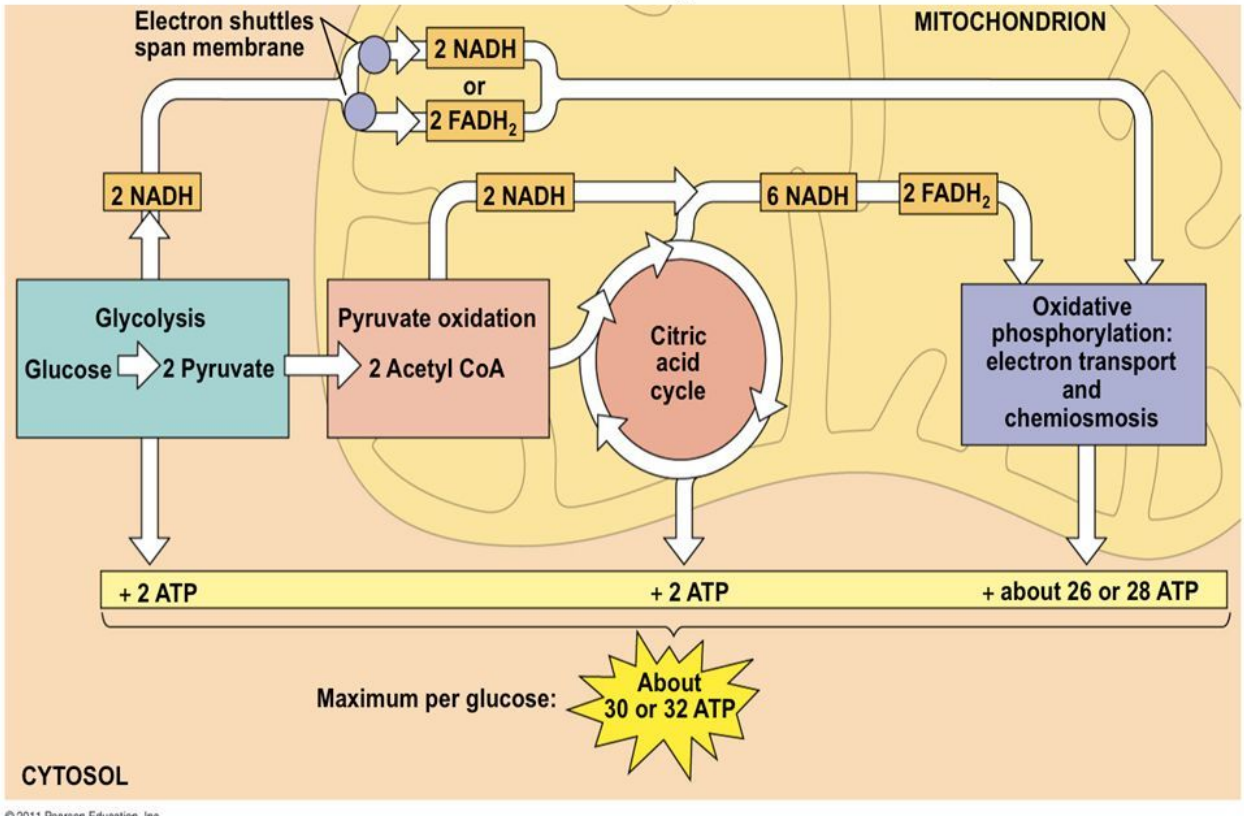
Elijah Banks
Diamond Adams
Raequon Mack
Rilajah Baynes

Cellular Respiration

Cellular respiration is the process where organisms burn food to produce energy. The starting material of cellular respiration is glucose, which has energy stored in its chemical bonds. You can imagine glucose as a cellular piece of coal, full of energy, but useless when you want to power a source. Just as burning coal produces heat and energy in the form of electricity, the chemical processes of respiration convert the energy in glucose into a usable form. Adenosine triphosphate (ATP) is the usable form of energy produced by respiration. For example, ATP is like the electricity that could power the stereo: it contains the same energy as coal, but it's easier to transport and is just what's needed when the cell needs some power to carry out a process.

Photosynthesis makes the glucose that is used for cellular respiration to make ATP. The glucose is then turned back into carbon dioxide, which is used in photosynthesis. Water is being broken down to form oxygen during photosynthesis, in cellular respiration oxygen is combined with hydrogen to form water. While photosynthesis requires carbon dioxide and releases oxygen, cellular respiration requires oxygen and releases carbon dioxide. It is the released oxygen that is used by us and most other organisms for cellular respiration. Here's a visual to get a better understanding of what goes on during cellular respiration.

