Living Environment Regents Review

EXAM OVERVIEW

Exam Section	Question Type	Raw Score
A	multiple-choice	30
B-1	multiple choice	12
B-2	multiple-choice & free-response	13
C	free-response	17
D	multiple-choice & free-response	13
	Total	85

GRAPH

MULTI STEP BULLET QUESTIONS

LAB SKILLS/STATE LABS

May 14-7:27 AM

Cells

Cell Basics
Cell Transport
Photosynthesis
Cell Respiration
Cell Division

Genetics

Intro to Genetics
DNA/RNA
Genetic Engineering
Human Genome

Evolution

Natural Selection
Mutations
Variations

Ecology

Biosphere
Ecosystems/Communities
Populations
Human Biosphere/Influence

Laboratory Skills

Scientific Method
Organizing Data
Tools and Measurement
Laboratory Safety
Skills

Human Body Systems

Overview and Homeostasis
Nervous System and Drugs
Skeletal, Muscular and Integumentary Systems
Circulatory and Respiratory Systems
Digestive and Excretory Systems
Endocrine and Reproductive Systems
Immune System and Disease

May 14-7:35 AM

http://www.regentsprep.org/Regents/biology/biology.cfm

May 14-7:39 AM

ORGANIZATION OF LIFE

I. Living vs. Non-Living

Living Things perform the Following **Life processes**

-digestion
-respiration
-circulation
-excretion
-locomotion
-immunity
-coordination
-synthesis

Non-living things are incapable of carrying out at least one or more of the life processes.

metabolism: sum of the energy used in all the life processes

May 26-9:40 AM

Homeostasis:

The ability to carry on the **life processes** allow a living thing to maintain **dynamic equilibrium** or **homeostasis** with their surroundings.

Homeostasis is a state of balance or steady state between a living thing and its environment

May 26-9:46 AM

II. Organizational Levels

Levels of Organization

Living things have different levels of organization.

cell- The simplest level of organization/Basic unit of life

tissue-A group of cells with a similar function.An example of this would include the nervous, muscle, and other tissues which make up the heart

organs-Groups of tissues working together to perform a common function

organ system- A Groups of organs working together to perform a common function . blood vessels, blood, and the heart are organs which work together to form the circulatory system.

Homeostasis in an organism is constantly threatened. Failure to respond effectively can result in disease or death

May 26-1:09 PM

III. Cell Structure

Cells have particular structures or organelles that perform specific jobs. These structures perform the life activities within the cell

Cell organelles carry out:

-transport of materials,
-energy capture and release,
-protein building,
-waste disposal
-information storage.

Each cell is covered by a membrane that performs a number of important functions for the cell as well.

May 26-1:19 PM

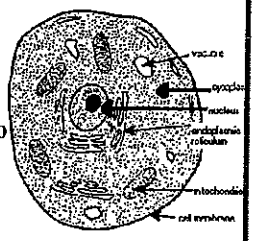
THE CELL THEORY

- The cell is the unit of structure in all living things.
- The cell is the unit of function in all living things.
- All cells come from preexisting cells.

A Few Exceptions:

1)Viruses lack typical cellular structure.

2)There also is some question as to how the first cell arose



May 26-1:25 PM

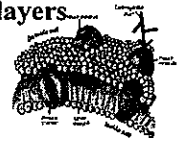
Some Cell Organelles

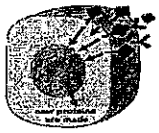
Cell Organelle	Function
nucleus	control center of the cell contains DNA which directs the synthesis of proteins by the cell
mitochondrion	carries on the process of cell respiration converting glucose to ATP energy the cell can use
endoplasmic reticulum	transport channels within the cell
ribosome	found on the endoplasmic reticulum and free within the cell responsible for the synthesis of proteins for the cell
cell membrane	selectively regulates the materials moving to and from the cell
food vacuole	stores and digests food
contractile vacuole	pumps out wastes and excess water from the cell
chloroplast	found in plant cells and algae carries on the process of photosynthesis
cell wall	surrounds and supports plant cells

May 26-1:32 PM

Cell Membrane/Plasma Membrane

The cell membrane consists of <u>two layers</u> of <u>phospholipids</u> with <u>proteins</u> embedded within these layers.



