Evolution Exam 1 Biology 1010 Spring 2015

1. Explosions of stars or Supernovae were caused by _____ and resulted in _____.
    a. Stars running into other stars in a confusing early galaxy; explosions that allowed H and He to fuse.
    b. Buildup of Fe; providing enough energy so that the remaining chemical elements were formed.
    c. Disintegration of the most dense portions of the stars; distribution of elements into the galactic dust.
    d. Using up most of the H as it fuses into helium; further fusion of H and He to make C, N and O.
2. Data from the Hubble Telescope show remarkable images of the Eagle Nebula. Scientific data based upon the study of the Eagle Nebula are consistent with which of the following statements?
    a. Stars developing in the Eagle Nebula will overcome our solar system within a billion years.
    b. The Eagle Nebula is a beautiful rendition of fireworks and star development that has no impact on our understanding of the development of our own solar system.
    c. Because the elemental composition in the areas within the Eagle Nebula where stars are forming is similar to that of our sun, it is possible that conditions for life could be repeated in these new solar systems.
    d. The Eagle Nebula is a representation of an older group of solar systems very far away from our solar system and what we see in the telescopic images is the death of an older stet of stars where the light images are just reaching us.
3. The properties of phospholipids that make them good candidates as building blocks for formation of micelles, protocells and modern cell membranes include which of the following
    a. Phosphlipids are bulky and you need fewer of them to make the structures.
    b. Phospholipids make a barrier that blocks passage of all substances.
    c. The components for the membranes have an unfortunate side effect in causing arteriosclerosis in humans because of their use in building membranes.
    d. Phospholipids have a hydrophobic and an opposing hydrophilic end.
4. Why do many scientists believe that RNA was the first information containing macromolecule?
    a. RNA has been shown to have both self-replicative and catalytic activities.
    b. RNA molecules are more stable than DNA and have greater mutability.
    c. Since the ribosome was the first organelle discovered and it is 50% by weight RNA, it must have come first in order to create proteins.
    d. All RNA molecules have little bits of DNA nucleotides thus the transition over time form RNA to DNA as the heritable macromolecule was easier.
    e. All of the above.
5. In the life cycle of HIV the viral genome often remains dormant for long periods of time. Since the HIV genome is RNA and the host genome is DNA, how do the genomes maintain dormancy?
    a. Both DNA and RNA are polynucleotides and the HIV genome integrates into the cellular genome.
    b. Reverse transcriptase converts the RNA genome of HIV into double stranded DNA which is compatible with integration into the host genome.

c. Once enough HIV viruses have been made the host genome is basically inactive and the viral RNA genome coexists in the nucleus with the host genome.
d. Because the viral genome in the cytoplasm is coated with proteins, it is stable to degradation. Removal of the proteins activates the HIV virus to produce more viruses.

6. Which is the following contributed toward protocell formation and evolution?
   a. Formation of fatty acids in self-assembly of vesicles fifth
   b. Encapsulation of a genome and separation of diverse genomes
   c. Physical grouping of non-random chemical interactions
   d. All of the above
7. How do living cells retain order which would seem to violate the second law of thermodynamics?
   a. Biological systems are not subject to the laws of physics
   b. Nutrients are continuously fed into cells
   c. With sufficient concentrations of minerals early microorganisms were not subject to problems of entropy because of their size. Entropy problems arise only in higher order cells.
   d. Living cells require a continuous source of energy to avoid decay predicted by the second law of thermodynamics.
8. A phylogeny or a phylogenetic tree indicates
   a. The relationships among species is based upon complexity listing simple organisms at the base of the tree and complex organisms at the top.
   b. Evolutionary relationships among species started with an ancestral form and including branches leading to its descendants.
   c. The morphological relationships among species using structural similarities and differences to define species relationships.
   d. How biologists categorize species so as to group organisms with similar evolved structures on the same lineage or branch.
9. Photosynthesis is in complex process that likely evolved in the following way.
   a. A cyanobacterium became an endosymbiont of an early eukaryotic cell.
   b. By adapting a light absorption mechanism to the processes already present in mitochondria which evolved earlier than chloroplasts.
   c. During the transition from haploid to diploid cells primitive single celled eukaryotes hybridized to bring photosystem I together with photosystem II.
   d. Early bacterial systems adapted light harvesting mechanisms into a cyclic photosynthetic mechanism that eventually evolved into the modern photosynthetic scheme.
10. The fossil record of the Cambrian explosion describes a time when
    a. Dinosaurs became extinct.
    b. Many of the body plans for modern organisms appeared, including the ancestor of vertebrates.
    c. Anomalocarus, the ancestor of all mammals, first appeared.
    d. Fish developed the ability to walk on land.
11. A student examined two different groups of cells and made the following observations

Trait	**Cell I**	**Cell II**
Cell Wall	Present	Present
Ribosomes	Present	Present

Nucleus	Absent	Present
Ability to photosynthesize	Present	Absent
Cell respiration	Present	Present

These observations support which of the following conclusions?

a. Cell I is more complex in its organization than cell II.
b. Cell I is a member of the domain Bacterium.
c. Cell II does not have a cell membrane.
d. Both groups of cells are from plants.

12. An E. coli cell living in the human colon, and a methanogen living in acid mine drainage water occupy separate phylogenetic domains because:
    a. Their habitats are significantly different.
    b. Their morphological features are significantly different.
    c. Their ribosomal RNA sequences are significantly different.
    d. Their nutrient sources are significantly different.
13. Think about the habitats occupied by the ancestors of reptiles. Which of the following sequences of habitats for the lineage of terrestrial reptiles is supported by the fossil record?
    a. Hot springs…streams…rivers…estuaries…ocean
    b. Hydrothermal vents…ocean…estuaries…streams…shorelines
    c. Ocean…estuaries…streams…shoreline
    d. Deep ocean…continental shelf…shoreline
14. Which example shows the earliest form versus something that evolved at a later time?
    a. Non-cyclic photosynthesis versus cyclic photosynthesis.
    b. Cyanobacteria versus chloroplasts
    c. Eukaryotes versus Archea
    d. Banded iron rock formations versus oxygenic photosynthetic organisms
15. The Ediacaran fauna
    a. Are animals living in the Ediacaran hills of Australia
    b. Are fossils of small, soft-bodied marine animals
    c. Are Cambrian species that have no gone extinct
    d. Evolved in fresh water and migrated to salt water giving rise to all ocean fish species

Essay Questions:

1. Provide an example of emergent properties from both living and non-living systems. (4 points) What properties are similar in emergent characteristics in both living and non-living systems? (2 points)
2. Currently, life forms are obvious on Earth and not obvious on Mars. The rover Curiosity sent to Mars has identified conditions to indicate that life could have originated on Mars. Describe two different aspects that would be expected to be very similar on Earth and Mars at the time life originated on Earth. (4 points)