TOPIC 8 TEST REVIEW

Jordyn Davis
April 16th, 2021

Subtopics 8.1 Metabolism, 2.1 Molecules to Metabolism and 2.5 Enzymes

1. **Outline the importance of enzymes to metabolic processes.**
   When the substrate approaches an enzyme, it induces a conformation change in the active site, so it changes shape to fit the substrate. Enzymes speed up chemical reactions without being altered.
2. **Explain enzyme-substrate specificity.**
   Many different enzymes are needed, since enzymes catalyze one biochemical reaction all in which thousands of reactions take place in cells, which all need to be catalyzed. This is the significant difference between enzymes and non-biological catalysts.
3. **Explain how enzymes catalyze chemical reactions.**
   Substrates binds to the active site. The shape and chemical properties of the active site and substrate match each other and allow the substrate to bind. Substrates are then converted into products while they are bound to the active site. The products are then released, freeing the active site to catalyze another reaction.
4. **Explain how metabolism is controlled via end-product inhibition.**
   Allosteric interactions are regulated by chemical substances that bind to special sites on the enzyme away from the active site. The enzyme that is regulated catalyzes one of the first reactions in a metabolic pathway and that substance binds to the allosteric site. This pathway works rapidly in cells with a shortage of end product.
5. **Explain the effect of competitive inhibitors on the reaction rate of an enzyme.**
   Competitive inhibitors binds directly to the active site and exist in direct competition with the substrate. Increasing substrate levels will increase the likelihood of the enzyme colliding with the substrate instead if the inhibitor. The maximum rate of enzyme activity can be achieved, although it requires a higher substrate concentration.

Subtopics 8.2 Cell Respiration and 2.8 Cell Respiration

6. **Be able to label the structures of a mitochondrion, know the functions of those structures and understand how those structures are adapted to carry out those functions.**

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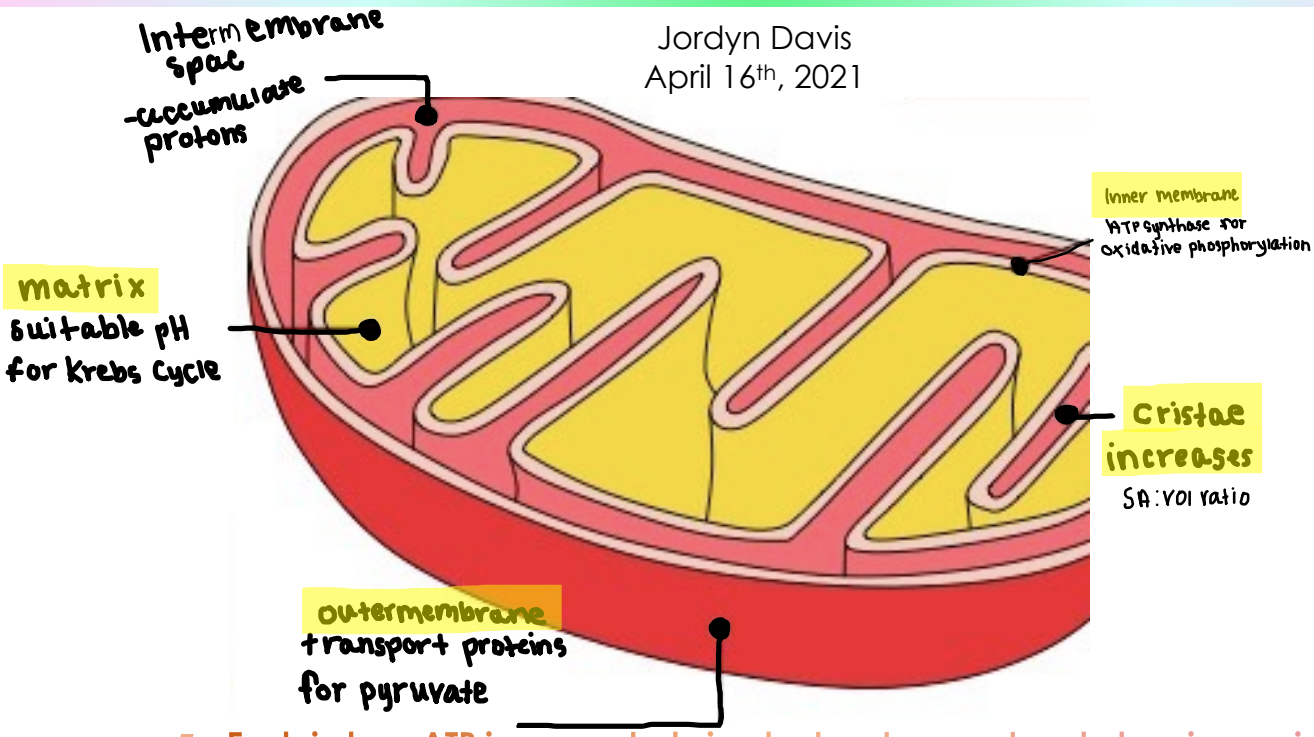

