BIO 130 Exam 2 Cheat Sheet

by msingh25 via cheatography.com/126395/cs/24918/

How is Energy defined?

Energy is something you need to do work

Law of Thermodynamics

1st Law of Thermodynamics

Energy can be transferred or transf-ormed but neither created nor destroyed

2nd Law of Thermodynamic

Each energy transfer or transformation increases the disorder

ATP

What is ATP?

Adenosine Triphosphate

What kind of molecule is ATP?

ATP is an energy storing molecule
Called the Cell's Energy Currency
Cells get energy from ATP

What is ATP made of ?

ATP is made out of adenine *(nitogen base)*, ribose (sugar), and phosphate groups

What happens when the bond breaks to the ATP?

ATP loses 1 phosphate group
When it loses a phosphate group it turns into adenosine "Di" phosphate

Stages of Cellular Respiration

1st- Glycolosis

-> Location: Cytoplasm
Splitting sugars in cytoplasm energy investment phase -> 2 ATP molecules combine with glucose molecule

Stages of Cellular Respiration (cont)

2nd- Oxidation

-> Location:Inner membrane and inner membrane space of the mitochondria Pyruvates move into the mitochondria through oxidation. pyruvates brolen into water

3rd- Krebs Cycle

-> Location:Matrix For every glucose, the cycle repeats 2x. The breakdown of pyruvic molecules --> carbon dioxide releases 2 ATPs in this stage

4th -Electron Transport Chain

-> Location: Inner membrane
Membrane bound carriers that transport electrons, produces 32 ATP's

Where does it occur?

Photosynthesis

Chloroplast

Cellular Respiration

Mitochondria

ATP vs ADP

ATP	ADP
Adenosine Triphosphate	**Adenosine Diphos-phate**
ATP is a nucleotide found in cells	**ADP is a nucleotide which has a low amount of energy**
Made of 1 adenine, 1 ribose, and 3 phosphates	**Made out of 1 adenine, 1 ribose, and 2 phosphates**
	ADP is formed when ATP LOSES a phosphate

Anabolic or Catabolic Pathway

Photosynthesis

Photosynthesis is an **Anabolic Pathway** because light energy from the sun is converted into glucose

Cellular Respiration

Cellular Respiration is **Catabolic Pathway** because organic molecules are broken down to release energy

Oxidation Reduction Reactions Vocab

Oxidation

A reaction that **REMOVES** 1 or more electrons from a substance

Reduction

A reaction where electrons are **GAINED** by either removing oxygen, adding hydrogen, or the addition of electrons

Oxidized

When a molecule has **LOST** Electrons and that has increase its oxidation #

Reduced

When a molecule has **GAINED** electrons by losing an oxygen or gaining a hydrogen atom

Oxidation-Reduction Reaction

Any chemical change where 1 molecule **LOSES** electrons and the other molecule **GAINS** electrons

Redox Reaction

Any chemical change where 1 molecule becomes **OXIDIZED** *loses electrons and the other molecule is* ***REDUCED*** *gains electrons*

Oxidizing Agent

The molecule that **GAINS** electrons in an oxidation-reduction reaction and is reduced

Oxidation Reduction Reactions Vocab (cont)

Reducing Agent

The molecule that has a potential to reduce another molecule

Anode

Where Oxidation takes place

Cathode

Where Reduction takes place

How many chromosomes do humans have?

46 or 23 pairs

Stages of The Cell Cycle

1st: Interphase

This is the **1st** stage of the cell cycle and occurs **before** mitosis.
During this phase the cell **GROWS** makes a **copy of it DNA** *(the chromosomes are copied)* and prepares to divide into 2 cells
The 2 structures that are being copied are cylinder shape and are called centrioles

2nd:Prophase

This is the 1st phase of Mitosis
During this phase the **centrioles start to move to the opposite ends of the cell**
The spindle fibers start to form a bridge to connect the cells

3rd:Metaphase

This is the 2nd phase of Mitosis
During this phase, **the chromosomes all line up down the middle of the cell**
(The nucleus has now disappeared)

Stages of The Cell Cycle (cont)

4th: Anaphase

This is the 3rd phase of Mitosis
During this phase **the chromosomes pull apart from each other and move to the opposite sides of the cell**
Thos process is caused by the split of the centromere of each chromosomes. These chromosomes have been pulled by spindle fibers, which has subsequently caused the cekk to stretch out

5th: Telophase

This is the 4th and Final Stage of Mitosis
During this phase **new nuclear membranes form**
a new nuclear envelope has also formed and the spindle fibers have disappeared. There are now 2 new nuclei

