AP Bio Unit 3 - Enzymes, Cell Processes & Feedback Cheat Sheet

by njags21 via cheatography.com/122373/cs/22777/

energy

first law of thermo dynamics	energy cannot be created or destroyed, can only be transformed from one form to another, ATP CAN BE DESTORYED/CREATED
(aka law of conservation of energy)	
second law of thermo dynamics	during energy conversions, entropy increases
More organized or built up compounds have more free energy and less entropy (i.e. glucose) and less organized have less free energy and more entropy (i.e. carbon dioxide).	
can det how much free energy is available to do work in cell by calculating Gibbs free energy	
if energy is released, reaction is exergonic, and triangle G is neg	
if energy is absorbed, reaction is endergonic, G is positive	
EXergonic reactions power ENDergonic ones	
a. Organisms use free energy for organization, growth and reproduction. Loss of order or free energy flow results in death.	
b. More free energy (ex. Food) than needed will be stored for growth (roots, glycogen, fat, etc.).	
d. Reactions can be coupled to maintain a system, ex. Photosynthesis and cell respiration	
redox:	one substance is reduce, another is oxidized
oil	rig

metabolism

sum of all the chemical reactions that take place in cells	
catabolism	reaction that breaks down molecules
anabolism	reaction the BUILD UP molecules
met reactions take place in pathways, each of which serves a specific function	
multistep pathways controlled by enzymes	
enable cells to carry out their chemical activities w remarkable efficiency	

enzyme controlled reactions

enzymes do NOT provide energy for a reaction or enable one to occur that wouldn't on its own	
enzymes serve as catalytic proteins that speed up reactions by lowering the activation energy	
activation energy	amount of energy needed to begin a reaction
enzymes only affect activation energy and activated complex (how much potential energy this needs/is at)	
transition state	reactive (unstable) condition of the substance after sufficient energy has been absorbed to initiate the reaction
(is after reaches activated complex)	

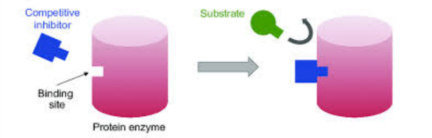
characteristics of enzymes

induced fit model	substrate enters the active site and induces enzyme to alter its shape slightly so substrate fits better
lock and key abandoned bc active site must change	
enzyme binds to its substrate(s) to form enzyme-substrate complex	
enzymes NOT destroyed during a reaction, are reused	
named after their substrate, name ends in "ase"	
ex: sucrase hydrolyzes sucrose	
enzymes catalyze reactions in both directions, to put together AND break apart	
often require assistance from cofactors (inorganic) or coenzymes (vitamins)	
efficiency of enzymes affected by temp and pH	
body temp too high, enzymes begin to denature and lose their unique conformation AND ability to function	

inhibition of enzymatic reactions

regulated by controlling when and where diff enzymes are active	
can be done by switching on and off the genes that code for enzymes or by regulating them once r made	
^(competitive or non competitive inhibition)	

competitive inhibition

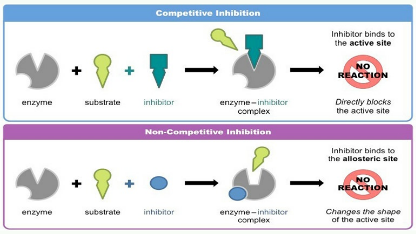


-some compounds resemble substrate molecules and compete for the same active site on the enzymes

-competitive inhibitors reduce amount of product by preventing/limiting the substrate from binding to the enzyme

-can be overcome by increasing the concen of the susbtrate

non competitive inhibition



cooperativity

type if allosteric activation

binding of one substrate molecule to one active site of one subunit of the enzyme causes a change in the the ENTIRE molecule

locks all subunits in the active position

amplifies response of an enzyme to its substrates

negative feedback

positive feedback

hypothalamus//hormones

noncompetitive inhibition

-allosteric: a change in shape alters their efficiency

-noncompetitive inhibitors/allosteric regulators bind to a site distinct and separate from the active site of the enzyme

-causes enzyme to change in shape which inhibits enzyme from catalyzing substrate into product

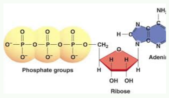
-active when product is formed (substrate binds)

-inactive when no product is formed (inhibitor attached to allosteric site)

-binding of either activator or inhibitor locks or stabilizes the allosteric enzymes in either the active or inactive form