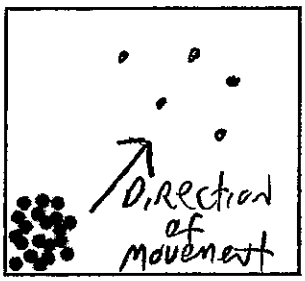


<u>Important function of Cell Membrane:</u>
-separation of the cell from its outside environment
-controlling which molecules enter and leave the cell
-recognition of chemical signals.

May 26-1:34 PM

Membrane Processes

Diffusion or **passive transport** is the movement of materials from a region of higher to a region of lower substance concentration.

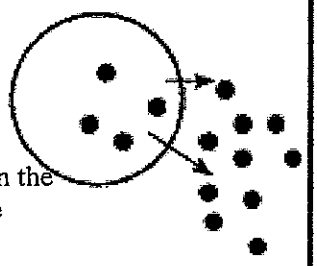


NO ENERGY REQUIRED!!!!!!!!!

May 27-8:51 AM

Active Transport

In **active transport,** molecules move from a region of lower concentration to a region of higher. concentration.



The cell has to **use energy** in the form of **ATP** to make **active transport occur.**

May 27-8:55 AM

Cell Chemistry

Many **organic and inorganic substances** dissolved in cells allow necessary chemical reactions to take place in order to maintain life.

organic: compounds that contain the atoms carbon and hydrogen together

inorganic: compounds that do not contain carbon or hydrogen together

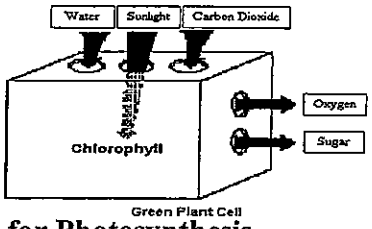
Organic Molecules and Digestive End Products	
Organic Molecule	Digestive End Product(s)
carbohydrates	simple sugars (glucose)
proteins	amino acids
lipids (fats)	fatty acids and glycerol

May 27-8:58 AM

Biochemical Processes

Photosynthesis:

The energy for life comes primarily from the Sun
Photosynthesis is the major way the energy of the Sun is converted to sugars which provide for the energy needs of living systems.



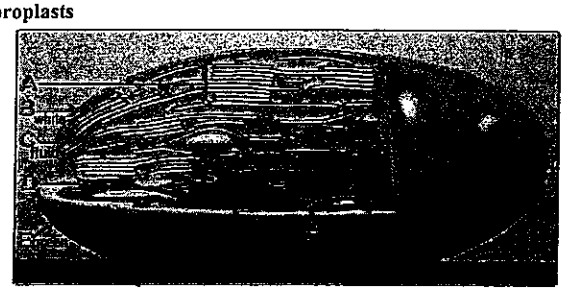
Equation for Photosynthesis

carbon dioxide + water → glucose + oxygen
(sunlight + enzymes needed)

May 31-10:23 AM

chloroplasts: organelles that carry on photosynthesis in green plant cells

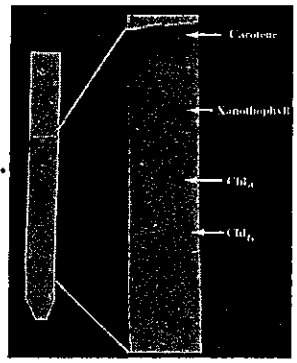
chlorophylls: the variety of green pigments within the chloroplasts



May 31-10:29 AM

Chromatography

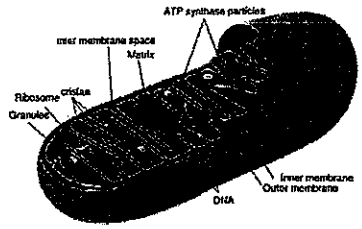
Pigments may be separated according to their various chemical charges by a technique known as chromatography.



