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Quiz 5 on Lectures 9 &10

Part 1: Quiz 5 on Lectures 9 &10

The ability to finely control metabolic pathways results in efficiency where the more efficient organisms will be at a selective advantage and therefore survive to make offspring at a higher frequency than those that are less efficient. It might be said that 'only the strong survive', or maybe put another way 'the most efficient survive more often'. What are regulatory processes in which there are signals indicating "too much" or "too little" which result in a correction to the processes?

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

The observation that populations of organisms change over time was widely known in the early to mid-1800s. Some organisms go extinct, and new varieties and new species appear. 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. showed that bacteria experience Darwinian selection and evolution by watching slot machines
- B. proposed that the inheritance of characteristics is acquired as a result of the environment, will of the organism, or purpose
- C. proved that the theory of evolution was incorrect because of acquired traits
- D. provided what would become the basis for modern understanding of evolution
- E. developed the idea for the phylogenetic tree which shows ancestral relationships

Why do some species go extinct and others survive through time? Why are there no dinosaurs? But other ancient species like sharks are still here? "Survival of the fittest" may be a misleading phrase to describe the process of evolution by natural selection because:

- A. it is impossible to determine the fittest individuals in nature for any given trait or gene, whereas populations matter more
- B. survival of an individual alone during its lifetime matters less to natural selection than reproductive success does
- C. natural variation in a population is too great to be influenced by differential reproductive success.
- D. fitness has little to do with natural selection.
- E. reproductive success on its own does not necessarily guarantee evolution.

Typically, before a cell divides all of its DNA is replicated. The fidelity of replication is not always accurate. Changes in the DNA code is

- A. normal and mutations are almost always random with respect to the needs of the organism.
- B. called a mutation, which is any change in an organism's DNA sequence
- C. where most mutations are harmful or neutral to the organism in which they occur, but in other cases may provide a benefit
- D. all of these statements are true
- E. positive for diversity providing a good deal of the origin of genetic variation

Ken Miller:

- A. is an expert on evolution and education.
- B. is disconcerted about his relationship between Faith and Evolution
- C. supports the idea that ID should be taught in biology as an alternative to evolution.
- D. thinks that biological life is static and unchangeable.
- E. plays short stop for the Boston Red Sox

The origin of life on earth is a fascinating topic. How did life start on earth? If life on earth could start what does this tell us about the origins of life on other planets? The best evidence available indicates that life on earth started as single cells about

- A. 3.2- 3.7 million years ago
- B. 6,000- 8,000 years ago
- C. 3.2-3.7 billion years ago
- D. at the end of the last ice age.
- E. 4.8 light years away

Charles Darwin reached following conclusions (1) Variation exists in natural populations. (2) Many more offspring are born each season than can possibly survive to maturity. (3) As a result, there is a struggle for existence (4) Characteristics beneficial in the struggle for existence will tend to become more common in the population, changing the characteristics of a species. (5) Over time, and given a steady input of new variation into a population, these processes lead to the emergence of new species. These conclusions, from the Origin of Species, was coupled with

- A. intelligent design
- B. natural selection
- C. supernatural consequences
- D. all of these answers are correct
- E. extinction of species

Whole genomes have now been sequenced for many organisms. Genes have been cloned and moved from one species to another. Stem cells can develop into sperm cells. The development of Biotechnology

- A. provides substantial molecular evidence for the Theory of Evolution.
- B. has therefore dis-proven the Theory of Evolution.
- C. is destroying evidence based medicine as we know it by supporting alternative treatments
- D. has been banned in Europe by governments in the EU
- E. has proven the need to teach Intelligent Design concepts in public schools.

Can we prove evolution? How do organisms change? 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. provides direct evidence for the possibility of bacterial life on other planets.
- B. the environmental influence of virus on mutation in bacteria allowing their survival
- C. purposeful change by the bacteria when confronted with the environmental challenge of a virus where 'only the strong survive'
- D. how to win more efficiently at slot machines
- E. chance mutation in bacteria and its role in evolution by natural selection in the laboratory

There are many misconceptions about evolution. Which of the following is NOT an observation or inference on which Darwin's theory of natural selection is based?