6th: Cytokinesis

This is the Final Stage of the Cell Cycle
(This phase occurs with Telophase)
This phase results in the cell spliting into 2 identical daughter cells. The 2 daughter cells both contain the same chromosome set and about half the organelles of the parents
There are differences in this phase of the animal cell & plant cells
Animal cells: The cell membranes squeezes together around the middle of the cell. The cytoplasm pinched into 2 cells. each daughter cell recieves about half the organelles of the parent cell
Plant Cells: A plant cell's rigid cell wall cannot squeeze together in the same way a cell membrane can

Potential Energy vs Kinetic Energy

Potential Energy

Energy an object has due to its position or structure

Kinetic Energy

Energy an object has due to its motion

Metabolism

Metabolism

All the chemical reactions in a cell

Catabolism

All the reactionns that break **LARGE** molecules into **SMALLER** ones
Energy is **Transferred** from food to a stored cellular form (downhill reactions))

Anabolism

All the reactions that build **LARGE** molecules from **SMALLER** ones
Energy is **Required** to build the molecule (uphill reactions)

Competitive Inhibition Vs Non

Competitive Inhibition

The inhibitor copies the substrate and competes for the activation site of the enzyme

Non-Competitive Inhibition

The inhibitor binds to another area on the enzyme, alters the shaoe of the enzyme and prevents the active site from functioning

How do Cells Regulate Enzymes?

Regulation:

-> The regulation of an enzyme may help to regulate metabolism
-> Turns off the genes that regulate enzyme activity
Regulate the enzyme activity once it is made

BIO 130 Exam 2 Cheat Sheet

by msingh25 via cheatography.com/126395/cs/24918/

How do Cells Regulate Enzymes? (cont)

Allosteric Regulation

-> mimics non-competitive inhibition
-> Enzyme function at one site is affected by the binding of a regulatory molecule at another site.

2 Possible ways of Allosteric Inhibitor

1) Inhibitor binds to the allosteric site, blocks the active site and changes the shape of the entire enzyme
2) Inhibitor bind to the allosteric site and changes the shape of the active site

Cellular Respiration

Cellular Respiration (cont)

Calvin Cycle

Products

Glucose

How is ATP Created?

Photosynthesis

ATP is made in light-dependent reactions through ATP synthase, chemiosmosis

Cellular Respiration

ATP is made in chemiosmoisis

Formulas

Balanced Chemical Photosynthesis

6 H2O + 6CO2 -- Sunlight-- C6 H12 O6 +6 O2

Balanced Chemical Cellular Respiration

6 O2+ C6 H12 O6--Sunlight-- 6H2O + 6CO2 + ATP Energy

The Cell Cycle & Mitosis Vocab

Heredity

The passing of traits from parents to offspring

Gene

A segment of DNA on a chromosome that codes a specific trait

Allele

The different forms/variations of a gene

Fertilization

The process where the egg and sperm cell join to form an offspring

Chromosome

DNA condensed into a transportable form after it has replicated; since DNA is replicated, each chromosome contains 2 identical copies

Chromatin

Uncoiled strand of DNA wrapped around proteins called histones

The Cell Cycle & Mitosis Vocab (cont)

Sister Chromatid

Identical copies of DNA attached to each other by the centromere

Homologous Chromosomes

A pair of chromosomes where 2 chromosomes are the same sixe and shape and they contain the same genes with each parent contributing 1 chromosome in each pair

Centromere

Area where the chromatids of a chromosome are attached

Mitosis vs Meiosis

Mitosis	**1) Crossing Over**	⊘
	2) Pairing of Homologues	⊘
	3) Number of Divisions	**1**
	4) Number of Haploid Daughter Cells	⊘
	5)Chromosome Number	***Stays the same***
Meiosis	**1) Crossing Over**	☑
	2) Pairing of Homologues	☑
	3) Number of Divisions	**2**
	4) Number of Haploid Daughter Cells	**4**
	5)Chromosome Number	**1/2**

What is the reaction *(starting materials and products)* for Cellular Respiration?