Cellular Respiration



1. **Plants and animals exchange materials through the processes of photosynthesis and respiration. Which of these statements is true about the way these two processes are related?**

a) The products of photosynthesis prevent respiration
b) The products of photosynthesis are also the products of respiration
c) The reactants of photosynthesis are also the reactants of respiration
d) The product of photosynthesis are the reactants of respiration

2. **What are the products of photosynthesis and reactants of respiration?**

a) ATP and ADP
b) Water and Oxygen
c) Glucose and Oxygen
d) Hormones

3. **What is the first step of cellular respiration?**

a) Glycolysis
b) Link reaction
c) krebs cycle
d) Electron transport chain

4. **Explain the role of chloroplast in photosynthesis and why it is important.**
5. **Compare and contrast aerobic and anaerobic respiration**

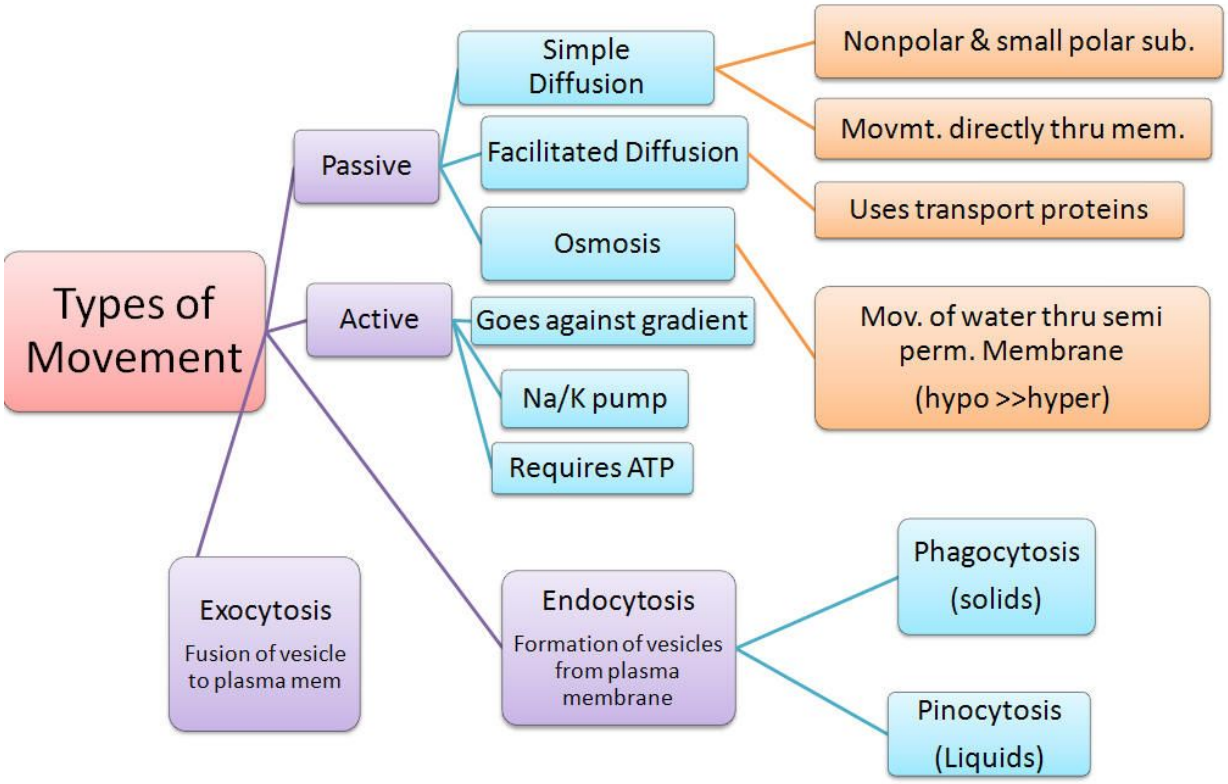
ESSENTIAL QUESTIONS

1. What is the energy molecule used by all living things?
2. What are the reactants and products for cellular respiration?

Homeostasis and transport

All body systems work together to maintain homeostasis. Passive transport (including diffusion and osmosis) is the movement of materials across the cell membrane without cellular energy. The movement of materials against a concentration differences is known as active transport. Cell transport helps cells maintain homeostasis by keeping conditions within normal ranges inside all of an organism's cells. A cell seeks to maintain homeostasis within the cell therefore osmosis will occur. The cell will change the concentration of water within the cell to match the concentration of water outside the cell. Exocytosis is the reverse process, where a cell expels large particles, usually waste from cellular processes. These processes both require energy but are important for the cell to maintain homeostasis. Endocytosis is a form of active transport in which a cell transports molecules (such as proteins) into the cell by engulfing them in an

energy-using process.(ATP) Endocytosis and exocytosis can occur in the same cell. It is how a cell transports and exports material in and out.



