CE212: Environment and Sustainability
Quiz No. 1, 2024-25, 1st Semester

Name: _____ **Roll No.:** _____

Duration: 50 minutes **Time: 11:10 – 12:00**
Day: Saturday **Date: August 3, 2024**
Full Marks: 25 **Closed Book, Closed notes**
Answer all questions **Q1-5 carry 2 marks each, Q6-10 carry 3 marks each**

Question 1: What is meant by Species?

Living organisms may be of various types and very different from each other. Living organisms are divided into species. Species is defined as a group of organisms which can produce fertile off springs through asexual/sexual reproduction. All members of a species are alike in many ways (similar DNA/RNA), but are not identical.

Question 2: What are the basic pre-requisites for a living organism to survive and grow?

A living organism must have some way to produce energy and use this energy to survive. To survive, a living organism must have the ability to carry out an oxidation-reduction reaction and use the released free energy as its energy source. Also a living organism must have some way to replicate, such that life persists. Thus, all living organisms must have a genetic code (DNA/RNA) which is passed on to its offspring during reproduction.

Question 3: Describe what is meant by the environment.

Environment is defined as the totality of circumstances surrounding an organism or group of organisms, including the external physical conditions that affect and influence the growth, development, and survival. The environment is not unchanging. There may be diurnal and seasonal variation in the environment. There may also be long-term changes in the environment caused by external factors, or relatively short term changes caused by catastrophic events.

Question 4: What is meant by adaptation in the context of species and environment?

Different species thrive in different environments. All members of a species are not identical, they have different characteristics. If members of a species are transported to a new environment, or if the environment itself changes, then some members of the species with characteristics suitable to the changed environment will survive and thrive in the long run, while those without suitable characteristics will die off. Thus the characteristics of the entire species change with change in environment. This is known as adaptation.

Question 5: What is meant by extinction of species?

Sometimes the changes in the surrounding environment of a species are so severe, that none of the members of the species can adapt and survive. Then all the members of that species in that environment die off. If this happens in all environments the species exist in, then the species becomes extinct. Extinction of species is a common phenomenon over the ages.

Question 6: Describe formation of earth.

Earth was formed around 4.6 billion years ago. A rotating disk of dust and gas orbiting the sun was the precursor to the earth. The rotating dust particles came together to form meteorites, which further came together through collisions and explosions to form the earth and the moon. High energy impacts during formation of earth produced heat, which melted the heavier elements and formed to core of the earth. The

lighter elements outside the core formed compounds (i.e., rocks) and solidified becoming the earth's crust. Very light compounds (including water vapor) formed earth's atmosphere. The water vapor in the atmosphere ultimately condensed as rain forming oceans. The crust of the early earth was very unstable with massive volcanic activity. Further the atmosphere of early earth contained no oxygen.

Question 7: Describe to conditions when first life originated on earth.

Initially, the crust of the earth was too unstable and temperatures too high for life. But the crust cooled and solidified over time, further, oceans were formed. However, environment of early earth was devoid of oxygen and high in methane and hence not conducive to growth of aerobic organisms which dominate the earth now. Hence the first life which originated on earth (about 3.5 billions of years ago) was almost certainly anaerobic in nature, i.e., organisms which did not require oxygen to survive. It is likely that such life originated in deep oceans, around hydrothermal vents and also in shallow pools, where conditions for life was conducive.

Question 8: Describe structure and composition of the core, mantle and crust of the earth.

The core consists of,

The Inner core: Composed of Iron and Nickel. Pressures are so great that metals are solid, despite the high temperature.

The Outer core: Metals (Iron and Nickel) are molten and exists as a liquid.

The mantle consists of,

The Mesosphere: Hot rocks, but relatively rigid due to high pressure

The Asthenosphere…..hot, molten (plastic) rocks

The outer solid crust of the solid Earth, where rocks are harder and more rigid than those in the plastic asthenosphere**.** The oceanic crust on average is about 8 km thick. The continental crust on average is about 45 km thick.

Question 9: What happens at the convergence of a continental plate with an oceanic plate and also at the convergence of two continental plates?

When continental and oceanic plates collide the thinner and denser oceanic plate is overridden by the thicker and less dense continental plate. The oceanic plate is forced down into the mantle in a process known as **'**subduction'. This leads to the formation of a mid-oceanic trench. Volcanic activities are common in such areas of convergence.

When two thick continental plates collide, and both of them have a density that is much lower than the mantle, 'subduction' is not possible. In such cases, the colliding plates fold and rise up as mountains. The Himalaya Mountain Range is the best active example of this type of plate boundary.

Question 10: What happens at the divergence of two continental plates and at the divergence of two oceanic plates?

When a divergent boundary occurs in a thick continental plate, a rift valley is formed. A rift valley is a low lying land formed between the two divergent continental plates. Red sea is an example of a rift valley that has become a sea. The East Africa Rift Valley is a classic example of this type of plate boundary visible on land.

When a divergent boundary occurs beneath oceanic lithosphere, the rising convection current below lifts the lithosphere producing a mid-ocean ridge.