SNS COLLEGE OF PHARMACY AND HEALTH SCIENCES

UNIT 1

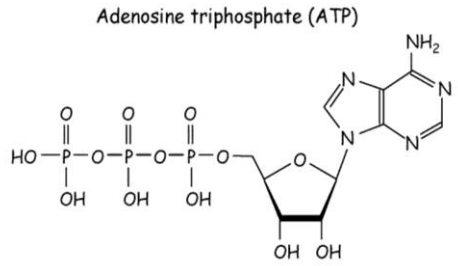
COURSE NAME: MEDICINAL BIOCHEMISTRY

TOPIC: ATP

Case Study Question 1: The Energy Currency

A marathon runner experiences extreme fatigue toward the end of a race, despite having eaten well beforehand. Muscle cells are unable to sustain prolonged activity due to rapid depletion of a key molecule that directly provides energy for contraction.

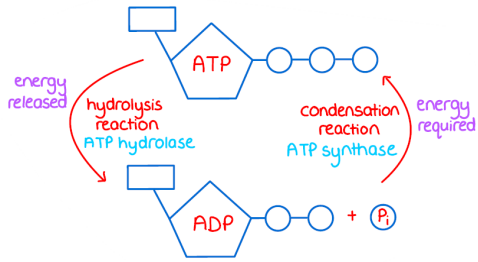
Question: What is the primary molecule known as the "energy currency" of the cell, and how does its structure allow it to store and release energy?



Case Study Question 2: The Reversible Energy Cycle

In a patient with metabolic issues, cells struggle to regenerate energy quickly after short bursts of activity, leading to prolonged recovery times. The cycle involves adding or removing a phosphate group to convert between high-energy and low-energy forms.

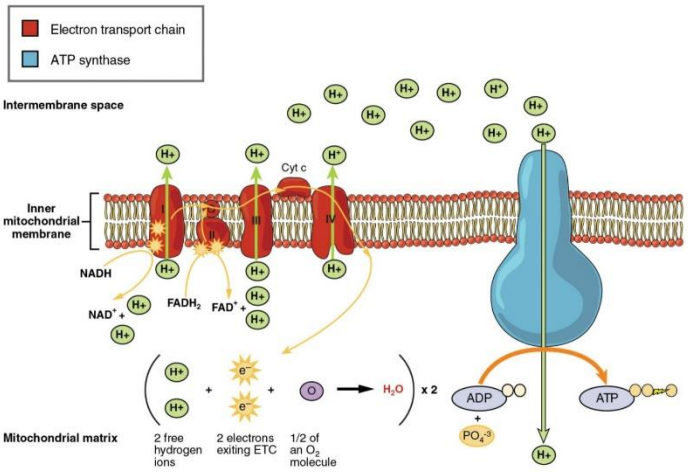
Question: Explain the ATP-ADP cycle, including how ATP is hydrolyzed to ADP + Pi to release energy and how it is resynthesized.



Case Study Question 3: Cellular Powerhouse Production

An individual exposed to cyanide poisoning collapses rapidly, as their cells cannot produce sufficient energy despite available oxygen and glucose. The poisoning disrupts the final stage of energy production in the mitochondria.

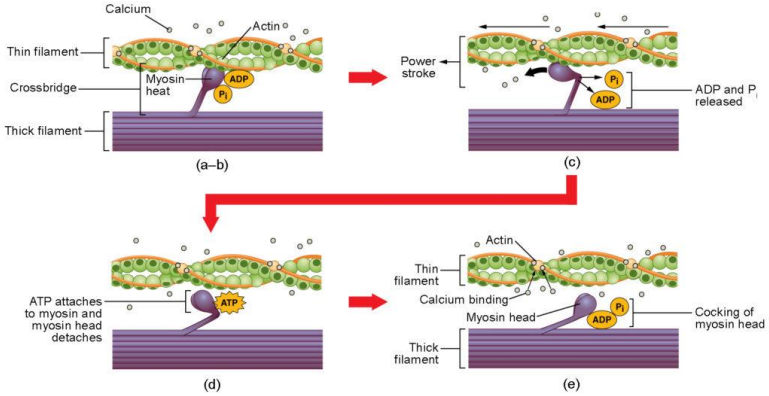
Question: Describe how ATP is primarily produced in aerobic respiration through the electron transport chain and chemiosmosis in mitochondria.



Case Study Question 4: Fueling Movement

A weightlifter is unable to complete repetitions as their muscles "lock up" due to insufficient immediate energy for cross-bridge cycling between actin and myosin filaments.

Question: How does ATP power muscle contraction, including its role in myosin head detachment and the sliding filament mechanism?



Case Study Question 5: Plant Energy Capture

In a greenhouse experiment, plants grown in the dark fail to produce carbohydrates, even with water and CO_2, because the light-dependent reactions cannot generate the necessary energy carriers.

Question: How is ATP generated during the light-dependent reactions of photosynthesis, and what role does ATP synthase play?

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