1. **Which is an example of a homeostasis mechanism?**

a) Sweating when you become cold
b) Shivering when you are cold
c) Releasing urine and feces
d) Wearing less clothes since it is warm

2. **Compare and contrast hypertonic, hypotonic, and isotonic solutions.**
3. **Two solutions are placed on either side of a selectively permeable membrane. The membrane is permeable to solute. There is a higher concentration of solute particles on the left side of the membrane. In which direction will the solute particles move? Why?**
4. **How would the body respond to an increased environmental temperature?**

a) Hairs on body erect

b) Sweating
c) shivering
d) become sleepy

5) **Which hormone regulate the amount of glucose in the blood?**

a) Pepsin
b) Trypsin
c) Insulin
d) Glycine

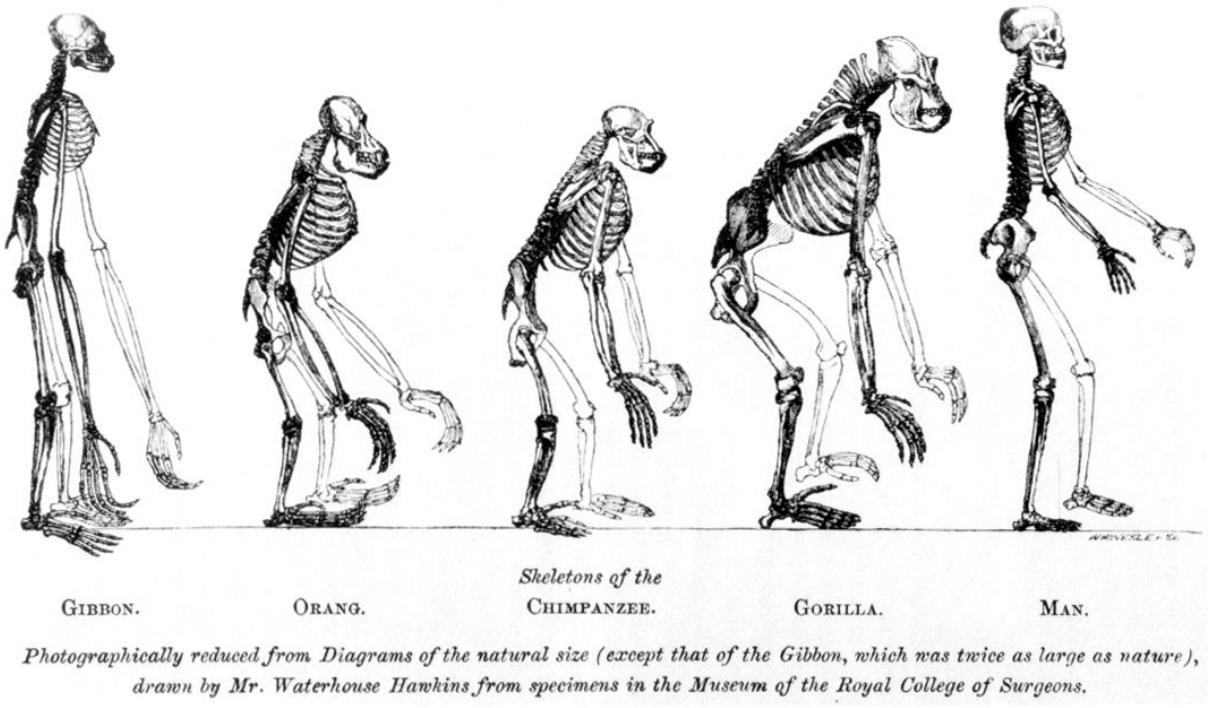
ESSENTIAL QUESTIONS

1. . How do the body systems coordinate & interact to maintain homeostasis of the whole organism?
2. How does disease always represent a loss of homeostasis?

Theory of Evolution

The theory of evolution by natural selection, first formulated in Darwin's book "On the Origin of Species" in 1859, is the process by which organisms change over time as a result of changes in heritable physical or behavioral traits. Changes that allow an organism to better adapt to its environment will help it survive and have more offspring. Evolution by natural selection is

one of the best substantiated theories in the history of science, supported by evidence from a wide variety of scientific disciplines, including paleontology, geology, genetics and developmental biology. All life on Earth is connected and related to each other and this diversity of life is a product of modifications of populations by natural selection, where some traits were favored in and environment over others. The other theory is that that there was a greater being who created men and women and we developed from there.



Photographically reduced from Diagrams of the natural size (except that of the Gibbon, which was twice as large as nature), drawn by Mr. Waterhouse Hawkins from specimens in the Museum of the Royal College of Surgeons.

