibrium reaction

- $\text{H}_2\text{O} \leftrightarrow \text{H}^+ + \text{OH}^-$
- Hydrogen ions formed in water are immediately hydrated to hydronium ions (H_3O^+)

Define fermentation in terms of biotechnology

Describe its types with Products

Define

The fermentation process involves the propagation of the microorganism and production of the desired product. The fermentation process can be categorized depending on various parameters.

Types:

It can be either **aerobic fermentation**, carried out in the presence of oxygen or **anaerobic fermentation**, carried out in the absence of oxygen.



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Fermentation types:

Lactic acid fermentation, alcohol fermentation, acetic acid fermentation, and butyric acid fermentation.

Products:

Common fermented foods include kimchi, sauerkraut, kefir, tempeh, kombucha, and yogurt. These foods may reduce heart disease risk and aid digestion, immunity, and weight loss.

Role of snRNA

Small nuclear RNA (snRNA)

- Small nuclear RNA (snRNA) are large number of small stable RNA species found in eukaryotic cells.
- Most of them are complexed with proteins to form ribonucleoproteins.

They are distributed in the nucleus, in the cytoplasm or in both. They are significantly involved in rRNA and mRNA processing and gene regulation.



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Equation of Delta G & delta G ° Prime

$$\Delta G^{\circ} = \Delta H^{\circ} - T \Delta S^{\circ}$$

$$\Delta G'^{\circ} = -RT \ln K'_{eq}$$

Competitive inhibition (Both in Short & Long)

- This type of inhibition occurs when the inhibitor binds reversibly to the same site that the substrate would normally occupy i.e. active site and, therefore, competes with the substrate for that site. Competitive inhibitors bind to the enzyme's active site.



- Reversible inhibitors bind to enzymes through non covalent bonds.



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- Dilution of the enzyme-inhibitor complex results in dissociation of the reversibly bound inhibitor, and recovery of enzyme activity.

1. Effect on V_{max} (Separate Long Also)

- The effect of a competitive inhibitor is reversed by increasing $[S]$. At a sufficiently high substrate concentration, the reaction velocity reaches the V_{max} as observed in the absence of inhibitor.
- When $[S]$ far exceeds $[I]$, the probability that an inhibitor molecule will bind to the enzyme is minimized and the reaction exhibits a normal V_{max} .
- Therefore, a competitive inhibitor does not decrease V_{max}

How to find equilibrium constant if AB are reactant and CD are product (5)

Let's talk how to get the equilibrium constant Assume the reaction given here... Let's try to understand it with an example.



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We have a reacting system where A and B are the reactants, with molar concentration denoted by small a and b Whereas C and D are the products of this particular reaction and their molar concentrations are denoted by small c and d respectively.

When the reaction is at equilibrium.. The eq. constant for this reaction is (the product of conc. Of the products divided by the product of conc. Of the reactants At this point, the equilibrium constant is the ratio of concentration of reactants to that of products and can be written as this equation.

When a reacting system is not at equilibrium, the tendency to move toward equilibrium represents a driving force, the magnitude of which can be expressed as the free-energy change for the reaction, ΔG

The equilibrium constant is given by following equation where [A], [B], [C], and [D] are the molar concentrations of the reaction components at the point of equilibrium, equilibrium constant can be written as:

Standard free-energy change



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$$K_{eq} = \frac{[C]^c [D]^d}{[A]^a [B]^b}$$

Difference btw DNA & RNA (5)

- ✓ DNA contains the sugar deoxyribose, while RNA contains the sugar ribose. ...
- ✓ DNA is a double-stranded molecule, while RNA is a single-stranded molecule.
- ✓ DNA is stable under alkaline conditions, while RNA is not stable.
- ✓ Instead of thymine in DNA, RNA contains the ribonucleotide of uracil.
- ✓ RNA is considerably smaller than DNA
- ✓ RNA has no simple, structural hierarchy that serves as a reference point, as does the double helix for DNA.

Ionization of water (3)

- Although many of the solvent properties of water can be explained in terms of the uncharged H₂O molecule, the small degree of ionization of water into hydrogen ions



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(H⁺) and hydroxide ions (OH⁻) must also be taken into account

- Pure Water is slightly ionized
- Water molecules have a slight tendency to undergo reversible ionization to yield a hydrogen ion (a proton) and a hydroxide ion, giving the equilibrium reaction



- Hydrogen ions formed in water are immediately hydrated to hydronium ions (H₃O⁺).

