|  |  |  |
| --- | --- | --- |
| **Unit Overview**  **Unit 3: Biodiversity and the interconnectedness of life** | | **NOTES** |
| In Unit 3, students explore the ways biology is used to describe and explain: the biodiversity within ecosystems; a range of biotic and abiotic components; species interactions; adaptations of organisms to their environment; principles of population dynamics; and how classification systems are used to identify organisms and aid scientific communication. An understanding of the structure of ecosystems, the processes involved in the movement of energy and matter in ecosystems and how environmental factors limit populations is essential to appreciate the dynamics, diversity and underlying unity of these systems. Students investigate the interactions within and between species, and the interactions between abiotic and biotic components of ecosystems. They also investigate how measurements of abiotic factors, population numbers, species diversity and descriptions of interactions between species can form the basis for spatial and temporal comparisons between ecosystems. They examine and analyse data collected from fieldwork to understand the interconnectedness of organisms, the physical environment and the impact of human activity.  Contexts that could be investigated in this unit include: the local ecosystem; fishing and mining industries; habitat destruction; and ecosystem management systems. Through investigating these contexts, students may explore the impact of human activity on biodiversity, and sustainability of practices.  Participation in a range of experiments and investigations will allow students to progressively develop their suite of science inquiry skills while gaining an enhanced appreciation of how scientific knowledge is used to offer valid explanations and reliable predictions, and the ways in which scientific knowledge interacts with social, economic, cultural and ethical factors. Collaborative experimental work also helps students to develop communication, interaction, character and management skills.  Throughout the unit, students develop skills in sampling ecological systems, organising and analysing data and developing ecological models to describe and explain the diversity and interconnectedness of life on Earth. | |  |
| **Subject Matter: Topic 1 (Describing Biodiversity)** | |
| **Biodiversity** | Recognise that biodiversity includes the diversity of species and ecosystems. |
| Determine diversity of species using measures such as species richness, evenness (relative species abundance), percentage cover, percentage frequency and Simpson’s diversity index. |
| Use species diversity indices, species interactions (predation, competition, symbiosis, disease) and abiotic factors (climate, substrate, size/depth of area) to compare ecosystems across spatial and temporal scales. |
| Explain how environmental factors limit the distribution and abundance of species in an ecosystem. |
| **Mandatory practical***:*Determine species diversity of a group of organisms based on a given index. |
| **Classification Process** | Interpret data to classify and name an ecosystem. |
| Explain how the process of classifying ecosystems is an important step towards effective ecosystem management (consider old-growth forests, productive soils and coral reefs). |
| Describe the process of stratified sampling in terms of:   * purpose (estimating population, density, distribution, environmental gradients and profiles, zonation, stratification) * site selection * choice of ecological surveying technique (quadrats, transects) * minimising bias (size and number of samples, random-number generators, counting criteria, calibrating equipment and noting associated precision) * methods of data presentation and analysis. |
| **Mandatory practical***:*Use the process of stratified sampling to collect and analyse primary biotic and abiotic field data to classify an ecosystem. |
| **Subject Matter: Topic 2 (Ecosystem Dynamics)** | |
| **Functioning ecosystems** | Analyse data to identify species (including microorganisms) or populations occupying an ecological niche. |
| **Population ecology** | Explain why the carrying capacity of a population is determined by limiting factors (biotic and abiotic).  Discuss the effect of changes within population-limiting factors on the carrying capacity of the ecosystem. |
| **Changing ecosystems** | Analyse ecological data to predict temporal and spatial successional changes. |
| Predict the impact of human activity on the reduction of biodiversity and on the magnitude, duration and speed of ecosystem change. |
| **Mandatory practical***:*Select and appraise an ecological surveying technique to analyse species diversity between two spatially variant ecosystems of the same classification (e.g. a disturbed and undisturbed dry sclerophyll forest). |
| **IA2: Student Experiment** | |
| In the student experiment, students modify (i.e. refine, extend or redirect) an experiment in order to address their own related hypothesis or question. It is sufficient that students use a practical performed in class or a simulation as the basis for their methodology and research question. | |
| **Specifications** | In order to complete the assessment task, students must:   * identify an experiment to modify * develop a research question to be investigated * research relevant background scientific information to inform the modification of the research question and methodology * conduct a risk assessment and account for risks in the methodology * conduct the experiment * collect sufficient and relevant qualitative data and/or quantitative data to address the research question |