Here's a link to a video for a better explanation.

https://www.youtube.com/watch?v=11hJal7qAtU

1. **What is the study of the early development of an organism?**
   a) Fossils
   b) Embryology
   c) Homologous
2. **What did the theory of evolution state, and which statement was true?**
   a. People are created from god

b. Every specie comes from an earlier specie
c. The human species evolved from chimpanzees
d. People evolve not population

3. **True or false? a dolphin fin and a human arm are homologous structure**
   a. True
   b. False
4. **In your own words describe what the theory of evolution is stating.**
5. **What's the biggest difference between homologous and analogous structures? Explain.**

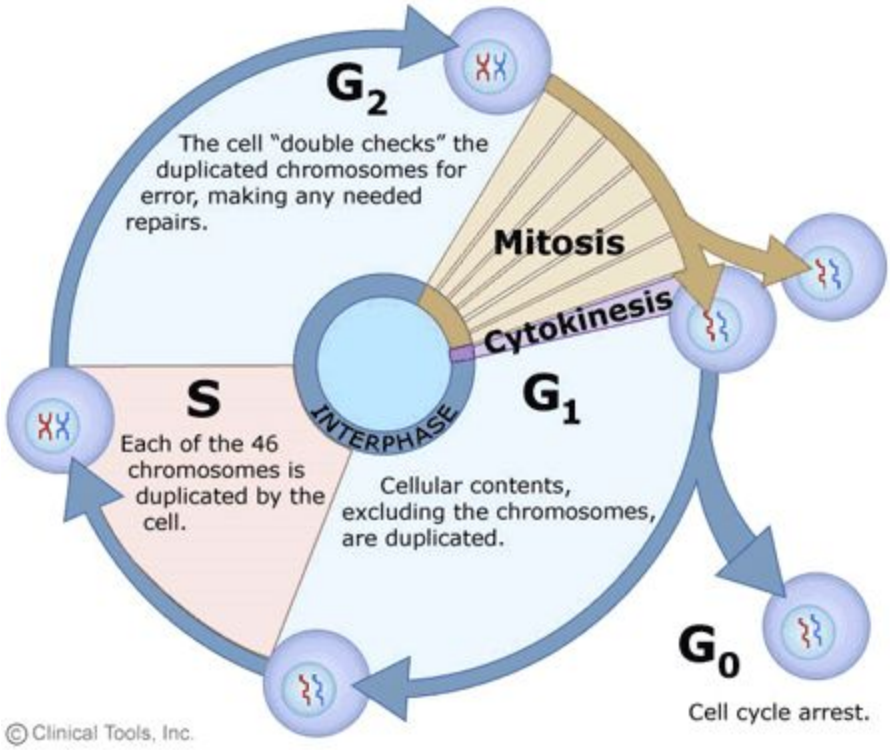
ESSENTIAL QUESTIONS

1. What is meant by evolution?
2. Are certain lines of evidence for evolution stronger than others?

Cell growth and Reproduction

Cell growth and reproduction can also be known as "the cell cycle." The cell cycle describes the stages of a single cell's life. There are three main stages which are interphase, nuclear division, and cytokinesis. Interphase is the longest stage in the cell cycle because during the G1 stage the cell grows and then replicates DNA in the S stage and ready to divide in the G2 stage. There are two types of cellular reproduction, mitosis and meiosis. These processes are responsible for creating two different types of cells. Mitosis is a process that creates a nearly exact copy of the original cell. Somatic cells, which include nearly all human cells, are created by this process. Meiosis is a different form of reproduction that leads to the production of germ cells, or sex cells. he goal of cellular reproduction is to reproduce a copy of a preexisting cell. Cells achieve this by first copying their contents and then dividing them so each of the resulting two cells has the same components. These processes are a part of a larger cell cycle that also

includes periods of preparation for synthesizing copies of cellular components and division. This cycle occurs continuously in most organisms.



1. **What role does cytokinesis play in the cell cycle?**
   a) Nuclear division
   b) Copying DNA
   c) The final stage
   d) All of the above
2. **How many phases is Mitosis duplicated of in the nucleus?**
   a) 4
   b) 3
   c) 1
   d) Prophase
3. **DNA replication consists of one old strand and one new strand.**
   a) False
   b) True
4. **What is one difference between the parent cell and daughter cell that results from mitosis?**

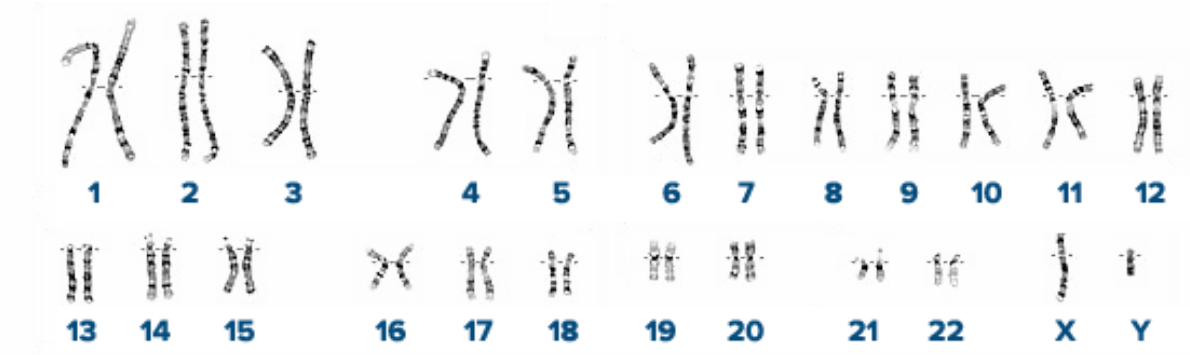
5. What happens when the chromatids separate?