The ionization of water can be measured by its electrical conductivity. Pure water carries electrical current as H₃O⁺ migrates toward the cathode and OH⁻ toward the anode

Phosphate pathway and Write its other Pathways Names;

- The major catabolic fate of glucose 6-phosphate is glycolytic breakdown to pyruvate, much of which is then oxidized via the citric acid cycle, leading to ATP formation.



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- Glucose 6-phosphate does have other catabolic fates, which lead to specialized products needed by the cell.
- E.g. the oxidation of glucose 6-phosphate to pentose phosphates by the pentose phosphate pathway.

The oxidative pentose phosphate pathway

- **Phosphogluconate pathway**
- **Hexose monophosphate pathway**

5 Types of Chemical Reactions in Cells or Biological Systems name (5)

The reactions going on in biological systems can be categorized into 5 types:

1. Reactions that make or break carbon-carbon bonds
2. Internal rearrangements, isomerization's, and eliminations
3. Free-radical reactions
4. Group transfer
5. Oxidation-reduction reactions



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Noncompetitive inhibitions

- Inhibitors bind enzymes at sites distinct from the substrate-binding site and generally bear little or no structural resemblance to the substrate. Noncompetitive inhibitors bind at a separate site, but may bind to either E or ES.
- Noncompetitive inhibition cannot be overcome by increasing the concentration of substrate.

1. Effect on V_{max}

- The apparent V_{max} changes, because the inhibitor is capable of preventing catalysis regardless of whether the substrate is bound to the enzyme. Noncompetitive inhibition cannot be overcome by increasing the concentration of substrate.
- Thus, noncompetitive inhibitors **decrease** the V_{max} of the reaction.
- The noncompetitive inhibitor, in effect, lowers the concentration of the active enzyme and therefore decreases the V_{max} of the enzyme



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What is the effect of Substrate concentration on the rate of reaction?

Order of Reaction

- When $[S]$ is much less, then the velocity of the reaction is approximately proportional to the substrate concentration.
- The rate of reaction is then said to be first order with respect to substrate. When $[S]$ is much greater than K_m the velocity is constant and equal to V_{max} .
- The rate of reaction is then independent of substrate concentration, and is said to be zero order with respect to Substrate concentration

Function of phosphofructokinase-1 (PFK-1). What they are produced?

Phosphofructokinase-1 (PFK-1) catalyzes the transfer of a phosphoryl group from ATP to fructose 6-phosphate to yield fructose 1,6-bisphosphate.



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KEY CONVENTION:

- The PFK-1 reaction is essentially irreversible under cellular conditions, and it is the first “committed” step in the glycolytic pathway • Glucose 6-phosphate and fructose 6-phosphate have other possible fates, but fructose 1,6-bisphosphate is targeted for glycolysis.
- Phosphofructokinase-1 is subject to complex allosteric regulation • The PFK1 has got binding sites for both, ATP-Mg²⁺ and F6P binding sites • The activity of PFK-1 enzyme and glycolysis is inhibited whenever the cell has high levels of ATP.

In this way, the cell can increase or decrease the rate of glycolysis in response to the cell's energy requirements

In Eukaryotes, fructose 2,6-bisphosphate (not to be confused with the PFK-1 reaction product, fructose 1,6-bisphosphate) is a potent allosteric activator of PFK-1



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- Ribulose 5-phosphate, an intermediate in the pentose phosphate pathway also activates phosphofructokinase indirectly.

Yeast fermentation process

- Alcohol fermentation is done by yeast and some kinds of bacteria.
- **Products:** glucose undergoes fermentation to produce **ethanol and CO₂**, instead of lactate.
- **Substrate:** glucose

Two-step process:

- Yeast contain the enzyme pyruvate decarboxylase that decarboxylates pyruvate to form acetaldehyde.
- Acetaldehyde is reduced to ethanol under anaerobic conditions. Ethanol Is the Reduced Product in Ethanol Fermentation

Ligand or Characteristics of Ligand

In biochemistry and pharmacology, a ligand (from the Latin ligandum, binding) is a substance (usually a small



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molecule), that forms a complex with a biomolecule to serve a biological purpose.

- In a narrower sense, it is a signal triggering molecule, binding to a site on a target protein
- A molecule bound reversibly by a protein is called a ligand.
- Ligands include substrates, inhibitors, activators, and neurotransmitters

Enone

An enone, also called an α , β -unsaturated carbonyl, is a type of organic compound consisting of an alkene conjugated to a ketone.

