

Name: \_\_\_\_\_

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### Quiz 3 on Lectures 5 &6

#### Part 1: Quiz 3 on Lectures 5 &6

Some of the aspects of life on Earth seem contradictory. 'Life' is said to be opportunistic and is present in nearly every environment on the planet because

- A. there is strong evidence for the purpose and planning of organisms from a Higher order
- B. organisms are genetically selected for survival and reproductive success out of populations with variation and differences in the population
- C. ) the ends justify the means and organisms and biological organisms given half a chance will always decide to cheat in order to survive
- D. living organisms all exhibit a strong will to live no matter what happens to them
- E. survival of the fittest as it pertains to each individual where each individual organism chooses where to live

To exist, life requires organization and organization requires energy, which means that life's molecules breakdown over time. Literally, you are not the 'same' person you were seven years ago, or even seven days ago. Life maintains itself by the process of:

- A. internal combustion
- B. turnover
- C. spontaneous combustion
- D. totally random processes
- E. hopeful purpose

We can describe generalities about biological life, such as the occurrence of feedback loops, or the interconnectedness we can observe in nature; but one commonality that is an underlying principle throughout all life on earth is

- A. that life is an information processing system, such as DNA, capable of replication with variations that can be inherited
- B. individual organisms change during their lifetime in response to the environment in ways that are inherited by their offspring
- C. that it is easily defined because there is relatively little diversity over the whole planet and therefore biological life is essentially the same everywhere.
- D. that all species on earth originated at the same time and have remained unchanged ever since
- E. that all life on earth is unique and not related to each other,

Since energy is another prerequisite of life on earth we must conclude that the energy flow through life on earth starts with:

- A. sunlight and producers, like plants
- B. humans as the only significant consumer
- C. herbivores, like cattle and sheep
- D. carnivores, like lions and tigers, and bears
- E. decomposition, like bacteria and fungi

Life is very diverse on planet Earth. A definition of life is difficult because of its diversity. But we can consider some of the commonalities of life. A common feature of life on Earth is the occurrence

- A. of organisms that can spontaneously generate from inorganic matter to generate new species as needed
- B. a series of feedback loops that provide control of biological inputs and outputs through cycles and pathways so that even in complex pathways and ecology 'life works in cycles'.
- C. a series of linear reactions of that consist of biochemical processes which will use all of the available resources until they are extinguished
- D. the use of an apparent source of energy that does not rely on an ability to live without it
- E. an evidenced based external life force that guides all life

We are in an era where CO<sub>2</sub> concentrations are increasing at alarming rates from human activities. Which of the following are inputs to photosynthesis?

- A. Carbon dioxide
- B. Oxygen
- C. glucose
- D. fossil fuels
- E. hydrogen peroxide

Water is more unusual than most people think. Most biologists and astrobiologists think that water is essential to the origin of life on earth, or perhaps anywhere. This is why one of the missions of the Mars rover was to search for water or the signs of water. Water is important to life on earth because

- A. most biological molecules and compounds important to life dissolve in liquid water
- B. it is always a liquid so it can form compartments, using lipid membranes
- C. it only occurs on planet Earth
- D. it is everywhere, like air, so it is in every environment on earth
- E. ) it forms strong bonds with itself, has low surface tension and is nonpolar

Robert Hooke was the first to observe cells under a microscope. If you were to look into a light microscope and view an unknown cell, what might you see that would tell you whether the cell is prokaryotic or eukaryotic?

- A. a plasma membrane
- B. DNA
- C. a nucleus
- D. ribosomes
- E. a rigid cell wall

Photosynthesis is one of the most amazing and the most important biochemical reactions on Earth. A cellular structure that captures sunlight to produce sugar using CO<sub>2</sub> is called a:

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

In a basic description, all life has an information processing system. All life on this planet has the ability to replicate information with variation. The flow of information in biological life is generally from:

- A. water and sunlight, inorganic materials and spontaneous reactions
- B. the transfer of information from viruses to Mars
- C. the transfer of gases through the cell membrane
- D. the transfer of information from DNA to RNA to proteins
- E. the transfer of DNA through a gel matrix by electrophoresis

Most methods for observing cells using a microscope involve 'fixing' the cell with chemicals and then processing them for observation. This creates the possibility of creating an image that is not in its real state. If you wanted to film the movement of chromosomes during cell division, the best choice for optical equipment would be:

- A. a transmission electron microscope for its resolution which requires fixation and embedment in a resin
- B. an x-ray crystallography image even though it requires extraction techniques
- C. your cell phone would suffice if you have a good one
- D. a scanning electron microscope, because chromosomes are on the cell surface
- E. a light microscope, because you can view living cells without fixation

Sometimes people look at the natural world and think "this is so complex, how could this happen by random chance and circumstance? Complex biological structures like the horn of a ram, a chambered nautilus shell or a growing plant tendril seem complex but are actually the result of

- A. a purpose created by the organism
- B. environmental pollutants
- C. emergent patterns that result in complex structures when simple units follow simple rules
- D. infections from a virus causing disease
- E. intentional will of the organism to change

DNA is the fundamental source of information in biological life forms (although some viruses use RNA). In eukaryotes a cellular structure which contains most of a cell's DNA in animals, fungi or plants is called the:

- A. ribosome
- B. chloroplast
- C. nucleus
- D. cell membrane
- E. centriole

Critics of evolution state that that evolution 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. entropy: where order tends to become disordered
- 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. metabolism: referring to the breakdown of sugars

Emergent patterns and self assembly are wide spread phenomena in biology. Through the application of a few very simple rules

- A. since it is all chemistry, the theory of evolution is easily disproven
- B. a purpose is created for each and every organism
- C. phylogeny acquires teleology, therefore there is a purpose to all structures
- D. synthetic life possibilities will fail
- E. the development of complex structures can occur

Energy is ultimately at the basic driving force of life on earth. The overwhelming source of energy for biological life on earth

- A. is used entirely to copy DNA
- B. is derived from sunlight
- C. is derived from water
- D. comes from uranium
- E. comes from gravity

What confuses our thinking about genetically modifying organisms. Some applications are well received, others are vilified.

The process of creating genetically modified organisms (GMOs)

- A. has been not demonstrated in peer review journals to cause health issues
- B. has been applied to salmon
- C. has not been commercialized for beef, chicken or pork
- D. all of the answers are correct.
- E. has been applied to most major crop plants

If we want to discover the differences between people for pharmacy, ancestry, medical or forensic purposes, we could sequence all of their DNA. Another way would be to use 'markers' which show the variation. STR stand for

- A. Standard Test for Recidivism
- B. Scientists for True Religion
- C. Seek To Reach assay
- D. Separation of Trans Replicators
- E. Short Tandem Repeats

Capabilities to copy DNA were revolutionized by the innovation of PCR, which

- A. is a dangerous prescription drug
- B. is a type of digital processing used in DNA sequencing
- C. uses a heat stable DNA polymerase to copy DNA
- D. is used to study life on other planets
- E. stands for the PolyChromal Repercussions that occur in cell division

Innovation in biotechnology is happening at an exponential rate now. These developments are in the news nearly daily (if you pay attention). The development of Biotechnology is also directly linked with Industry. Basic results become applied very quickly. Which of the following is not true?

- A. The application of biotechnology is driven by profits and the promise of profits
- B. Basic Science is nearly immediately applied in today's biotech fields.
- C. Basic Science has not yet been applied in any of today's biotech fields.
- D. The distinction between Basic and Applied Science is often blurred.
- E. The application of the biological sciences has largely moved from academia to the private sector.