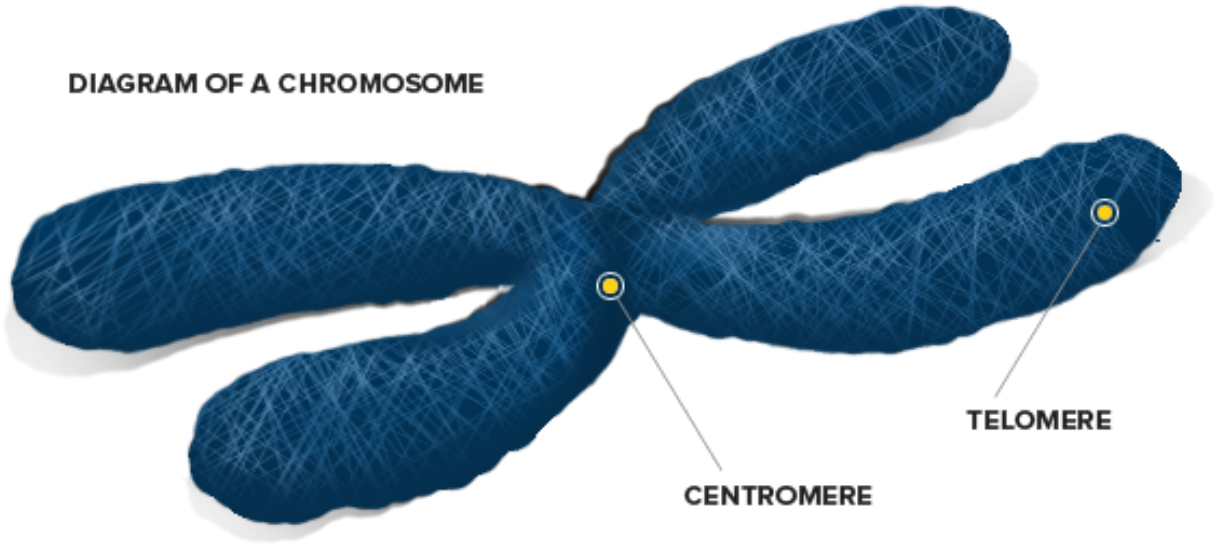
ESSENTIAL QUESTIONS

1. How does life result from chemical structure and function?
2. How does life result from cellular structure and function?

Genetics

The human body is made of some 50 trillion to 100 trillion cells, which form the basic units of life and combine to form more complex tissues and organs. Inside each cell, genes make up a blueprint for protein production that determines how the cell will function. Genes also determine physical characteristics or traits. The complete set of some 20,000 to 25,000 genes is called the genome. Only a tiny fraction of the total genome sets the human body apart from those of other animals. Chromosomes carry hereditary, genetic information in long strings of DNA called genes. Humans have 22 numbered pairs of chromosomes and a single pair of sex chromosomes—XX in females and XY in males. Each chromosome pair includes one inherited from the father and one from the mother. If unwound, the microscopic DNA strands in one cell's nucleus would stretch to over six feet in length.





1. **What are the similarities between dominant allele and recessive allele?**
2. **What chromosomes are the sex-linked genes determined by?**

a) X
b) Y
c) Neither
d) Both

3. What makes homozygous and heterozygous different?

4. What is a gene?

a) The combination of alleles in an organism's
b) A DNA sequence that specifies a protein
c) An appearance of a trait
d) None of the above

5. What inherits one of each allele explain?

a) Homozygous

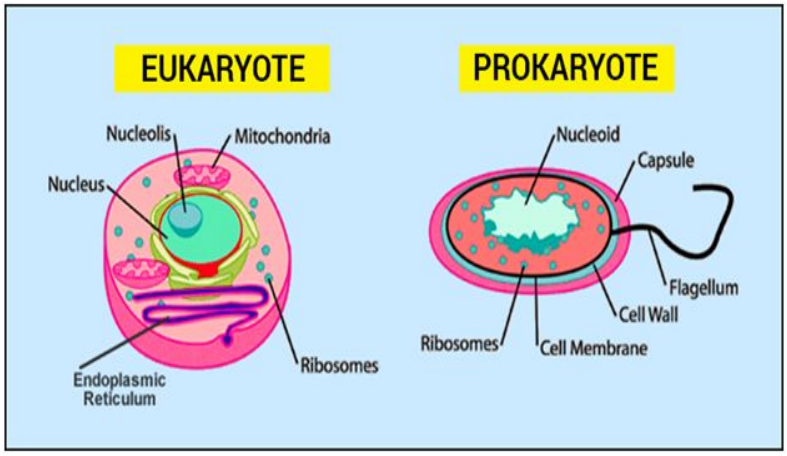
b) Recessive
c) Heterozygous
d) Dominant

