

Name: _____

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Quiz 4 on Lectures 7 &8

Part 1: Quiz 4 on Lectures 5 &6

Non-Photosynthetic life (animals) require the primary producers (plants) for an energy source. That energy is usually in the form of sugars and some proteins. This stored energy must be converted to be useful. The metabolic function of respiration is important to cells because in this reaction

- A. The energy in sugar molecules is used to make energy that is stored in the form of ATP and in the process liberated CO₂
- B. DNA is replicated into two exact copies
- C. Light energy is used to split water into hydrogen and oxygen and that captured energy is converted to chemical energy as ATP
- D. Occurs only within chloroplasts in plant cells
- E. Light energy from the sun is harvested by plants capable of photolysis

Cloning is the asexual reproduction of an organism. The 'cloning' of plants was demonstrated by Steward in 1958 at Cornell University showing that plants could be grown back from a single cell. This ability, in plant or animals, is called "totipotency" and like the more recent examples of animal cloning, demonstrates

- A. the necessity to ban all types of cloning
- B. Steward must have belonged to the group that calls themselves the 'Raeliens'
- C. that all of the DNA that codes for an entire organism is in every cell of that organism
- D. that all biological scientists are unethical and fraudulent
- E. the basis of intelligent design

The ability to isolate and track DNA, RNA, proteins and genes in cells and organisms was a fundamental breakthrough in molecular biology and biotechnology. Al 'Southern blot' is used for

- A. sequencing the individual amino acids of specific proteins
- B. detection of proteins using antibodies as in a home pregnancy test
- C. the most important diagnostic tool used in determining the forensic results of a crime scene.
- D. detection of specific DNA sequences.
- E. detection of specific RNA sequences.

Light energy is essential to most life on Earth. Photosynthesis then is arguably the most important biochemical reaction on Earth. In this reaction

- A. The energy in sugar molecules is used to make energy that is stored in the form of ATP and in the process liberated CO₂
- B. Light energy is used to split water into hydrogen and oxygen and that captured energy is converted to chemical energy as ATP
- C. Light energy from the sun is harvested by animals capable of photo-conversion
- D. Occurs within mitochondria in eukaryotic cells
- E. Amino acids are assembled into proteins in plants

The sequencing of DNA was developed using manual and tedious technology developed by Nobel laureate Fred Sanger. We can now sequence DNA at rapid rates and relatively inexpensively, revolutionizing many aspects of biotechnology.

Automated high-throughput DNA sequencing

- A. can create messenger RNA molecules from small pieces of DNA
- B. all of the answers are correct
- C. utilizes RNA polymerase to build strands of DNA
- D. is now conducted by robots and mega computers allowing rapid inexpensive genome sequencing
- E. makes it possible to create huge numbers of copies of tiny pieces of DNA

Consider a face: it is comprised of a community of cells. Its basic features change very little over a year, yet in that time most of the original cells and all the molecules will be replaced. The 'fabric' changes but not the pattern. This is explained by the process of

- A. rejuvenation that allows cells to live forever, also called immortalization
- B. Intelligent Design for rejuvenation
- C. loss of cell repair that leads to skin cancer and other diseases
- D. turnover of cells and rejuvenation
- E. rare disease infections such as the Elephant Man Syndrome

How do atoms come together to make molecules? A covalent bond

- A. is a type of biotechnology stock
- B. is a weak bond, like those between water molecules in liquid water.
- C. is a variant of mating behavior which favors males.
- D. in a molecule is made when electrons are shared between atoms.
- E. is created without energy only by living cells

DNA markers can serve as a proxy for the genome and hence can be used in the identification of any organism or individual organism including humans. Highly repetitive sequences of DNA called STRs:

- A. are used in biotechnology when creating a clone
- B. are produced when a mutation occurs in a sperm-producing or egg-producing cell.
- C. are produced when a mutation occurs in a non-sex cell
- D. are characteristic of genes that code for biochemical traits rather than structural traits
- E. can be used in DNA fingerprinting for forensic purposes

Every cell has certain proteins which are specific to that cell type. A 'Western blot' is used for

- A. detection of proteins using antibodies as in a home pregnancy test
- B. sequencing the individual amino acids of specific proteins
- C. detection of specific DNA sequences
- D. detection of specific RNA sequences
- E. detection of nuclear weapons of mass destruction