May 31-10:30 AM

Respiration

Stored energy is released when chemical bonds are broken during cellular respiration and new compounds with lower energy bonds are formed. Cells usually transfer this energy temporarily in phosphate bonds of a high-energy compound called ATP. (adenosine triphosphate)



Jun 1-9:01 AM

Equations for Cell Respiration

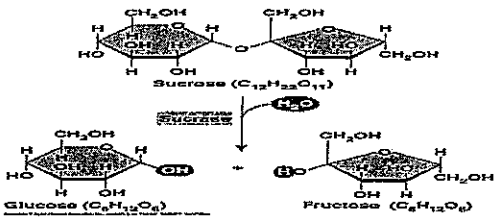
glucose + oxygen → carbon dioxide + water + ATP

The energy from ATP is then used by the organism to obtain, transform, and transport materials, and to eliminate wastes.

water + ATP → ADP + P + Energy

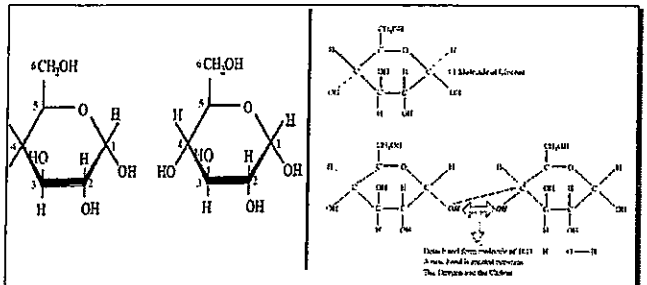
May 31-10:31 AM

Types of Reactions



hydrolysis: reaction in which large molecules are broken down into smaller molecules. Chemical digestion is an example of a hydrolysis reaction

May 31-10:35 AM



synthesis: the combining of simpler molecules to form a more complex molecule

Jun 1-9:05 AM

Biochemical processes, both hydrolysis and synthesis, are made possible by enzymes. Enzymes and other molecules, such as hormones and antibodies, have specific shapes that influence both how they function and how they interact with other molecules.

Enzyme Structure and Function

catalyst: inorganic or organic substance which speeds up the rate of a chemical reaction without entering the reaction itself.

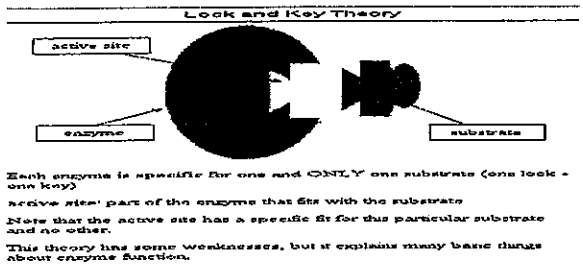
enzymes: organic catalysts made of protein.
* most enzyme names end in -ase
* enzymes lower the energy needed to start a chemical reaction. (activation energy), thus speeding the reaction

May 31-10:36 AM

How do enzymes work?

substrate: molecules upon which an enzyme acts. The enzyme is shaped so that it can only lock up with a specific substrate molecule .

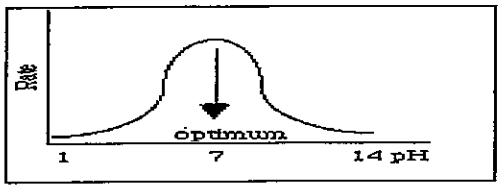
enzyme
substrate ----------> product



May 31-10:37 AM

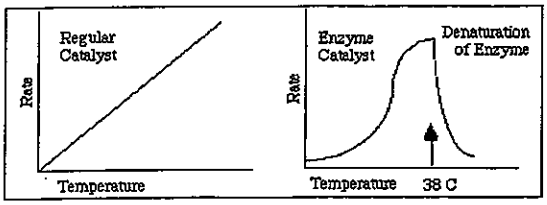
Factors Influencing Enzyme Activity

Factors Influencing Enzyme Activity
1.pH: the optimum (best) in most living things is close to 7 (neutral). High or low pH levels usually slow enzyme activity



May 31-10:38 AM

2. Temperature: strongly influences enzyme activity
*** optimum (best) temperature for maximum enzyme function is usually about 35-40 C.**
*** reactions proceed slowly below optimal temperatures**
*** above 45 C. most enzymes are denatured (change in their shape so the enzyme active site no longer fits with the substrate and the enzyme can't function)**



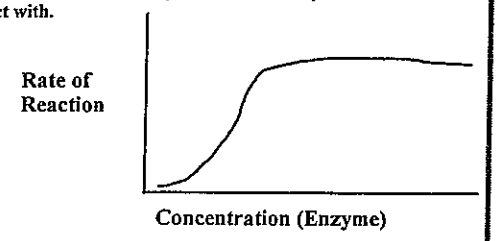
May 31-10:39 AM

3. Concentrations of Enzyme and Substrate

When there is a fixed amount of enzyme and an excess of substrate molecules the rate of reaction will increase to a point and then level off.