ESSENTIAL QUESTIONS

1. What is DNA?
2. What is the difference between DNA and RNA?

Basic Biological Principles

Prokaryotic cells have been proven to have been evolved before eukaryotic cells. Just as plant cells prokaryotic cells have cell walls also. Thye use them as protectants since cell walls have single organism or building blocks. Don't forget that prokaryotic cells DNA isn't found in the nucleus but in a region around it (nuclear). If you are still confused as to what prokaryotes some examples are bacteria and archaea. One last thing important about this cell is that it uses cell respiration for energy. Now for eukaryotic cells, they are made up of cells just as prokaryotic. A few huge difference between these two cells are their size (eukaryotic cells are more vast) and this cell has a nucleus, mitochondria, and chloroplasts. Unlike prokaryotic cells, eukaryotic cells have double membranes to protect them. Or in other words a single complex cell. Here's a visual of what prokaryotic and eukaryotic cells actually look like and how they work.



Both cells contain a ribosome which is basically another form of protein which is called RNA instead. Both these cells also use cilia and flagella to move around and or transport. Both plant and animal cells are considered eukaryotic. In each cell, the cytoplasm helps cellular growth, metabolism, and replication.

1. **What do both prokaryotic and eukaryotic cells have in common?**
   a. They are both organisms made up of cells
   b. They both use cell respiration for energy
   c. Prokaryotes are bigger than eukaryotes
   d. Prokaryotes lack something while eukaryotes make it up what is it?

2. Which cell has a nucleus?
   a. Prokaryote
   b. Eukaryote
   c. Bacteria
   d. Lysosomes

3. Which cell has ribosomes?
   a. Prokaryote
   b. Eukaryote
   c. Both cells contain ribosomes

4. Which of the following questions are false about prokaryotes/eukaryotes, explain why the following question is false?
   a. Both are surrounded around a cell membrane

b. Prokaryotic cells are larger than eukaryotic
c. Both can move around with cilla and or flagella
d. Prokaryotic cells contain cell walls

5. Which of the following question(s) are false about prokaryotes/eukaryotes explain why the following question(s) are false.

a. Eukaryotic cells are larger than prokaryotic
b. The dna of a eukaryotic cell is found in the nucleus
c. Both animal and plant cells are eukaryotic
d. Eukaryotic is an organism with is a single cell that has a complex structure

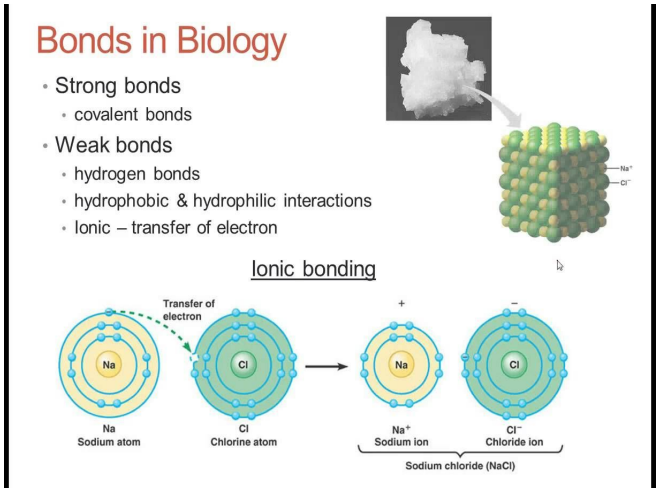
ESSENTIAL QUESTIONS

1. What are the similarities between prokaryotes and eukaryotes?
2. What do the functions of membrane proteins include?

The Chemical Basis of LIfe .

Here's some information about the chemical bases of life. Polar bonds are covalent which is basically sharing atoms where the forming bonds of electrons are unbalanced or unequally shared. For example, these bonds are unequal which causes it to be polar. Living organism only use a small percentage to carry out their functions. There are six important elements which are hydrogen, carbon, nitrogen, oxygen, phosphorus, and calcium. Now for ions which are charged elements that are brought up from the gain or loss of electrons from a neutral atom or molecule. Some atoms that gain and lose are sodium and fluorine. Bonding from atoms and ions can be covalent which basically means bonds formed by the sharing of electrons between atoms. Atoms are important units of chemical matter. Atoms contain a nucleus. It also contains positively charged protons and uncharged neutrons. Nonpolar bonds are molecules that share electrons with one another. Another important concept is chemical reactions which is a substance or substances

that are converted into one or more new substances. Here's a better understanding of each bond.



