

## Lesson 7 Study Guide

1. Is there life on other planets? What is Life? How did it start? How long has it been here? The best evidence available indicates that life on earth started as single cells about:

- (A) 3.2 billion years ago
- (B) 3.2 million years ago
- (C) 6,000 years ago
- (D) 4.8 light years away
- (E) at the end of the last ice age

2. Plants use sunlight in the most important chemical reactions on earth called photosynthesis. All biological energy comes to earth through these reactions. A cellular structure that captures sunlight to produce sugar is called a:

- (A) chloroplast
- (B) nucleus
- (C) ribosome
- (D) chromosome
- (E) transcriptome

3. The human genome has over 24,000 genes. Since all of the genes that code for all of the proteins in an organism are present in every cell then:

- (A) there must be a way to turn some genes on and leave other genes off
- (B) we should all just be a big bag of protein
- (C) the environment must play a stronger role than genetics
- (D) Darwin was certainly wrong
- (E) sexual reproduction is not important to evolution

4. Enzymes are coded for by genes and are:

- (A) proteins that catalyze many reactions in cells
- (B) not involved with neither energy production nor DNA replication
- (C) made primarily of lipid
- (D) themselves genes involved with biochemical pathways
- (E) not important to the development of an organism or its evolution

5. Genes can be involved with controlling expression of other genes during development. Some of which, like the hox genes, code for transcription factors that regulate when other genes are expressed. These 'master' genes that control the expression of other genes code for:

- (A) proteins
- (B) sugars
- (C) lipids
- (D) cancer
- (E) environmental pollutants

6. Plants use the energy in sunlight to make sugars. All other organisms use sugars for energy. The breakdown of sugar molecules into energy and carbon dioxide is called:

- (A) respiration
- (B) the light reaction
- (C) cytolysis
- (D) legislation
- (E) mitosis

7. Life is an information processing system capable of replication with variation. The flow of information in biological life on earth:

- (A) uses the same twenty amino acids
- (B) all of these answers are correct
- (C) typically occurs from DNA to RNA to protein
- (D) uses the same four letter code
- (E) could not possibly exist without divine intervention

8. Atoms share electrons to form bonds making molecules. Energy flows from one chemical bond to another. Breaking covalent bonds in molecules results in:

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

9. A covalent bond:

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

10. A rice plant has nearly twice as many genes as a human. Genes are the sequences in DNA that code for proteins. In cells, proteins can function as:

- (A) any of the answers are correct
- (B) regulators, like transcription factors
- (C) an enzyme, like trypsin
- (D) a hormone, like insulin or estrogen
- (E) a catalyst for making all nanotechnology products

11. Sugars are broken down in cells to liberate their chemical energy. This chemical energy is stored in cells as ATP and used for other chemical reactions in metabolism. Mitochondria:

- (A) compartmentalize reactions that split water to generate oxygen
- (B) compartmentalize most of the DNA in a cell
- (C) are the primary location of photosynthesis in plants
- (D) are derived from bacteria and are the central location of respiration in eukaryotic cells
- (E) structures only found in prokaryotes

12. The energy flow through life on this planet occurs from:

- (A) sunlight directly into a Big Mac
- (B) sunlight to chloroplasts to sugars to mitochondria to ATP
- (C) mainly coal burning electrical plants in the Midwest of the US
- (D) water to carbon dioxide to carnivores
- (E) oil in the mideast countries

13. 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. Transcription is:

- (A) the transfer of gases through the cell membrane
- (B) the transfer of information from DNA to RNA
- (C) the transfer of information from RNA to proteins
- (D) the transfer of DNA through a gel matrix
- (E) a software package designed by biotechnology companies for genomic analysis

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

15. Critics of evolution state that that it is not possible since it disobeys the second law of thermodynamics. The tendency of energy to dissipate as described by the second law of thermodynamics is called:

- (A) equilibrium: where everything must remain in an equal balance
- (B) entropy: where order tends to become disordered
- (C) metabolism: referring to the breakdown of sugars
- (D) endothermic: where reactions require heat
- (E) nuclear: where reactions in life occur only in atomic chain reactions

16. 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) turnover of cells and constant skin cell renewal
- (B) rejuvenation that allows cells to live forever
- (C) loss of cell repair that leads to skin cancer
- (D) rare disease infections
- (E) Intelligent Design

17. Every time one of your cells divides it makes a (nearly) exact copy of all of your DNA. This has happened many times over while you have been reading these questions. A person's unique DNA is carried in:

- (A) muscle cells
- (B) hair
- (C) saliva
- (D) skin cells
- (E) all of the above contain a person's DNA

18. *"Life is an information processing system capable of replication with variation mediated by metabolism through biochemistry in an aqueous environment ..."* The flow of information is a characteristic of life on this planet (and probably elsewhere). To start the transcription process, a large molecule, \_\_\_\_\_, recognizes a \_\_\_\_\_.

- (A) RNA polymerase; messenger RNA
- (B) DNA polymerase; termination site
- (C) DNA polymerase; promoter site
- (D) RNA polymerase; promoter site
- (E) DNA polymerase; messenger RNA