The simplest enone is methyl vinyl ketone or $\text{CH}_2=\text{CHCOCH}_3$.

Where RNA is present in the cell?

Location: In addition to nucleus, RNA is found in cytoplasm.



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How malate synthase through light on evolutionary history of glyoxylate cycle?

In recent years, the detection of malate synthase (MS) and isocitrate lyase (ICL), key enzymes involved in the glyoxylate cycle, in some animal tissue has raised questions regarding the evolutionary relationship of enzymes in bacteria and animals and suggests that animals encode alternative enzymes of the cycle that differ in function from known MS and ICL in non-metazoan species.

- This bypasses the decarboxylation steps that take place in the TCA cycle, allowing simple carbon compounds to be used in the later synthesis of macromolecules, including glucose.
- Glyoxylate is subsequently combined with acetyl-CoA to produce malate, catalyzed by malate synthase
- Malate is also formed in parallel from succinate by the action of succinate dehydrogenase and fumarase.



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Coordinated regulation of glyoxylate and citric acid cycles

- The central molecules between 2 cycles is isocitrate
- The translocation of isocitrate between the citric acid cycle and the glyoxylate cycle is controlled by the activity of isocitrate dehydrogenase, which is regulated by reversible phosphorylation.
- A specific protein kinase phosphorylates and inactivates the dehydrogenase. This inactivation shunts isocitrate to the glyoxylate cycle, where it begins the synthetic route toward glucose.
- A phosphoprotein phosphatase removes the phosphoryl group from isocitrate dehydrogenase, reactivating the enzyme
- Reactivation of enzyme sends more isocitrate through the energy-yielding citric acid cycle
- The regulatory protein kinase and phosphoprotein phosphatase are separate enzymatic activities of a single polypeptide.



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Define bisphosphate? Give example

Bisphosphates

Compounds that contain two phosphate or phosphoryl groups attached at different positions in the molecule are named bisphosphates (or bisphospho compounds);

for example, fructose 1,6-bisphosphate and 1,3-bisphosphoglycerate.

Diphosphates

Compounds with two phosphates linked together as a pyrophosphoryl group are named diphosphates;

for example, adenosine diphosphate (ADP).

Triphosphate

Similar rules apply for the naming of diphosphate (such as inositol 1,4,5-trisphosphate;) and triphosphates (such as adenosine triphosphate, ATP)



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Glucose formula

Glucose is a simple sugar with the molecular formula $C_6H_{12}O_6$, which means that it is a molecule that is made of six carbon atoms, twelve hydrogen atoms, and six oxygen atoms. Glucose circulates in the blood of animals as blood sugar.

Advantages of using triacylglycerol's for energy storage

Advantages of using triacylglycerols for energy storage

1. Fats are highly reduced hydrocarbons with a large energy of oxidation.
2. Fats are insoluble molecules that aggregate into droplets. They are unsolvated and no storage mass is water.
3. Fats are chemically inert. They can be stored without fear of unfavorable reactions.



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Disadvantages of triacylglycerols as energy storage

1. Fats must be emulsified before enzymes can digest them.
2. Fats are insoluble in the blood and must be carried in the blood as protein complexes

What is R in the reaction of equilibrium constant and it's value

R is the gas constant. It's value is 8.31 cal/Mol.K.

✧✧ What is Ping-Pong mechanism of nucleoside diphosphate kinase.(5)

Ping-pong mechanism of nucleoside diphosphate kinase: The enzyme binds its first substrate (ATP in our example), and a phosphoryl group is transferred to the side chain of a His residue. ADP departs, and another nucleoside (or deoxynucleoside) diphosphate replaces it, and this is converted to the corresponding triphosphate by transfer of the phosphoryl group from the phosphohistidine residue.

- This reaction is fully reversible, so after the intense demand for ATP ends, the enzyme can recycle AMP by



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converting it to ADP which can then be phosphorylated to ATP in mitochondria.

- A similar enzyme guanylate kinase, converts GMP to GDP at the expense of ATP. By these pathways energy conserved in the catabolic production of ATP is used to supply the cell with all required NTPs and dNTPs

✦✦ What is Cori cycle and its substrate? 3

Cori cycle (the Lactic acid cycle)

- The pathway through which lactate produced by anaerobic glycolysis in skeletal muscle returns to the liver and is converted to glucose
- This moves back to muscle and is converted to glycogen is called the Cori cycle

Site: Liver

Substrate: Lactate

- “Occurs due to absence of glucose-6- phosphate in liver”



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Features of denaturing DNA in laboratory

DNA Denaturation

- Separation of the two strands of the double helix when hydrogen bonds between the paired bases are disrupted.

