

Lesson 9 Study Guide – Evolution: How does it Happen?

1. This Universe is over 13 billion years old. The Earth is over 4 billion years old. Most probably the first information molecule capable of replication was an RNA. The best evidence available indicates that life on earth started as single cells about:

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

2. Jean-Baptist Lamarck thought for giraffes that by stretching their necks for leaves higher in trees this characteristic would be passed on to the offspring of those giraffes. Lamarck, therefore:

- (A) proved that the theory of evolution was incorrect**
- (B) proposed that the inheritance of characteristics is acquired as a result of the environment or purpose**
- (C) showed that bacteria experience Darwinian selection and evolution by watching slot machines**
- (D) developed the idea for the phylogenetic tree**
- (E) laid the basis for modern understanding of evolution**

3. When cells could 'stick' together to form multi-celled colonies, there had to be a molecular mechanism capable of self recognition. Self is 'okay' ; non-self is not 'okay', giving rise to defense mechanisms that eventually lead to our immune system. Cells also required the ability to communicate with each other and the outside environment. Specialized proteins embedded in cell membranes which receive and transmit chemical messages are referred to as:

- (A) receptors**
- (B) random walkers**
- (C) retractors**
- (D) transgressors**
- (E) interceptors**

4. Salvador Luria asked whether bacteria evolve like other organisms. Do Darwinian principles apply to bacteria; or are they more subject to environment? Using a brilliant experimental design involving virus resistance in bacteria he was able to clearly demonstrate what phenomenon?

- (A) how to win at slot machines
- (B) the environmental influence on mutation
- (C) evolution
- (D) drug resistance in bacteria
- (E) the possibility of bacterial life on other planets

5. In photosynthesis, chlorophyll molecules act as solar antennae, so that when sunlight strikes them their electrons are excited to a higher energy state which eventually results in the splitting of water (H₂O). The hydrogen ions from the splitting of H₂O form a gradient that drives the chemical synthesis of ATP. Throughout the evolution of plants energy from sunlight is first used to make ATP. The energy stored in ATP is then used to make what compound?

- (A) lipids
- (B) RNA
- (C) sugar
- (D) DNA
- (E) all of these answers are correct

6. Some proteins are capable of recognizing specific DNA sequences. Some of these bind to those sequences and regulate gene expression. A protein that binds to a site on DNA next to a gene and blocks the transcription of that gene, thus preventing the synthesis of a protein that the gene encodes is known as a:

- (A) regulator
- (B) repressor
- (C) receptor
- (D) responder
- (E) communicator

7. What are regulatory processes in which there are signals indicating “too much” or “too little” which result in a correction to the processes?

- (A) feedback loops
- (B) regressions
- (C) stop codons
- (D) auto rewinds
- (E) ecological networks

8. Natural selection, by various means, acts as a filter on the heritable change already present in a population. The average time to death from starvation in a fruit fly is about 20 hours. Selecting for increased starvation resistance in fruit flies:

- (A) has no effect because starvation resistance is not a trait that influences a fruit fly's ability to survive
- (B) has little effect because ongoing mutation continuously reduces starvation resistance, counteracting any benefits from selection
- (C) cannot increase their survival time because there is no genetic variation for this trait
- (D) has no effect because starvation resistance is too complex a trait, dependent on the effects of too many genes
- (E) can produce populations in which the average time to death from starvation is 160 hours

9. Which of the following statements about mutations is NOT true?

- (A) a mutation is any change in an organism's DNA
- (B) mutations are almost always random with respect to the needs of the organism
- (C) most mutations are harmful or neutral to the organism in which they occur
- (D) the origin of genetic variation and individuals is mutation
- (E) all of these statements are true

10. Genes code for proteins. Proteins conduct many different functions in cells, including some which function as catalysts called enzymes. Enzymes are catalysts for biochemical pathways involved with the synthesis and metabolism of biological compounds. These pathways often occur with feedback mechanism that regulate when too much or too little of a compound is present. Biological feedback loops occur:

- (A) only in plant cells
- (B) only at the tissue or organ level in humans
- (C) in throughout various levels in biological systems, including ecology
- (D) in anaerobic conditions such as found in some bacteria
- (E) as an example why evolution is an insufficient explanation for biological change

11. In cells, genes are segments of DNA that code for proteins; not sugars or complex carbohydrates, or lipids, but proteins. The code in the sequence of nucleotides in a gene specifies the sequence of nucleotides in messenger RNA which in turn specifies the sequence of amino acids in a protein. The sequence is variable because of mutations which can change the sequence of amino acids in the protein coded for by that gene. Therefore in evolution a change in a single code for a single amino acid may have an effect on individual survival. Proteins carry out many functions in a cell such as:

- (A) structural, like myosin in muscle fibers
- (B) regulators, like transcription factors
- (C) enzymes like trypsin, that act as catalysts for cellular reactions
- (D) hormones, like insulin or estrogen
- (E) any of the answers are correct

12. Evolution occurs:

- (A) only when the environment is changing**
- (B) only through natural selection**
- (C) almost entirely because of directional selection**
- (D) only via natural selection, genetic drift, migration, or mutation**
- (E) by altering physical traits but not behavioral traits**

13. Evolutionary Adaptation:

- (A) refers both to the process by which populations become better matched to their environment and to the features of an organism that make it more fit than other individuals**
- (B) cannot occur in environments influenced by humans**
- (C) is possible only when there is no mutation**
- (D) is responsible for the fact that porcupines are at an unusually high risk of predation**
- (E) occurs for physical traits but not behaviors**

14. Life might well be considered as an information processing system, and then in many ways, has analogies in the cyber world. The flow of information in biological life on earth:

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