**Unit Assessment Statements--Biodiversity and Conservation**

• Biodiversity is a broad concept encompassing the total diversity of living systems, which includes the diversity of species, habitat diversity and genetic diversity.

• Species diversity in communities is a product of two variables: the number of species (richness) and their relative proportions (evenness).

• Communities can be described and compared through the use of diversity indices. When comparing communities that are similar, low diversity could be indicative of pollution, eutrophication or recent colonization of a site. The number of species present in an area is often indicative of general patterns of biodiversity.

• Habitat diversity refers to the range of different habitats in an ecosystem or biome.

• Genetic diversity refers to the range of genetic material present in a population of a species.

• Quantification of biodiversity is important to conservation efforts so that areas of high biodiversity may be identified, explored, and appropriate conservation put in place where possible.

• The ability to assess changes to biodiversity in a given community over time is important in assessing the impact of human activity in the community.

• Species diversity is a function of the number of species and their relative abundance and can be compared using an index. There are many versions of diversity indices, but students are only expected to be able to apply and evaluate the result of the Simpson diversity index as shown below. Using this formula, the higher the result (D), the greater the species diversity. This indication of diversity is only useful when comparing two similar habitats, or the same habitat over time.



– *D* is the Simpson diversity index

– *N* is the total number of organisms of all species found

– *n* is the number of individuals of a particular species

• Species richness is the number of species in a community and is a useful comparative measure.

• Biodiversity arises from evolutionary processes.

• Biological variation arises randomly and can either be beneficial to, damaging to, or have no impact on, the survival of the individual.

• Natural selection occurs through the following mechanism.

1. Within a population of one species, there is genetic diversity, which is called variation.

2. Due to natural variation, some individuals will be fitter than others.

3. Fitter individuals have an advantage and will reproduce more successfully than individuals who are less fit.

4. The offspring of fitter individuals may inherit the genes that give that advantage.

• This natural selection will contribute to the evolution of biodiversity over time. • Environmental change gives new challenges to species: those that are suited will survive, and those that are not suited will not survive.

• Speciation is the formation of new species when populations of a species become isolated and evolve differently from other populations.

• Isolation of populations can be caused by environmental changes forming barriers such as mountain formation, changes in rivers, sea level change, climatic change or plate movements. The surface of the Earth is divided into crustal, tectonic plates that have moved throughout geological time. This has led to the creation of both land bridges and physical barriers with evolutionary consequences.

• The distribution of continents has also caused climatic variations and variation in food supply, both contributing to evolution.

• Mass extinctions of the past have been caused by various factors, such as tectonic plate movements, super-volcanic eruption, climatic changes (including drought and ice ages), and meteorite impact—all of which resulted in new directions in evolution and therefore increased biodiversity.

• Estimates of the total number of species on Earth vary considerably. They are based on mathematical models, which are influenced by classification issues and a lack of finance for scientific research, resulting in many habitats and groups being significantly under-recorded.

• The current rates of species loss are far greater now than in the recent past, due to increased human influence. The human activities that cause species extinctions include habitat destruction, introduction of invasive species, pollution, overharvesting and hunting.

• The International Union of Conservation of Nature (IUCN) publishes data in the “Red List of Threatened Species” in several categories. Factors used to determine the conservation status of a species include: population size, degree of specialization, distribution, reproductive potential and behaviour, geographic range and degree of fragmentation, quality of habitat, trophic level, and the probability of extinction.

• Tropical biomes contain some of the most globally biodiverse areas and their unsustainable exploitation results in massive losses in biodiversity and their ability to perform globally important ecological services.

• Most tropical biomes occur in less economically developed countries (LEDCs) and therefore there is conflict between exploitation, sustainable development and conservation.

• Arguments about species and habitat preservation can be based on aesthetic, ecological, economic, ethical and social justifications.

• International, governmental and non-governmental organizations (NGOs) are involved in conserving and restoring ecosystems and biodiversity, with varying levels of effectiveness due to their use of media, speed of response, diplomatic constraints, financial resources and political influence**.**

• Recent international conventions on biodiversity work to create collaboration between nations for biodiversity conservation.

• Conservation approaches include habitat conservation, species-based conservation and a mixed approach.

• Criteria for consideration when designing protected areas include size, shape, edge effects, corridors, and proximity to potential human influence.

• Alternative approaches to the development of protected areas are species-based conservation strategies including:

– CITES

– captive breeding and reintroduction programmes, and zoos

– selection of “charismatic” species to help protect others in an area (flagship species)

– selection of keystone species to protect the integrity of the food web.

• Community support, adequate funding and proper research influence the success of conservation efforts.

• The location of a conservation area in a country is a significant factor in the success of the conservation effort. Surrounding land use for the conservation area and distance from urban centers are important factors for consideration in conservation area design.