This leveling off occurs because all of the enzyme is used up and the excess substrate has nothing to combine with.

If more enzyme is available than substrate, a similar reaction rate increase an leveling off will occur. The excess enzyme will eventually run out of substrate molecules to react with.



May 31-10:40 AM

IV: Life Functions

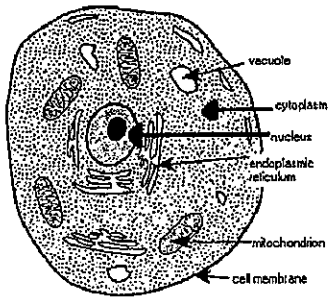
Life Processes

Humans and other complex organisms require many different organ systems to carry on the activities required for life

Life Processes	
Digestion	breakdown of food to simpler molecules which can enter the cells
Circulation	the movement of materials within an organism or its cells
Movement (locomotion)	change in position by a living thing
Excretion	removal of waste products by an organism (wastes may include carbon dioxide, water, and urea in urine and sweat)
Respiration	process which converts the energy in food to ATP (the form of energy which can be used by the cells)
Reproduction	the making of more organisms of one's own kind -- not needed by an individual living thing but is needed by its species
Immunity	the ability of an organism to resist disease causing organisms and foreign invaders
Coordination	the control of the various activities of an organism (mostly involves the nervous system and endocrine glands in complex animals)
Synthesis	the production of more complex substances by combining two or more simpler substances

May 27-9:05 AM

Realize that **cell organelles** are involved in many of these **life processes,** as well as the **organ systems** of complex organisms.



May 27-9:12 AM

V. Cellular Communication

Cell Membrane Receptors

Many cell membranes have receptor molecules on their surface. These receptor sites play an important role in allowing cells and organs to communicate with one another.

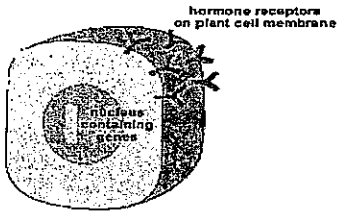
receptor sites on the surface of the cell membrane which can fit a hormone having a complementary shape

Hormones provide a primary way for cells to communicate with each other. A **hormone** is a chemical messenger with a specific shape that travels through the bloodstream influencing another **target cell** or **target organ.** Upon reaching the cell the hormone is targeted for, the hormone often activates a gene within a cell to make another necessary compound.

May 27-9:16 AM

Hormonal Regulation

Hormones provide a way for cells to communicate with each other. A **hormone** is a chemical messenger with a specific shape that travels through the bloodstream influencing another **target cell** or **target organ**. Upon reaching the cell the hormone is targeted for, the hormone often activates a gene within a cell to make another necessary compound.



May 27-9:17 AM

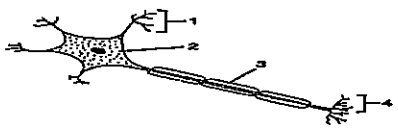
Nervous Regulation

Nerve cells or neurons also allow cells to **communicate** with each other. Neuron communications are one way organism can **detect and respond to stimuli** at both the cellular and organism level.

Neurons may stimulate other **nerve cells or muscle cells**, thus causing the later to **contract and produce movement**

May 27-9:23 AM

Structure and Function of a Nerve Cell



Structures and their Functions

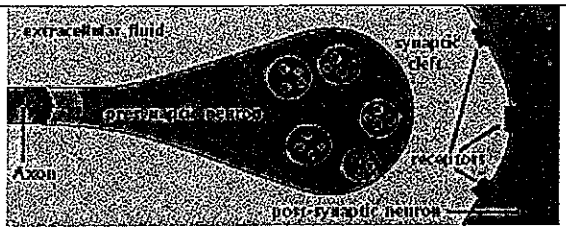
1. **dendrite** -- neuron branch which detects stimuli (changes in the environment)

