THE EVOLUTION GAME

By SIDDHARTH SANGHVI

1. There was no free oxygen (O_2) in the Earth's atmosphere when life originated. What is the geological evidence for this?

The earliest rocks on earth contain unoxidized minerals. Two billion year old banded iron deposits representing of the ocean as oxygen was released to the atmosphere. Oxygen is absent from volcanic sources.

Why did oxygen (O_2) have to be absent from the atmosphere for life to originate?

If oxygen had been present in the atmosphere, it would have combined with the precursors (monomeres) of macro-molecules that were the building blocks for origin of life.

What was the source for oxygen that accumulated in the atmosphere after the origin of life?

Photosynthesis. Water.

Why did oxygen (O_2) have to accumulate in the atmosphere before multicellular organisms could evolve?

All multicellular organisms are eucaryotes, which require free atmospheric oxygen. Active, large-bodied metazoans require large quantities of oxygen to sustain high levels of activity.

2. Evolutionary thinking emerged in the late 1700's and early 1800's. Describe the direct or indirect contributions of <u>three</u> of the six people below to the development of evolutionary thinking?

Thomas Malthus *Argued that populations grow faster than their food supplies. His arguments convinced Darwin that there is more offspring are produced than can survi*ve and reproduce.

Alfred Russel Wallace *Co-discoverer of natural selection. Receipt of his manuscript on natural selection prompted Darwin to publish <u>The Origin of Species</u>.*

Galileo *Developed strong evidence (using telescope) that the sun is at the center of the universe (heleocentric solar system). This view challenged and weakend Biblical dominance over natural history.*

Sir Isaac Newton *Developed the laws of physics (in Principia), which was the first science to explain natural phenomena that had been attributed to God using materialistic mechanisms. This weakened biblical dominance over natural history.*

James Hutton *Founded the modern science of geology which provided such important concepts as uniformatarianism and gradualism, and crucial evidence that the world much older than Biblical scholars said, weakening Biblical authority and providing time for evol.*

Jean-Baptiste Lamarck *Evolutionist (early 19th century) who argued for the reality of evolution without rejecting Biblical views entirely and proposed that traits acquired (by phenotypic plasticity) were inherited by offspring, producing evolution.*

3. What phenomena in the fossil record are referred to as the "Cambrian Explosion?"

Sudden (within 5-10 Ma) appearance of all preservable marine phyla world wide. Multiple groups of some phyla appear in the fossil record during the cambrian explosion.

What have we learned about the Cambrian Explosion from DNA sequence data?

The phyla that appear in the Cambrian explosion separated long before that time, suggesting that they all evolved skeletons then but had evolved much earlier.

4. Even though all natural populations have the potential for exponential growth, they tend to be stable over long periods of time. The <u>evidence</u> that natural populations tend to be stable comes from simply counting numbers of individuals generation after generation. Answer <u>two</u> of the following

three questions about this pair of observations.

A. What is the evidence that populations have the potential for exponential growth?

The females of every species can produce many more than the 2 offspring required to replace themselves and their mates.

B. How does this pair of observations contribute to the conclusion that natural selection occurs?

If many extra offspring are produced, the resulting "struggle for existence" provides the potential for some phenotypes to greatly out produce others.

C. What two facts about the properties of individuals are needed to conclude that natural selection occurs and causes evolution?

Fact 1 *Variation is common in nature.*

Fact 2 *Much of the variation in nature is inherited.*

5. Circle one of the cellular organelles below and answer all three questions concerning that organelle.

MITOCHONDRION NUCLEUS CHLOROPLAST FLAGELLA/CILIA

A. What is the function of this organelle? *Energy production; site of chromosomes; photosynthesis; locomotion or transport of fluids and particles, respectively.*

B. From what free-living organism did this organelle evolve?

Aerobic bacteria; none; blue-green algae (cyanobacteria); spiro- chaetes.

C. What evidence supports the conclusion that this organelle evolved from a free-living organism?

Presence of DNA and similarity of DNA sequences; none; presence DNA and similarity of DNA sequences; presence of 9 + 2 internal pattern of filaments.

6.What is a hypothesis and how is it used to gain scientific knowledge?

WHAT? *A prediction of what will be seen in nature (the material world if a model on which the hypothesis is based is correct.*

HOW USED? *It is tested by observing nature to see if the prediction is correct. If it is, confidence in the model is increased.*

7**.** Define each of the following terms and state why they are important in evolution. Do not define a term by example alone or using the term itself.

GALAPAGOS ISLANDS -- *Archipelago off the coast of South America (Ecuador) in which presence of unique species that resemble other South American species suggested to Darwin that they colonized the islands and new species evolved.*

EDIACARAN FAUNA -- *Soft-bodied metazoans that occur in the fossil record about 600 Ma. They range from 1-60 cm long and mostly consist of two cell cell layers. Some resemble echinoderms, annelids, and jellyfish, but most probably left no descendants.*

GRADUALISM -- *Concept that small changes extended over long periods of time can cause large differces.*

GREGOR MENDEL -- *Austrian monk who discovered laws of inheritance genetics in 1860. His work was unknown to Darwin and was not incorporated into evolutionary thinking until 1900, when it resulted in rejection of natural selection on small differences as the cause of differences between species, and the claim that mutations caused them in one big jump. Populations synthesized genetics and natural selection into a single theory.*

ARCHAEOPTERYX **--** *Early fossil bird that was discovered in 1860 and provided fossil evidence shortly after publication of The Origin of Species that birds and reptiles (major groups) shared a common ancestor.*

JOIN

Sidd Sir Live

MONDAY NIGHT @ 10 IST

ON HOW TO TACKLE NEET 2019 ?