Which molecule(s) are polar?

a. Water
b. Carbon
c. Oxygen
d. None of the above

2. What are polar bonds?

a. Hydrophobic
b. Hydrophilic
c. Semipermeable
d. Permeable

3. Which isn't a part of the plasma membrane?

a. Amino acids
b. Fatty acids
c. Nucleic acids
d. Phosphates

4. Explain why water molecules are polar.

5. Explain how biological macromolecules form from monomers.

KEY TERMS

Basic Biological Principles

Eukaryote- A type of organism composed of one or more cells containing a membrane-bound nucleus

Nucleus- A membrane-bound organelle in eukaryotic cells functioning to maintain the integrity of the genetic material and, through the expression of that material, controlling and regulating cellular activities.

Cell- The basic unit of structure and function for all living organisms

Prokaryote- A single-celled organism that lacks a membrane-bound nucleus and specialized organelles. A subunit within a cell that has a specialized function.

Tissue- An anatomical unit composed of cells organized to perform a similar function.

-multicellular-Made up of more than one cell.

Ribosome- A cellular structure composed of RNA and proteins that is the site of protein synthesis in eukaryotic and prokaryotic cells**.**

Plasma membrane- A thin, phospholipid and protein molecule bilayer that encapsulates a cell and controls the movement of materials in and out of the cell through active or passive transport.

Organ- An anatomical unit composed of tissues serving a common function. \

The Chemical Basis Of Life

Matter- a substance or a material) from which objects are made**.**

Element- A substance that cannot be decomposed into simpler substances by chemical means, and is made up of atoms all with identical number of protons.

Compound- A material made up of two or more parts or elements.

Atom- The smallest possible unit of an element that still has all the chemical properties of that element

Proton- a subatomic particle with a positive electric charge. Protons are found in the nucleus of every atom.

Electron- an elementary particle that is a fundamental constituent of matter

Nucleus- is a membrane-enclosed organelle found in eukaryotic cells

Ion- an atom or group of atoms that carries a positive or negative electric charge as a result of having lost or gained one or more electrons — see anion, cation

Covalent bond- A chemical bond formed by the sharing of one or more electrons, especially pairs of electrons, between atoms.

Polar molecule- an asymmetric molecule with non-uniform positive and negative charges

Non polar molecule- when electrons are shared equally by the atoms, and there is no resulting charge

Hydrogen bond- a weak chemical bond between an electronegative atom, such as fluorine, oxygen, or nitrogen, and a hydrogen atom bound to another electronegative atom

Photosynthesis and Cellular Respiration

Photosynthesis- a process used by plants and other organisms to convert light energy into chemical energy that can later be released to fuel the organisms' activities.
Cellular respiration- a set of metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products.
Pigment- a material that changes the color of reflected or transmitted light as the result of wavelength-selective absorption.
Nadp- a cofactor used in anabolic reactions, such as lipid and nucleic acid synthesis, which require NADPH as a reducing agent.
Glycolysis- the metabolic pathway that converts glucose $C_6H_{12}O_6$, into pyruvate, $CH_3COCOO^- + H^+$. The free energy released in this process is used to form the high-energy molecules ATP and NADH.
Nad- a coenzyme found in all living cells.
Atp- a complex organic chemical that participates in many processes.

Cell Transportation and Homeostasis

Semi-permeable- allowing certain substances to pass through it but not others, especially allowing the passage of a solvent but not of certain solutes.
Passive transport- a movement of ions and other atomic or molecular substances across cell membranes without need of energy input.
Diffusion- the net movement of molecules or atoms from a region of high concentration with high chemical potential to a region of low concentration with low chemical potential.
Osmosis- the spontaneous net movement of solvent molecules through a semi-permeable membrane into a region of higher solute concentration, in the direction that tends to equalize the solute concentrations on the two sides
Hypotonic solution- is any solution that has a lower osmotic pressure than another solution
Hypertonic solution- a particular type of solution that has a greater concentration of solutes on the outside of a cell when compared with the inside of a cell.
Isotonic solution- to two solutions having the same osmotic pressure across a semipermeable membrane.
Active transport- the movement of ions or molecules across a cell membrane into a region of higher concentration, assisted by enzymes and requiring energy.
Endocytosis- the taking in of matter by a living cell by invagination of its membrane to form a vacuole.
Exocytosis- a form of active transport in which a cell transports molecules out of the cell by expelling them through an energy-dependent process.
Homeostasis- as the maintenance or regulation of the stable condition, or its equilibrium; or simply as the balance of bodily functions.