Glycolysis

Reactants

> Glucose
> 2 ATP molecules
> 2 NAD+

Glycolysis

Products

> 2 Pyruvic Acid
> 2 ATP
> 2 NADH

Citric Acid / Krebs Cycle

Reactants

> 2 Pyruvic Acid *(produced by Glycolysis)*

Citric Acid / Krebs Cycle

Products

> 2 ATP
> 4 CO2
> NADH and FADH2

Electron Transport Chain

Reactants

> Oxygen and Energy Carriers *(produced by Glycolysis and the Citric Cycle)*

Electron Transport Chain

Products

> 32 ATP

Light-Dependent Reactions

Reactants

> Light
> Water

Light-Dependent Reactions

Products

> ATP
> NADPH
> Oxygen

Calvin Cycle

Reactants

> 6 CO2
> 6 ATP
> 6 NADPH

Steps of Mitosis

Interphase
Prophase
Metaphase
Anaphase
Telophase
Cytokinesis

Free Energy

Free Energy

the amount of the systems energy that can do work when temperature and pressure are uniform throughout

Exergonic Reactions

A **Release** of free energy and is **Spontaneous**
G is negative

Endergonic Reaction

Absorbs free energy from its surroundings and is **Non-spontaneous**
G is positive

Enzymes

Properties of an Enzyme:

Recyclable
Are able to maintain their structures
Specific to a substrate
Lower Activation Energy

What type of macromolecules are enzymes?

Enzymes are **protein** macromolecules that act as catalysts

...

Electron Transport Chain

-> 1st part of stage 3
-> Location: inner membrane
NADH and FADH2 are moved across the ETC to oxygen, the final electron acceptor. Proteins in ETC use energy from released electrons to shuttle H+ against the concentration gradient into the inner membrane space

... (cont)

Chemosmosis

-> Location: Inner membrane space, Inner membrane, Matrix
-> Energy from H+ concentration in inner membrane space drives H+ through ATP synthase, which activates catalytic sites that attach a phosphate group to ADP to form ATP

What is the purpose?

Photosynthesis

To make food *(Glucose)* for a Plant Cell

Cellular Respiration

To release usable energy to power a cell

What is needed?

Reactants for Photosynthesis

Light Energy
Carbon Dioxide *(C02)*
Water *(H20)*

Products for Photosynthesis

Glucose *(C6 H12 O6)*
Oxygen *(O2)*

Reactants for Cellular Respirations

Gluclose *(C6 H12 O6)*
Oxygen *(O2)*

Products for Photosynthesis

Usable Chemical Energy
Carbon Dioxide *(CO2)*
Water *(H2O)*

What is?

Substrate-level Phosphorylation

In this process a phosphate group from a substrate molecule directly to ADP, forming ATP

Oxidative Phosphorylation

Final Stage in cellular respiration which the energy stored in electron carrier molecules is used to generate ATP

Can Cellular Respiration aerobic or anaerobic?

Aerobic because it require oxygen

Fate of Pyruvate

Aerobic Conditions

Pyruvate -> acetyl-coA -> Citric Acid Cycle

Anarobic Conditions
Eukaryotic Cell

Pyruvate -> Lactate/Lactic Acid

Anarobic Conditions
Prokaryotic Cell

Pyruvate -> Acetaldehyde -> Ethanol

Photosystems

Photosystems:

An organized complex of chlorophyll,- other pigments and proteins that rap light energy as exicted electrons
Plants have 2 linked photosystems in the thylakoid membrane of chloroplasts
Photosystem II passes an excited electron transport chain to Photosystem I to replace an exicted electron passed to NADPH. The electron lost from Photosystem II is replaced by the oxidation of water.

Photosynthesis & Cellular Respiration

How are Photosynthesis + Cellular Respiration related?

Photosynthesis removes CO2 from the atmosphere and Cellular Respiration puts it back. Photosynthesis releases oxygen into the atmosphere and Cellular Respiration uses that oxygen to release energy from food.

Mitosis vs Meiosis

Mitosis

A process of **Asexual Reproduction** where the cell divides into 2 producing a replica with identical number of chromosomes in a haploid cell

Meiosis

A type of cellular respiration where the number of chromosomes are reduced by half through the separation of homologous chromosomes in a diploid cell

Function of Mitosis

Asexual Reproduction

Function of Meiosis

Sexual Reproduction

Mitosis occurs in:

All Organisms

Meiosis occurs in:

Humans, Animals, Plants, Fungi

Mitosis is Genetically

Identical

Meiosis is Genetically

Different *(Genetic Variance)*

Which phase of the cell cycle does DNA replicate?

Interphase
DNA replicates during interphase. This provides each new daughter cell with a complete nucleus

3 ways variability is achieved

1) Crossing Over & Recombination
2) Independent Segregation of Homologous Chromosomes
3) Random Assortment

What is Spermatogenesis?

Spermatogenesis

The process when the seminiferous tubules of the testes produce sperm cells

When does it occur?

Puberty

What does spermatogonia do?

They divide continously via mitosis unitl puberty all their daughter cells become spermatogonia

It remains at the basal lamina to maintain the germ cell line

Steps of Meiosis

Interphase
Prophase I
Metaphase I
Anaphase I
Telophase I
Prophase II
Metaphase II
Anaphase II
Telophase II