7. **Explain how ATP is generated via electron transport and chemiosmosis.**
   Electron transport chain releases energy stored within the reduced hydrogen carriers in order to synthesis ATP. Oxidative phosphorylation, the energy to synthesize ATP is derived from the oxidation of hydrogen carriers. Chemiosmosis is facilitated by the transmembrane enzyme ATP synthase. As the H ions move through ATP synthase they trigger the molecular rotation of the enzyme, synthesizing ATP.
8. **Describe the role of oxygen in aerobic cell respiration.**
   Oxygen acts as the final electron acceptor, removing the de-energized electrons from the chain and maintains the electrochemical gradient by binding to H ions in the matrix to form water.
9. **Explain the stages of aerobic respiration that occur in the mitochondria of eukaryotes.**
   Decarboxylation: carbon atoms are removed from the organic molecule to from carbon dioxide.
   Oxidation: electrons and hydrogen ions are removed from glucose and taken up by hydrogen carriers. Hydrogen carriers are oxidized at the electron transport chain. Electrons and hydrogen ions are taken up by oxygen reduction to form water.
   Phosphorylation: energy is released from the breakdown of glucose is used to phosphorylate ADP to make ATP. A net total of 4 ATP molecules are produced via substrate level phosphorylation. Remaining ATP is produced indirectly by electron transport chain.

Subtopics 8.3 Photosynthesis and 2.9 Photosynthesis

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10. **Describe the process of photolysis in photosynthesis.**
    If NADP runs out, the electrons flow back along the electron transport chain to PSI causing the pumping of protons and allowing ATP production to continue. This is known as ***cyclic photophosphorylation***.
11. **Explain the processes by which light energy is converted into chemical energy.**
    Occur on the thylakoid membrane and require light
- Chlorophyll is grouped into light harvesting arrays called *photosystems*, which have a reaction center located within them. Occur in the stroma and do not rely directly on light, but do require the ATP and NADPH that was made in the light dependent reactions
- Consists of a cyclic metabolic pathway known as the **Calvin Cycle**

12. **Explain Calvin's experiment and what was discovered about photosynthesis through his work.**
    Calvin mapped the complete conversion of carbon within a plant during the process of photosynthesis

    Calvin's elucidation of photosynthetic carbon compounds is commonly classed the 'lollipop experiment'

    This is due to the fact that the apparatus he utilised was thought to resemble an upside-down lollipop
13. **Describe the role of Rubisco in photosynthesis.**
    The Calvin cycle begins with a 5C compound called ribulose bisphosphate (or RuBP)
    An enzyme, RuBP carboxylase (or Rubisco), catalyses the attachment of a CO_2 molecule to RuBP

14. **Compare and contrast the location of ATP synthase and the movement of protons during aerobic cell respiration and photosynthesis.**
    In photosynthesis, ATP is produced via light energy (photophosphorylation) and used to make organic molecules
    In cell respiration, ATP is produced by breaking down organic molecules (oxidative phosphorylation)

15. **Outline how plants make use of the different wavelengths of light.**

    When a pigment is energised by light, it releases high energy electrons (ionisation)

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Antenna pigments transfer their energised electrons to a central reaction centre
From the reaction centre, electrons are passed on to an acceptor molecule in an electron transport chain to synthesise ATP