Disruption can occur in the laboratory if

- The pH or the salt concentration of the DNA solution is altered
- If the solution is heated above 80°C
- Disruption of the hydrogen bonds between paired bases and of base stacking causes unwinding of the double helix to form two single strands complete separation of DNA stands along the entire length.
- No covalent bonds in the DNA are broken



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Write equation of glycolysis? (3)



Reducing Agent & Oxidizing Agent

The electron-donating molecule in an oxidation-reduction reaction is called the reducing agent or reductant • the electron-accepting molecule is the oxidizing agent or oxidant.

Reduce equivalents and its examples?

Reducing equivalent refers to **chemical species which transfer the equivalent of one electron in redox reactions**. The term is common in biochemistry. A reducing equivalent can be an electron, a hydrogen atom, as a hydride ion.

Examples of reducing equivalents are:

A lone electron

A hydrogen atom



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A hydride ion (:H^-)

Cytochromes roles in plant growth and mammalian circadian rhythms?? (5)

- Family of flavoproteins,
- Found in both bacteria and eukaryotes
- mediate the effects of blue light on plant development and the effects of light on mammalian circadian rhythms (oscillations in physiology and biochemistry, with a 24-hour period)

Components/ Factors of fermenter

Factors to consider when designing a fermenter

- Aseptic and long-term reliability
- Adequate for aeration and agitation
- Low power consumption



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- Temperature and pH controls
- Sampling facilities
- drain or overflow
- control systems
- Sensors
- Cooling to achieve maximum microbial yield

Which enzyme is used in Brewer's and Beaker yeast mechanism?

Saccharomyces cerevisiae

Define medium? Write their Characteristics?

“A medium which is used for a large scale fermentation, in order to ensure the sustainability of the operation”

The fermentation medium should contain an energy source, a carbon source, a nitrogen source and



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micronutrients required for the growth of the microorganism along with water and oxygen, if necessary.

1. It should be cheap and easily available
2. It should maximize the growth of the microorganism, productivity and the rate of formation of the desired product
3. It should minimize the formation of undesired products

Coordinated regulation of glyoxylate and citric acid cycles.

- Regulation of isocitrate dehydrogenase activity determines the partitioning of isocitrate between the glyoxylate and citric acid cycles.



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- When the enzyme is inactivated by phosphorylation (by a specific protein kinase), isocitrate is directed into biosynthetic reactions via the glyoxylate cycle.
- When the enzyme is activated by dephosphorylation (by a specific phosphatase), isocitrate enters the citric acid cycle and ATP is produced.

Galactosemia

- A defect in any of the three enzymes in this pathway causes galactosemia

1. Galactokinase deficiency galactosemia

- high conc. are found in blood and urine.
- Infant develop cataracts, caused by deposition metabolite galactitol in the lens



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2. Transferase deficiency galactosemia

- more serious • characterized by poor growth in children, mental deficiency and liver damage that may be fatal

3. Epimerase deficiency galactosemia

- similar symptoms, less severe when dietary galactose is carefully controlled

Elimination reaction

- The loss of water from an alcohol, resulting in the introduction of a $C=C$ bond b/w 2 adjacent carbon atoms • An elimination reaction with no changes in oxidation state

Write the steps of synthesis of phosphoenolpyruvate into pyruvate...

Conversion of Pyruvate to Phosphoenolpyruvate



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- The first of the bypass reactions in gluconeogenesis is the conversion of pyruvate to phosphoenolpyruvate (PEP).
- This reaction cannot occur by simple reversal of the pyruvate kinase reaction
- Instead, the phosphorylation of pyruvate is achieved by a sequence of reactions that in eukaryotes requires 2 enzymes in both the cytosol and mitochondria.
- Pyruvate is first transported from the cytosol into mitochondria or is generated from alanine within mitochondria by transamination, in which the alpha - amino group is transferred from alanine (leaving pyruvate) to an alpha-keto carboxylic acid
- In mitochondria, pyruvate is converted to oxaloacetate in a biotin (coenzyme)-requiring reaction catalyzed by pyruvate carboxylase, a mitochondrial enzyme



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Remember me in you Precious Prayer

Jazak Allah

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