

- 1) A
- 2) A, C, D
- 3) D
- 4) C
- 5) B, C
- 6) A, C, D
- 7) A, C, D
- 8) B, C, D
- 9) A, D
- 10) B
- 11) C
- 12) A, C, D
- 13) A, C
- 14) A, B, C
- 15) H

Section B

Q1. Species interactions are an important part of the ecosystem and any imbalance created can have negative consequences. If the predator population decreases, the herbivore population will increase and would lead to an increase in soil erosion because the top layer grass would get eaten away at a faster rate. This is an example of the consequences of imbalance. Species interactions are part of the framework that forms the complexity of ecological communities. Species interactions are extremely important in shaping community dynamics. It was originally thought that competition was the driving force of community structure, but it is now understood that all of the interactions, along with their indirect effects and the variation of responses within and between species, define communities and ecosystems.

Global Warming will increase the number of wildfires that take place. This would mean the habitat of many animals get destroyed along with their food source. This not only will affect herbivores but carnivores too. Animals would need to migrate in search of food and shelter. To test this hypothesis we can monitor the animal population of areas close to a forest fire. An abnormal increase in the animal population will prove the hypothesis.

Q2. Coevolution occurs when two or more species reciprocally affect each other's evolution through the process of natural selection. Each party in a coevolutionary relationship exerts selective pressures on the other, thereby affecting each other's evolution. An example of this can be the co-evolution of predator and prey. The predator evolves to catch the prey more effectively while the prey evolves to escape.

Tight interspecific interactions do not always lead to coevolution. Mimicry, for example, can be a parasite/host interaction. Batesian mimics may not be able to escape its parasite and thus also lose the protection of their own species' warning pattern. This proves that the outcome of Batesian mimicry is not coevolution but unilateral adaptation by one species to the other.

Q3. Human activities often augment drift and diminish gene flow for many species, which reduces genetic variation in local populations and prevents the spread of adaptive complexes outside their population of origin, thereby disrupting adaptive processes both locally and globally within a species. Human infrastructure restricts species populations in an area and also negatively impacts it. Human activities are causing massive impacts on biodiversity on levels such as genes, species, communities, and ecosystems. Water pollution in many rivers and lakes has made the water to become inhabitable for fishes leading to complete extinction of many species. Besides population, human activity can also affect the food chain in an ecosystem. When humans create a disturbance in one population it may only affect a few species. But the disruption in those species then affects even more species that interact with it, branching out in a domino effect-like disruption. Human activities directly influence the population of species which is an important factor in gene drift and gene flow. These two are important factors in evolutionary changes and human activities have had a significant impact on them.

Q4. They should report 4 different species were found. To confirm whether the geckos are the same species a small population of each color should be bred with each other and the fitness of the offspring thus produced should be measured. If there is no reduction in fitness, then the geckos are the same species and otherwise there are 5 species to be reported.

Q5. Amur Falcons migrate and come to northeast India during the winters. To capture them fishing nets were set up high and 12,000 to 14,000 falcons were killed each day during the peak migration. The birds once captured were sold in villages and the ones alive were even exported. The government, the forest department, local NGOs and, most importantly, the local communities extended their conservation efforts to ensure there were no trapping or killing of the birds. The most important factor was the education of locals to the importance of the birds to ecology. Other factors included patrolling and enforcement, as well as scientific study of the birds. Hunters turned into guardians and took up jobs such as bird spotting and other activities promoting tourism. A combined effort helped put a stop to the mass hunting of the falcon.

