

## Unique Biodiversity Instructions and Answers for Teachers

- Venue: Flower Dome and Cloud Forest (indoor)
- Estimated duration to complete all questions: 1 hr

### Level / Subject:

- Lower Secondary (Science): Understanding Diversity of Living Things; Interactions within Ecosystems
- Upper Secondary (Science): Man and His Environment
- Lower Secondary (Social Studies): Managing Our Environment
- Lower Secondary (Geography): Managing the Changing Environment

### Learning Objectives:

- Discuss the reasons for the extinction of plants and animals
- Explain the importance of conserving the environment
- Learn about the environmental sustainable practices at Gardens by the Bay



### **ACTIVITY 1: Unique Biodiversity (30 min)**

(a) Located at the extreme south-western region of South Africa is the *Cape Floral Region*, home to one of the greatest concentration of non-tropical vascular plant species in the world. The area is filled with extremely diverse plants, with nearly three-quarters of them endemic, found naturally only in this part of the world. Learn more about some of these plants at the South African Garden, at the Flower Dome.

What are the three distinct types of plant communities that can be found at this region? State their characteristics in the table provided.

(Hint: Read about them from the information panels here)

Answers:

Name of Plant Community	Characteristics of the Climate / Environment	Type / Example of Plants
Fynbos	Fire-prone, sandy, low-nutrient soil	Fire-prone shrubs with hard leaves / needle-like leaves e.g. Silver Tree, Proteas, Ericas
Karoo	Semi-arid plateau	Succulents e.g. Aloes, Bulbines, Crassulas, Livingstone Daisies, spiny shrubs e.g. Coral Tree
Wetland	High and constant humidity, with rivers and lagoons	Evergreen, broad-leaved trees and shrubs e.g. Cabbage Tree, Blue-flowered African Lily

(b) The unique plants in this amazingly diverse region are threatened by human activities. Name and elaborate on three of these threats.

Answers:

Agriculture - Intensive agriculture replaced huge biodiversity with plantations of a few crops.

Alien invasion - Trees and shrubs from other Mediterranean-type climates have been introduced into the region, invading about 70 percent of mountain and lowland fynbos. Such alien invasion takes over native species and changes the natural climate patterns of the habitat.

Urbanisation - Population growth has caused towns and cities to expand, threatening the native plants with habitat destruction to make way for people and industries.

### **ACTIVITY 2: Highly Adapted (15 min)**

Cloud forests around the world are important sources of freshwater and are unique habitats of many endemic species. Many of these flora and fauna are highly adapted to survive in a very specific set of cool and moist conditions that exist at a certain elevation but not another. Explore the Cloud Forest at the Gardens.

How are these organisms affected by global warming?

(Hint: Find out more from the information panels at the Forest Floor, Cloud Walk and Cloud Forest Gallery)

Answers:

Global warming is causing extreme weather. Higher sea surface temperatures caused by global warming will result in clouds forming at higher altitudes than they are today, changing the humidity and temperature at various heights. Hence, the plants and animals that are highly dependent on the current humidity and temperature will start to die out when the conditions of these regions change.

### **ACTIVITY 3: Alternative Solutions (15 min)**

(a) To play our part in maintaining a balance with nature and reducing our carbon footprint, Gardens by the Bay uses sustainable energy and practices. Proceed to watch the animation and illustration of the Gardens' sustainability strategies at Cloud Forest Theatre, to find out more.

What is an alternative, renewable energy source used at Gardens by the Bay? How is it used here?

**Answers:**

**Solar Energy.**

**This energy is harnessed by the solar panels / photovoltaic cells fixed on the Supertrees and some buildings at the Gardens. The solar energy is converted to electricity to supplement what is required at the Gardens.**

(b) You have just learnt about the sustainable practices Gardens by the Bay implements. If you are an architect of a new housing development in Singapore, how would you design these buildings to be environmentally sustainable? Draw your designs in the space provided and share it with your class.

Teachers may consider completing this question as a post-programme classroom activity to provide students with ample time for creativity.

### **Notes to Teacher:**

For more on biodiversity, Man's impact on the environment and the environmental sustainable strategies at the Gardens, check out these Secondary School programmes:

- Gardens Under Glass
  - The COOL Factor
  - Home Today, Gone Tomorrow
  - Renewed Energy
  - Stretched to the Limit
- Please refer to our website for more details.