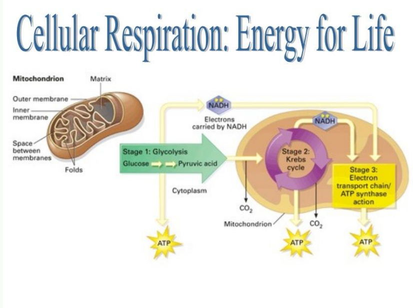
-feedback inhibition can be used to regulate a lengthy metabolic pathway. the end product of the pathway is the allosteric inhibitor for an enzyme that catalyzes an early step in the pathway

ATP



-adenosine is adenine + ribose
-atp is unstable, phosphates are all negatively charged and repel themselves
-when one phosphate group is removed from atp by hydrolysis, more stable adp is formed
-change from less stable molecule to more stable ALWAYS releases energy
-provides energy for all cellular acrivites by transferring phosphates to another molecules

cellular respitation



Makes ATP for cell use; uses glucose and oxygen makes waste products of carbon dioxide and water; occurs in mitochondria; NADH is electron carrier used

glycolysis

(1) occurs in cytoplasm; anaerobic

(2) rearranges the bonds in glucose molecules, releasing free energy to form ATP from ADP through substrate-level phosphorylation resulting in the production of pyruvate.

2 atp + 1 glucose ->2 pyruvate +4atp	(2 net atp)

enzyme that catalyzes third step, PFK is an allosteric enzyme

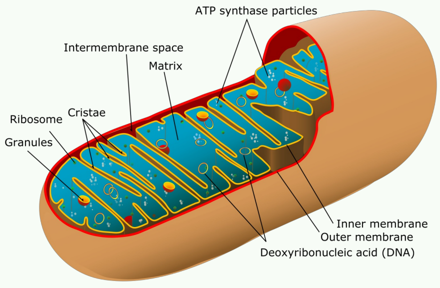
inhibits glycolysis when cell contains enough atp

if atp is present in large quantities, inhibits PFK by altering conformation of that enzyme and stops glycolysis

ex of how cell regulates atp production through allosteric inhibition

PFK is ENZYME

mitochondria structure



matrix-krebs cycle
cristae membrane (inner membrane)-etc
outer compartment (inter membrane space)-proton concen builds up

aerobic respiration: citric acid (krebs cycle)

(1) occurs in mitochondrial matrix

(3) occurs twice per molecule of pyruvate

(4) Pyruvate is oxidized further and carbon dioxide is released; ATP is synthesized from ADP and inorganic phosphate via substrate-level phosphorylation and electrons are captured by coenzymes (NAD+ and FAD).

(5) NADH and FADH2 carry electrons to the electron transport chain.

aerobic respiration: electron transport chain

(1) The electron transport chain captures electrons, pumping H+ ions into the inter-membrane space of the mitochondria.

(2) Electrons are accepted by O2 molecule forming H2O	FINAL ELEC ACCEPTOR!!

aerobic respiration: electron transport chain (cont)

(3) Concentration of H+ builds up within inter-membrane space lowering the pH and ions rush through ATP synthase into the mitochondria matrix. Rush of ions “spins” ATP synthase protein, causing ADP and Pi to join forming ATP by oxidative phosphorylation

series of redox reactions

electroneg oxygen pulls electrons through the etc

NADH provides more energy for atp bc delivers elect to higher energy level in the chain

etc consists mostly of cytochromes

proteins structurally similar to hemoglobin

present in all aerobes

used to trace evolutionary relationships

oxidative phosphorylation and chemiosis

anaerobic respiration: fermentation

a. No oxygen; cell only goes through glycolysis followed by fermentation

b. Fermentation recycles NAD needed to restart glycolysis

e. Fermentation does not make ATP but glycolysis does- 2ATP; very inefficient; sufficient for microorganisms

alcohol fermentation

c. alcohol fermentation ex. yeast cells- glucose ethyl alcohol + CO2+ NAD+

lactic acid fermentation

d. lactic acid fermentation ex. muscle cells- glucose lactic acid + NAD+

photosynthetic pigments

a. Photosynthetic organisms capture free energy present in sunlight and use water and carbon dioxide to make carbon products and free oxygen.

chloroplast structure

photosystems

light reactions

noncyclic photophosphorylation

cyclic photophosphorylation

calvin cycle // light INdependent reactions

photorespiration

modifications for dry environments

cinal link

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