- A. Poorly adapted individuals never or less frequently produce offspring
- B. Individuals whose inherited traits make them best fit to the environment will survive
- C. That individuals always adapt themselves to the environment and these then traits are inherited.
- D. Because excessive numbers of offspring are produced, there is a competition for limited resources.
- E. There is heritable variation among individuals

Evolution has been a controversial topic for over 150 years and remains so today. Polls show that a significant percentage of the US population does not consider that evolution is an adequate explanation for the diversity of species on earth. The subject of evolution is controversial because:

- A. general public education about it is insufficient given modern biology
- B. it may not be properly represented in current curriculum throughout grade levels
- C. all of these answers apply
- D. some people think it conflicts with religious beliefs
- E. people have conflicting ideas about human origins

The process of evolution is a consistent pattern for life on earth. A particular example of evolution that is common globally and often in the news is

- A. that examples of evolution have been shown to occur in the wild but cannot be validated in the laboratory
- B. that evolution is responsible for increased occurrence of antibiotic resistant bacteria.
- C. that evolution has been demonstrated through genomics that it does not occur in humans.
- D. none of these statements is correct; there are no examples of evolution currently in the news.
- E. that evolution is wrong because it occurs too slowly to be observed in nature.

How can we observe evolution as it occurs? 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 no effect because starvation resistance is too complex a trait, dependent on the effects of too many genes.
- C. cannot increase their survival time because there is no genetic variation for this trait.
- D. can produce populations in which the average time to death from starvation is 160 hours
- E. has little effect because ongoing mutation continuously reduces starvation resistance, counteracting any benefits from selection.

Genes which code for transcription factors can have a large influence on gene expression. Mutations in genes that control gene expression can have large and sudden effects on the evolution of species. 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. repressor
- B. receptor
- C. resusitator
- D. communicator
- E. responder

If changes in DNA occur regularly, how come some survive in a population and others do not? Natural selection acts like a filter separating the positive changes from the negative and results in the origin of new species. Populations with variations that favor their survival are favored to pass on their genes to offspring. Biological changes in species occur

- A. do not occur in humans
- B. in and throughout various levels in biological systems, including ecology
- C. as an example why evolution is an insufficient explanation for biological change
- D. only in anaerobic conditions such as found in some bacteria in hot springs
- E. only in plants as recognized in domesticated crops

What about alternative explanations for the diversity of life on earth? A National discussion had developed about the teaching in public schools of an alternative explanation, to evolution, for biological diversity called Intelligent Design. This idea suggests that that the world ecology and biology is so complex that this infers that there must be a creator much the same way that the complexity of a watch infers a watchmaker. Intelligent Design:

- A. Is currently a well-established, evidence-based alternative to theories of evolution and natural selection.
- B. Has been determined by the US Supreme Court as material that should be taught in public schools along with other theories of origin including all worldwide mythologies and religions.
- C. Has been proven quantitatively in the laboratory in repeated experiment.
- D. Is a theory that is well supported by peer-reviewed scientific evidence
- E. Is not currently a well-established, evidence-based alternative to theories of evolution by natural selection.

Some species, such as the Galapagos finches, become adapted over time to their environment. Evolutionary Adaptation:

- A. refers both to the process by which populations become better matched to their environment and the features of an organism that make it more fit than other individuals.
- B. is possible only when there is not mutation
- C. occurs for physical traits but not behaviors.
- D. cannot occur in environments influenced by humans, and clearly does not occur in humans.
- E. is responsible for the fact that some organisms can will their features, such as porcupines, which are at an unusually high risk of predation.

What is life? Life might well be considered as an information processing system, and then in many ways, has homologues in the cyber world. Could Artificial Intelligence (AI) be considered a life form? Selection for what works better in an environment will be selected for, while less efficient models go extinct (think about older models of cell phones). The flow of information in biological life on earth:

- A. uses only the same ten amino acids
- B. any of these answers are correct.
- C. proves that the complexity could not possible exist without divine intervention
- D. uses the same twenty six letter code
- E. typically occurs from DNA to RNA to protein

How could evolution occur? How can organisms become more complex over time? 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. metabolism: referring to the breakdown of sugars
- B. nuclear: where reactions in life occur only in atomic chain reactions
- C. endothermic: where reactions require heat
- D. equilibrium: where everything must remain in an equal balance
- E. entropy: where order tends to become disordered

Organisms are related to one other like a family tree. The historical evolutionary relationship between a group of related organisms is known as its:

- A. gerontology
- B. teleology
- C. reflexology
- D. phylogeny
- E. ontogeny