Section C

Q1. Insects are thought of as a nuisance by many. But the importance of insects are not known by most people. Insects create the biological foundation for all terrestrial ecosystems. They cycle nutrients, pollinate plants, disperse seeds, maintain soil structure and fertility, control populations of other organisms, and provide a major food source for other taxa. Insects are crucial components of many ecosystems, where they perform many important functions. They aerate the soil, pollinate blossoms, and control insect and plant pests. Many insects, especially beetles, are scavengers, feeding on dead animals and fallen trees, thereby recycling nutrients back into the soil. As decomposers, insects help create

topsoil, the nutrient-rich layer of soil that helps plants grow. All insects fertilize the soil with the nutrients from their droppings. Apart from their role in agriculture, some insects produce useful substances, such as honey, wax, lacquer, and silk. Honeybees have been raised by humans for thousands of years for honey. Insects are not just eaten by people. Insects are the sole food source for many amphibians, reptiles, birds, and mammals, making their roles in food chains and food webs extremely important. It is possible that food webs could collapse if insect populations decline.

If we try to imagine the world without insects, we soon realize that it would be very difficult. Insects pollinate at least a third of the total volume of crops cultivated worldwide, and many are useful predators of non-insect pests such as mites. Even if we managed to convert agriculture to purely wind-pollinated crops we would have to deal with an even more fundamental problem: the complete collapse of most ecosystems.

The total biomass of insects vastly outstrips the mass of all vertebrates so insects are a vital part of most food webs. Without insects for them to eat, we would lose most reptiles and amphibians and about half of all the bird species. Insects are also a very important part of the decomposition process that returns nutrients from dead plants and animals to the soil. The environmental catastrophe that resulted would probably totally disrupt agriculture for decades or more and leave us almost entirely dependent on the sea for food.

Despite this insects are responsible for spreading a lot of diseases in both plants and humans. Insect bites generally have a couple harmful effects namely irritation and illness. The less severe effect is the simple irritation, swelling and pain that sometimes come from bites by certain insects such as mosquitoes, bees and some spiders.

Considering both sides of the argument, I would convince the group of people to include insects otherwise the biosphere would not be a long lasting project. It would also be necessary to keep the insect population in check to reduce their harmful impact on humans,

Q2. Earth's temperature goes through various cycles over a large period of time. In the past few years the rise in temperature has been very rapid which is unlike natural cycles. This has been a cause of concern because it has led to the depletion of glaciers on the poles. Melting glaciers add to rising sea levels, which in turn increases coastal erosion and elevates storm surge as warming air and ocean temperatures create more frequent and intense coastal storms like hurricanes and typhoons. Specifically, the Greenland and Antarctic ice sheets are the largest contributors of global sea level rise. Right now, the Greenland ice sheet is disappearing four times faster than in 2003 and already contributes 20% of current sea level rise. As this ice melts, darker patches of ocean start to emerge, eliminating the effect that previously cooled the poles, creating warmer air temperatures and in turn disrupting normal patterns of ocean circulation. Research shows the polar vortex is appearing outside of the Arctic more frequently because of changes to the jet stream, caused by a combination of warming air and ocean temperatures in the Arctic and the tropics.

The glacial melt we are witnessing today in Antarctica and Greenland is changing the circulation of the Atlantic Ocean and has been linked to collapse of fisheries in the Gulf of Maine and more destructive storms and hurricanes around the planet.

Climate change can affect species in myriad ways including the expansion, contraction, and “migration” of habitat; increased incidence of disease and invasive species; changes in temperature, precipitation, and other environmental conditions; shifts in food availability; and failure of ecological relationships with other species — for example the loss of critical pollinators or mutualistic nutrient fixers. In the past some species may have escaped extinction by “migrating” north or southward in response to climate change. Today humans have made it a lot tougher by fragmenting, converting, and destroying habitats and potential migration corridors.

Even though higher temperatures might benefit tropic areas, the entire system is interconnected. Temporary gains in the tropical region will not be able to balance out the destruction caused by rising sea levels because that would disrupt the food cycle. We at this point cannot fully measure what the impact of global warming would be if there are no measures taken but we do know that the planet will survive but humankind might not. There is little doubt that climate has played a critical role in past fluctuations of biodiversity levels. Among the five recognized mass extinction events — the Ordovician, the Devonian, the Permian, the Triassic and the Cretaceous — at least four are believed to have some correlation to climate change. Hence, it is important to limit the factors contributing to global warming.