2. **cyton** -- body of the neuron where normal metabolic activities occur

3. **axon** -- longest dendrite covered by a myelin sheath which provides electrical insulation -- carries nerve message or impulse to the end brushes

4. **end brushes** -- release nerve chemicals called **neurotransmitters** which stimulate adjacent dendrites on the next neuron or a muscle cell

May 27-9:29 AM



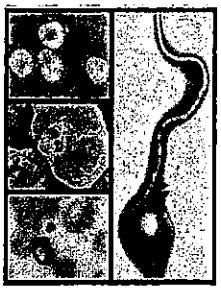
Neurotransmitters:
Chemicals used by a neuron to transmit a nerve impulse across a synapse from one neuron to the next neuron.

May 31-10:21 AM

Disease

Some Causes of Disease

Living organisms which cause disease are known as pathogens.
viruses, bacteria, fungi are examples.



An **antigen** is any **foreign substance** which invades the body of an organism, while a **pathogen** is a **living antigen** (such as viruses or bacteria) which invade an organism.

Jun 1-9:22 AM

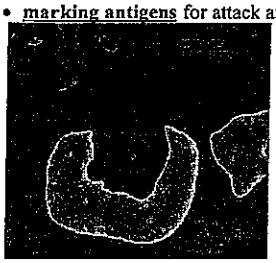
Immunity describes the ability of an organism to resist foreign organisms or invaders which enter its body.

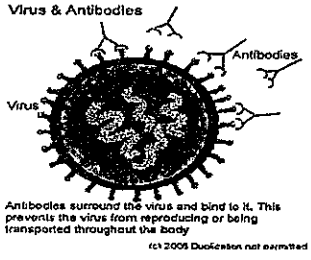
The **immune system** is designed to protect against microscopic organisms (bacteria, viruses) and foreign substances which enter an organism from outside its body.

Jun 1-9:27 AM

Many different kinds of white blood cells exist which are able to help the body fight foreign invaders in various ways. These various ways include:

- engulfing (eating) invaders (phagocytes are white blood cells doing this)
- producing antibodies (chemicals which destroy or neutralize antigens) (lymphocytes are the kind of white blood cells which produce antibodies)
- marking antigens for attack and killing by other white blood cells





Antibodies surround the virus and bind to it. This prevents the virus from reproducing or being transported throughout the body

Jun 1-9:31 AM

Immune System Memory and Vaccinations

When organisms are exposed to disease, they make **specific antibodies** which **destroy that antigen** during their first exposure to it.

Our immune system has a **Memory**
This means that if we ever are exposed to that same particular disease antigen again, our immune system has a memory and will make antibodies so rapidly in response to another exposure that we will not get the disease

Vaccinations use dead or weakened microbes or parts of them to stimulate the primary immune response or first production of antibodies. Using dead or weakened microbes has the advantage of not making the organism sick as they would become if they caught and recovered from a disease.

Jun 1-9:35 AM

Allergies and Auto-immune Diseases

Allergies: the body's immune system produces chemicals in response to normally harmless substances

Auto-immune diseases: the body's immune system for usually unknown reasons may attack and destroy some its own cells. Some kinds of arthritis and degenerative diseases result from auto-immune

AIDS: a viral disease which destroys the ability of the immune system to produce antibodies, so the afflicted individual is unable to cope with infections and cancer cells which arise within the body.

Cancer: a group of diseases resulting from gene mutations which cause cells to divide uncontrollably. Exposure of cells to certain chemicals and radiation appears to increase the chance of mutations and thus cancer.

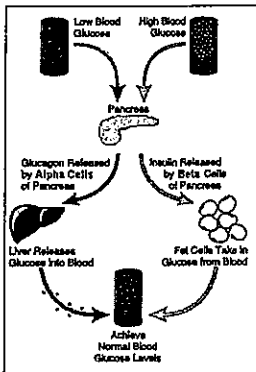
Jun 2-3:38 PM

Feedback Mechanism Examples

Feedback mechanisms have evolved in living things as a mechanism by which they maintain homeostasis or dynamic equilibrium.

A feedback mechanism occurs when the level of one substance influences the level of another substance or activity of another organ.

