Living Environment Name_____

Human Reproduction/Development and Homeostasis

Reproduction and Development

Reproduction

Humans undergo sexual reproduction. In sexual reproduction, offspring receive half of their genes from their mother and half of their genes from their father.

The genes involved are carried on chromosomes in sex cells (aka gametes, sperm-males, egg-female). When the gametes join fertilization occurs.

In sexual reproduction since the offspring gets half of its genetic material from each parent it is not identical to either of its parents. This is the opposite of asexual reproduction where all the offspring are identical to the parent.

Cloning – a technique used to make identical organisms

Cloning in plants can be quite simple, if you cut a piece of stem from a plant and it grows roots and develops into a new plant, you have produced a clone of the original plant. Ex. Spider plants

It is also possible to clone animals. This is done by inserting a nucleus from a "parent" organism's cell into an egg cell from which the nucleus has been removed. The result is an egg that got 100% of its genetic information from a single parent; therefore it is considered a clone.

Variation among the sex cells is accomplished because of meiosis. Variation can also occur because of crossing over.

Meiosis makes gametes. In humans 4 sperm cells or 1 egg and three polar bodies are produced each time meiosis occurs.

Development

Fertilization occurs inside of the female's fallopian tube. A fertilized egg is called a zygote and has double the chromosomes of a sex cell (2n).

When the zygote is formed it contains all of the genetic information needed by the offspring. This process results in recombination.

Recombination – the additional mixing of genetic material from a sperm and egg which results in a unique combination of gene.

The fetus develops in the uterus. Cells divide without becoming larger through cleavage. After a few days, cells begin to differentiate into different types of cells (nerve, skin, bone, etc.). At this stage the embryo is very vulnerable to alcohol, drugs, etc. because the important organs and systems are just starting to develop.

Differentiation – the process that transforms developing cells into specialized cells with different structures and functions

Homeostasis

An organism's external and internal environment is always changing. As a result, living things must be able to respond to changes in the environment. Stability is maintained when an organism has the ability to detect and react with appropriate action to the environment in order to maintain homeostasis.

Homeostasis – the ability of an organism to maintain a stable internal environment even when the external environment changes

Organisms have a variety of mechanisms that maintain the physical and chemical aspects of their internal environment. Some scientists prefer the term dynamic equilibrium over the term homeostasis, because it refers to the many small corrections that an organism is constantly making in order to maintain its internal limits.

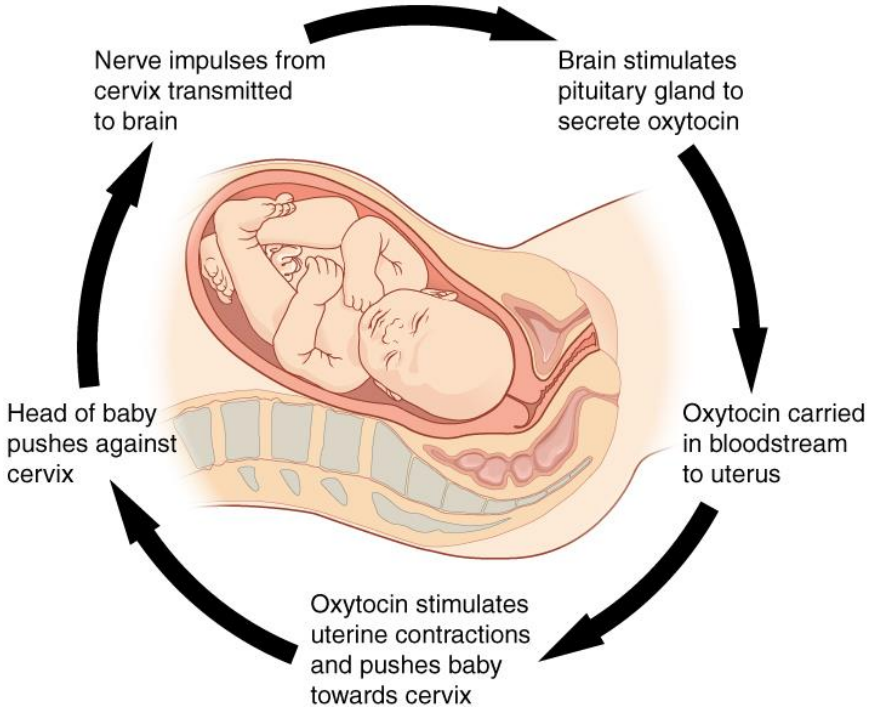
Dynamic Equilibrium – the constant small corrections that normally occur to keep an organism's internal environment within the limits needed for survival

Feedback Mechanism – a cycle in which the output of a system either modifies or reinforces the first action taken by the system