Each person has a unique DNA sequence. The human genome is the complete set of nucleic acid sequence for humans (Homo sapiens), encoded as DNA within the 23 chromosome pairs in cell nuclei and in a small DNA molecule found within individual mitochondria. Human genomes include both protein-coding DNA genes and noncoding DNA. A person's unique DNA is carried in:

- A. all of the answers contain a person's DNA
- B. cheek cells in saliva
- C. muscle cells
- D. hair follicle cells
- E. skin cells

In photosynthesis plants split water into hydrogen and oxygen. If humans could invent artificial photosynthesis, it has been hypothesized that this would provide an endless supply of energy through a hydrogen economy. Without plants there would be no oxygen and very little biological energy source on earth. A cellular structure in eukaryotic plants that captures sunlight is called a:

- A. nucleus
- B. chromosome
- C. transcriptome
- D. chloroplast
- E. ribosome

The major chemical energy currency in life in eukaryotic cells is ATP (Adenosine Triphosphate). The major contribution of ATP in eukaryotic cells comes from mitochondria. Every cell in your body contain mitochondria. Mitochondria then might be called the most successful organism on the planet since they:

- A. split water to generate oxygen and hydrogen and compartmentalize reactions that convert the energy of sunlight into ATP
- B. compartmentalize most of the DNA in a cell
- C. are the central location of respiration in all human cells and are derived from bacteria as endosymbionts
- D. structures only found in prokaryotes such as bacteria
- E. are the primary location of photosynthesis in humans

Each cell must produce only a subset of the genes that are being expressed. This subset is what differentiates one cell from another. For example, cancer cells must be expressing one subset of genes when compared to normal cells.

Photosynthetic cells in a leaf are expressing different genes from root cells. A 'Northern blot' is used for

- A. detection of specific DNA sequences
- B. determining the effects of arctic global warming
- C. sequencing the individual amino acids of specific proteins.
- D. detection of proteins using antibodies as in a home pregnancy test.
- E. detection of specific RNA sequences

Energy transfer is essential to all functions for life on earth. There must be energy to drive the reactions for metabolism and other functions. Energy flows from one chemical bond to another. Breaking covalent bonds in molecules results in:

- A. a destruction of both matter and energy
- B. cold fusion
- C. the release or transfer of energy
- D. wide spread global warming
- E. a nuclear chain reaction.

DNA contains information. Genes are segments of DNA that:

- A. carry information for making the proteins required by all of the cells in the body.
- B. determine our environment
- C. code for everything, including all the characteristics a person acquires
- D. are currently only in GMO crops and have made their way into humans by consumption.
- E. remain exactly the same from one generation to the next because of DNA replication

Genes often code for proteins. Different genes have a specific and different DNA sequence compared to each other.

Different proteins can be distinguished from each other by

- A. their amino acid sequence
- B. their ATP molecules
- C. the ribosomes that make them
- D. PCR analysis
- E. the type of sugar molecules they generate

The same way as genes code for proteins, the DNA sequence is a code for the amino acid sequence in these proteins.

Proteins are molecules made from sequences of a number of:

- A. four different nucleic acids, designated as A, T, G, and C.
- B. twenty so called 'donuts'
- C. DNA triple helices corresponding to each protein.
- D. an infinite number of different amino acids generated by each individual cell.
- E. twenty amino acids

Without a steady input of energy there would be no replicative life on earth. The energy flow through life on this planet occurs from:

- A. sunlight directly into a Big Mac
- B. mainly coal burning electrical plants in the Midwest of the US
- C. sunlight to chloroplasts to sugars to mitochondria to ATP
- D. currently from oil in the Mideast countries leading to global warming.
- E. water to carbon dioxide to carnivores

Not every gene in the genome or an organism can be expressed at the same time. Or else we would just be a bag of protein. There must be differential gene expression where some genes are expressed in eye cell and off in others for example. The expression of a gene is said to be 'turned on' when certain signals interact with the promoter of a gene and RNA is produced. "Translation" of that code occurs in the cytoplasm and is:

- A. a viable strategy for drug design used by biotech companies
- B. the transfer of information from RNA to proteins
- C. the transfer of RNA through a gel matrix in an 'Northern blot'
- D. the transfer of hydrogen ions through the cell membrane
- E. the transfer of information from DNA to RNA

Most biochemical reactions would occur with the reactants, given enough time. But in life that might be too long. Most of the reactions in biological life then require catalysts. Enzymes are usually:

- A. proteins
- B. carbohydrates
- C. helpful bacteria
- D. very inefficient
- E. none of these answers are correct