Jun 2-10:01 PM



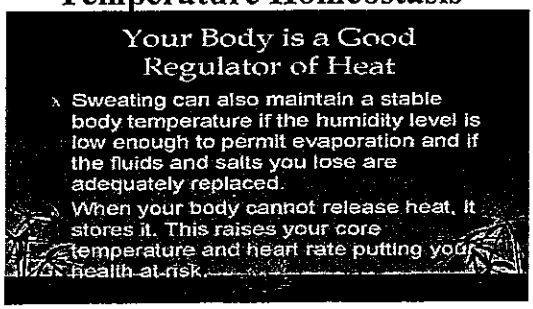
An increase in blood sugar level triggers the release of the hormone insulin by the pancreas

the hormone insulin lowers blood sugar level restoring the body to its original blood glucose level in two major ways:

* it increases the ability of body cells to take in glucose from the blood
* it converts blood glucose to the compound glycogen -- this compound is also called animal starch and is stored in our liver and muscles

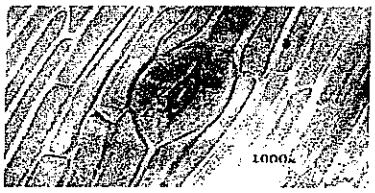
Jun 2-10:13 PM

Temperature Homeostasis



Jun 2-10:07 PM

Homeostasis by Plants Maintenance of Water

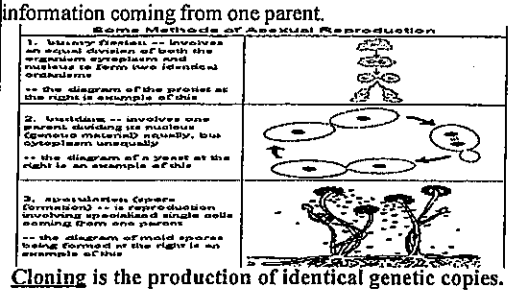


The ability of the guard cell to close during periods of limited water availability for the plant allows the plant to maintain water homeostasis

Jun 2-10:10 PM

Reproduction

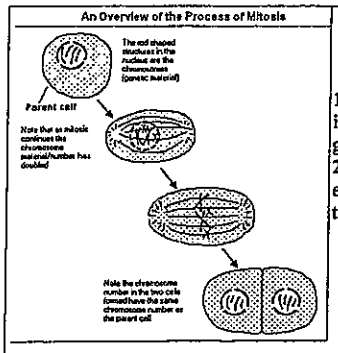
Asexual reproduction is a method of reproduction with all the genetic information coming from one parent.



Cloning is the production of identical genetic copies.

Mitosis is associated with asexual reproduction, as well as growth and repair in sexually reproducing organisms.

Jun 2-10:18 PM



Mitosis

Key Results of Mitosis

1. The same chromosome number is retained from generation to generation.
2. Each daughter cell receives an exact copy of the chromosomes of the parent cell. (clones)

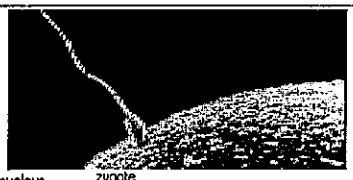
Jun 2-10:25 PM

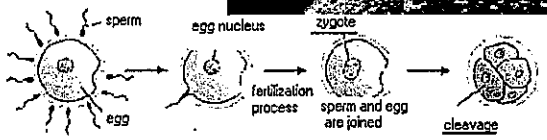
Sexual Reproduction

Sexual reproduction involves two parents.
Both parents normally contribute one gamete or sex cell to the process.
The female gamete is called the egg or the ovum and the male gamete is called a sperm.
The gametes are formed in specialized reproductive structures called gonads. The sperm is much smaller than the egg, but is capable of moving on its own power using a whip-like tail called a flagellum.

Jun 2-10:30 PM

Sperm and Egg (fertilization)



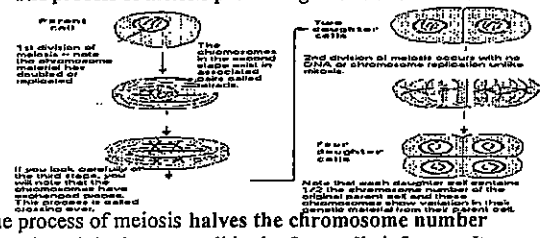


The development of specialized structures from the zygote is called differentiation.

