**B18 Specification Sheet: Biodiversity and the effect of human interaction on ecosystems**

**Waste management**

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| Rapid growth in the human population and an increase in the standard of living mean that increasingly more resources are used and more waste is produced. Unless waste and chemical materials are properly handled, more pollution will be caused. |  |
| Pollution can occur:  • in water, from sewage, fertiliser or toxic chemicals  • in air, from smoke and acidic gases  • on land, from landfill and from toxic chemicals. |  |
| Pollution kills plants and animals which can reduce biodiversity. |  |

**Land use**

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| Humans reduce the amount of land available for other animals and plants by building, quarrying, farming and dumping waste. |  |
| The destruction of peat bogs, and other areas of peat to produce garden compost, reduces the area of this habitat and thus the variety of different plant, animal and microorganism species that live there (biodiversity). |  |
| The decay or burning of the peat releases carbon dioxide into the atmosphere. |  |
| Understand the conflict between the need for cheap available compost to increase food production and the need to conserve peat bogs and peatlands as habitats for biodiversity and to reduce carbon dioxide emissions. |  |

**Deforestation**

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| Large-scale deforestation in tropical areas has occurred to:  •provide land for cattle and rice fields  • grow crops for biofuels. |  |
| Evaluate the environmental implications of deforestation. |  |

**Global warming**

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| Levels of carbon dioxide and methane in the atmosphere are increasing, and contribute to ‘global warming’. |  |
| Students should be able to describe some of the biological consequences of global warming. |  |
| Understand that the scientific consensus about global warming and climate change is based on systematic reviews of thousands of peer reviewed publications. |  |
| Explain why evidence is uncertain or incomplete in a complex context. |  |

**Biodiversity**

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| Biodiversity is the variety of all the different species of organisms on earth, or within an ecosystem. |  |
| A great biodiversity ensures the stability of ecosystems by reducing the dependence of one species on another for food, shelter and the maintenance of the physical environment. |  |
| The future of the human species on Earth relies on us maintaining a good level of biodiversity. Many human activities are reducing biodiversity and only recently have measures been taken to try to stop this reduction. |  |
| Explain how waste, deforestation and global warming have an impact on biodiversity. |  |

**Maintaining biodiversity**

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| Scientists and concerned citizens have put in place programmes to reduce the negative effects of humans on ecosystems and biodiversity. |  |
| These include:  • breeding programmes for endangered species  • protection and regeneration of rare habitats  • reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop  • reduction of deforestation and carbon dioxide emissions by some governments  • recycling resources rather than dumping waste in landfill. |  |
| Students should be able to describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity. |  |
| Evaluate given information about methods that can be used to tackle problems caused by human impacts on the environment. |  |
| Explain and evaluate the conflicting pressures on maintaining biodiversity given appropriate information. |  |

**Impact of environmental change (biology only)**

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| Environmental changes affect the distribution of species in an ecosystem. These changes include:  • temperature  • availability of water  • composition of atmospheric gases. |  |
| The changes may be seasonal, geographic or caused by human interaction. |  |
| Students should be able to evaluate the impact of environmental changes on the distribution of species in an ecosystem given appropriate information. |  |

**Trophic levels (biology only)**

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| Trophic levels can be represented by numbers, starting at level 1 with plants and algae. Further trophic levels are numbered subsequently according to how far the organism is along the food chain. |  |
| Level 1: Plants and algae make their own food and are called producers. |  |
| Level 2: Herbivores eat plants/algae and are called primary consumers. |  |
| Level 3: Carnivores that eat herbivores are called secondary consumers. |  |
| Level 4: Carnivores that eat other carnivores are called tertiary consumers. Apex predators are carnivores with no predators. |  |
| Decomposers break down dead plant and animal matter by secreting enzymes into the environment. Small soluble food molecules then diffuse into the microorganism. |  |
| Students should be able to describe the differences between the trophic levels of organisms within an ecosystem. |  |

**Pyramids of biomass (biology only)**

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| Pyramids of biomass can be constructed to represent the relative amount of biomass in each level of a food chain. Trophic level 1 is at the bottom of the pyramid. |  |
| Students should be able to construct accurate pyramids of biomass from appropriate data. |  |

**Transfer of biomass (biology only)**

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| Producers are mostly plants and algae which transfer about 1 % of the incident energy from light for photosynthesis. |  |
| Only approximately 10 % of the biomass from each trophic level is transferred to the level above it. |  |
| Losses of biomass are due to:  • not all the ingested material is absorbed, some is egested as faeces  • some absorbed material is lost as waste, such as carbon dioxide and water in respiration and water and urea in urine. |  |
| Large amounts of glucose are used in respiration. |  |
| Calculate the efficiency of biomass transfer between trophic levels. |  |
| Students should be able to:  • describe pyramids of biomass  • explain how biomass is lost between the different trophic levels. |  |
| Students should be able to calculate the efficiency of biomass transfers between trophic levels by percentages or fractions of mass. |  |
| Students should be able to explain how this affects the number of organisms at each trophic level. |  |

**Food production (biology only)**

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| Food security is having enough food to feed a population. |  |
| Biological factors which are threatening food security include:  • the increasing birth rate has threatened food security in some countries  • changing diets in developed countries means scarce food resources are transported around the world  • new pests and pathogens that affect farming  • environmental changes that affect food production, such as widespread famine occurring in some countries if rains fail  • the cost of agricultural inputs  • conflicts that have arisen in some parts of the world which affect the availability of water or food. |  |
| Sustainable methods must be found to feed all people on Earth. |  |
| Interpret population and food production statistics to evaluate food security. |  |
| The efficiency of food production can be improved by restricting energy transfer from food animals to the environment. This can be done by limiting their movement and by controlling the temperature of their surroundings. |  |
| Some animals are fed high protein foods to increase growth. |  |
| Understand that some people have ethical objections to some modern intensive farming methods. |  |
| Evaluate the advantages and disadvantages of modern farming techniques. |  |
| Fish stocks in the oceans are declining. It is important to maintain fish stocks at a level where breeding continues or certain species may disappear altogether in some areas. |  |
| Control of net size and the introduction of fishing quotas play important roles in conservation of fish stocks at a sustainable level. |  |
| Understand how application of different fishing techniques promotes recovery of fish stocks. |  |
| Modern biotechnology techniques enable large quantities of microorganisms to be cultured for food. |  |
| The fungus *Fusarium* is useful for producing mycoprotein, a protein-rich food suitable for vegetarians. The fungus is grown on glucose syrup, in aerobic conditions, and the biomass is harvested and purified. |  |
| GM crops could provide more food or food with an improved nutritional value such as golden rice. |  |
| Students should be able to describe and explain some possible biotechnical and agricultural solutions, including genetic modification, to the demands of the growing human population. |  |