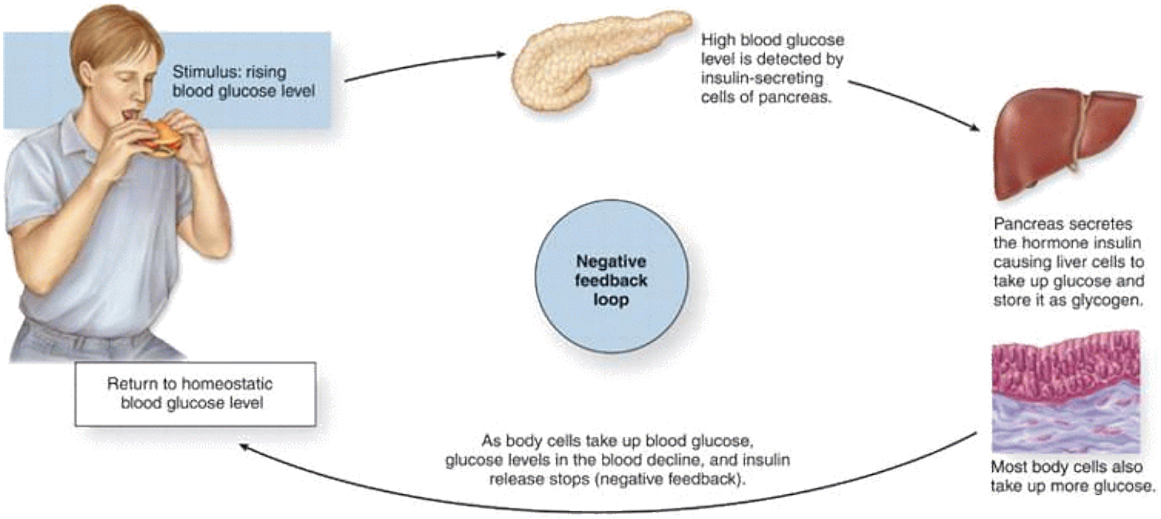
Some feedback responses are simple, while others are more complex. A simple feedback response may be a hormone that regulates a chemical process in an organism. An example of a more complex feedback response might be a behavior suck as bird migration.

Positive Feedback vs. Negative Feedback

Positive Feedback – feedback that increases the output of a system

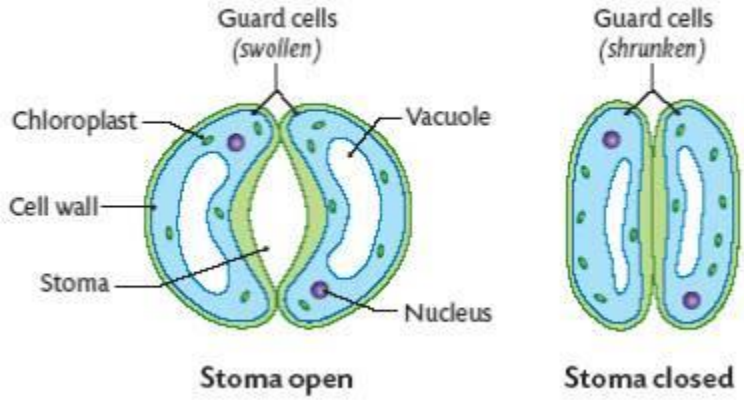


Negative Feedback – Feedback that decreases the output of a system



Other examples of cell/organ feedback:

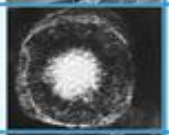
- Increased muscle activity is often accompanied by an increase in heart rate (so the muscles can get an increase in blood flow and oxygen)
- In plant cells when there is a water shortage guard cells change shape (to reduce evaporation).



Failure of Homeostasis

When homeostasis can't be maintained an organism can become sick or die.

Disease – a condition, other than injury that prevents the body from working as it should

Type of pathogen	Description	Human diseases caused by pathogens of that type
Bacteria *Escherichia coli* 	Single-celled organisms without a nucleus	Strep throat, staph infections, tuberculosis, food poisoning, tetanus, pneumona, syphilis
Viruses *Herpes simplex* 	Non living particles that reproduce by taking over living cells	Common cold, flu, genital herpes, col sores, measle, AIDS, genital warts, chicken pox, small pox
Fungi *Death cap mushroom* 	Simple organisms, including mushrooms and yeasts, that grow as single cells or thread like filaments.	Ringworm, athlete's foot, tineas, candidiasis, histoplasmosis, mushroom poisoning
Protozoa *Giardia lamblia* 	Single-celled organism with a nucleus.	Malaria, "traveller's diarrhea" giardiasis, typano somiasis ("sleeping sickness")

Types of pathogens that commonly cause human diseases include bacteria, viruses, fungi, and protozoa. Which type of pathogen causes the common cold? Which type causes athlete's foot?

Causes of Disease (Pathogens)

- Viruses (AIDS, cold, flu, chicken pox)
- Bacteria (strep throat, food poisoning, syphilis – treated with antibiotics)
- Fungus (athlete's foot, ringworm)
- Parasites (tapeworm, leeches)
- Genetic Disorders (Down's Syndrome, sickle cell, cystic fibrosis)
- Environmental Toxins (lead poisoning, radiation)
- Poor Nutrition (scurvy, goiter)
- Organ Malfunction (heart attack, diabetes)
- High Risk Behavior (smoking, drug use, exposure to sun)