Jun 2-10:33 PM

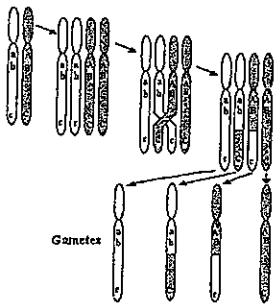
Meiosis

The process of meiosis produces gametes or sex cells.



The process of meiosis halves the chromosome number from the original parent cell in the four cells it forms. It does this by having two cell divisions forming four cells, where mitosis has only one cell division forming two cells.

Jun 2-10:36 PM



Crossing-over and recombination during meiosis

Crossing over assures that the cells produced as a result of meiosis will be different from and exhibit variations from the parent cell that produced them

Jun 2-10:38 PM

Comparative Reproduction and Development

External fertilization: Organisms like fish tend to lay their eggs in great numbers (thousands) in the water

Internal fertilization: the male of the species deposits his sperm inside the female

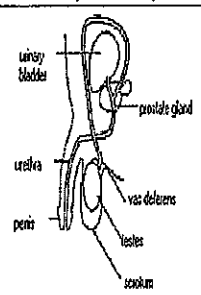
External development: The young organisms then develop outside the mother in the water

Internal development: development occurs within the female organism.

Jun 2-10:43 PM

Human Reproductive System

Male Reproductive System



Male Reproductive System Structures

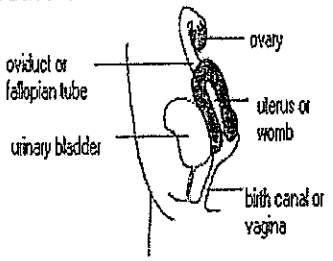
1. testes -- produces sperm and the hormone testosterone
2. scrotum -- pouch enclosing the testes keeping the sperm at an optimum temperature for development
3. vas deferens -- tube carrying sperm away from the testes
4. prostate gland -- the largest of several glands which add lubricating and other fluids to the sperm

-- this combination of sperm and fluids is called semen

5. urethra -- tube through the penis carrying sperm to the outside of the body
6. penis -- adaptation for internal fertilization of the female

Jun 2-10:51 PM

Female Reproductive System



Female Reproductive System Structures

1. ovary -- (females have two of these) -- produce female gametes or eggs and the hormone estrogen

2. oviduct (fallopian tube) -- carries the egg away from the uterus

-- internal fertilization normally occurs here

3. uterus -- implantation and development of the embryo and fetus before birth occurs here

4. vagina or birth canal -- entry point for sperm from the male and exit tube for the baby when it is born

Jun 2-10:52 PM

Endocrine Interactions

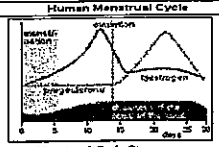
testosterone -produced by the testes in the male and stimulates the development of male secondary sex characteristics (like facial hair and deeper voice).

estrogen -- produced by ovaries in the female and stimulates the development of female secondary sex characteristics (wider hips and mammary glands) as well as starting the thickening of the uterus lining in preparation for a possible pregnancy after the egg is released by the female each month.

progesterone -produced by yellow tissue called corpus luteum in the empty ovarian follicle (place in ovary producing and releasing the egg -- this hormone maintains the thickness of the uterus lining in case fertilization occurs and development of a fetus occurs.

Jun 2-10:56 PM

Human Menstrual Cycle



Menstrual Cycle Stages

1. follicle stage (10-14 days average duration)
   * production of ova/eggs occurs in tiny cavities in the ovary called follicles
   * enlarging follicle produces estrogen which causes the uterus to get ready for embryo implantation (uterus thickens its lining)

2. ovulation (1 day)
   * follicle enlarges and ruptures ovary wall
   * egg is released to the oviduct (usually only 1 is released at a time)

3. corpus luteum stage (10 -14 days average duration)
   * yellow tissue fills the follicle after ovulation called the corpus luteum
   * "yellow body" secretes progesterone which maintains the thickness of the uterus in case a pregnancy occurs

4. menstruation (3-5 days average duration)
   * periodic shedding of the thickened lining of the uterus which occurs if fertilization does not occur

Jun 2-10:59 PM