Theory of Evolution

Evolution- change in the heritable characteristics of biological populations over successive generations.

Theory- a supposition or a system of ideas intended to explain something, especially one based on general principles independent of the thing to be explained.

Fossils- any preserved remains, impression, or trace of any once-living thing from a past geological age.

Adaption- the dynamic evolutionary process that fits organisms to their environment, enhancing their evolutionary fitness.

Common descent- There is strong quantitative support for the theory that all living organisms on Earth are descended from a common ancestor.

Homeostasis structures- Explain the role of cell organelles for both prokaryotic and eukaryotic cells, including the cell membrane, in maintaining homeostasis

Cell growth

Anaphase- the stage of meiotic or mitotic cell division in which the chromosomes move away from one another to opposite poles of the spindle.

Cell cycle- the series of events that take place in a cell leading to its division and duplication of its DNA to produce two daughter cells.

Cell division- the process by which a parent cell divides into two or more daughter cells

Cytokinesis- the cytoplasmic division of a cell at the end of mitosis or meiosis, bringing about the separation into two daughter cells

Centromere- the region of a chromosome to which the microtubules of the spindle attach, via the kinetochore, during cell division

Homologous- similar in position, structure, and evolutionary origin but not necessarily in function.

Interphase- the resting phase between successive mitotic divisions of a cell, or between the first and second divisions of meiosis.

Metaphase- the second stage of cell division, between prophase and anaphase, during which the chromosomes become attached to the spindle fibers.

Mitosis- a part of the cell cycle when replicated chromosomes are separated into two new nuclei.

Prophase- the first stage of cell division, before metaphase, during which the chromosomes become visible as paired chromatids and the nuclear envelope disappears.

Telophase- the final phase of cell division, between anaphase and interphase, in which the chromatids or chromosomes move to opposite ends of the cell and two nuclei are formed.

Genes

Alleles- one of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.

Amino acids- are organic compounds containing amine and carboxyl functional groups, along with a side chain specific to each amino acid
Chromosomes- a DNA molecule with part or all of the genetic material of an organism.
Dna- a molecule that carries the genetic instructions used in the growth, development, functioning and reproduction of all known living organisms and many viruses.
Eukaryotic- any organism whose cells have a cell nucleus and other organelles enclosed within membranes.
Genetics- the study of genes, genetic variation, and heredity in living organisms.
Genes- a sequence of DNA or RNA which codes for a molecule that has a function.

ANSWER KEY:

Bioenergetics: Photosynthesis and Cellular Respiration

1) D
2) C
3) A
4) Chloroplasts absorb sunlight and use it with water and carbon dioxide gas to produce food for the plant. Chloroplasts capture light energy from the sun to produce the free energy stored in ATP and NADPH through a process called photosynthesis.
5) The difference between aerobic and anaerobic cellular respiration is aerobic respiration requires oxygen in order to generate energy molecule ATP, whereas anaerobic respiration synthesize ATP by using the electron transport chain, with inorganic molecules other than oxygen.

Homeostasis and Transport

1) B
2) Hypertonic solutions have a greater solute concentration than the cell, causing water to move out of the cell. Hypotonic solutions have a lower concentration of solution than the cell, causing water to move in to the cell. Isotonic solutions have an equal concentration of solute inside and outside the cell, causing no net gain or loss of water
3) The molecules will move to the right side until equilibrium is reached, then continue to move back and forth with no net change in concentration. This will occur because the membrane is soluble to solute, which will move from high to low concentration.
4) B
5) C

Theory of Revolution

1) B
2) B
3) A
4) It's basically saying that everyone and everything evolved from a related species that was around before.
5) Both these structures are based around the same thing but have different functions.

Basic Biological principles

1. **A**
2. **B**
3. **C**

4. **B is false because eukaryotic cells are far more vast and or larger than prokaryotic**
5. **B is false because it's not found in the nucleus, but in a area or region near it**

The Chemical Basis of LIfe .

1. **A**
2. **A**
3. **C**
4. **Water molecules are polar because it's unbalanced one side is negatively charged while the other is charged positively.**
5. **Most of the macromolecules are made up by building blocks which are called monomers.**

Cell Growth

1. **C**
2. **4**
3. **B**
4. **The difference is the daughter cell has sister chromatids and the parent cell does not.**
5. **When it separates each chromatid is joined to one centromere.**

Genes

1. **The similarities between dominant alleles and recessive allele are that they both can be expressed based on if the individual inherits copies of alleles.**
2. **D**
3. **Homozygous means the same alleles and heterozygous means different alleles.**
4. **A DNA sequence that specifies a protein and is a unit of heredity that is transferred from a parent to offspring**
5. **Heterozygous which is basically a pair of genes where one is dominant and one is recessive and or different from one another**