**Option G.2 Notes**

*G.2.1  Define gross production, net production and biomass*

Gross Production:  The amount of organic matter (biomass) produced by plants

Net Production:  The amount of organic matter produced by plants minus what is needed for plant respiration

Biomass:  The total dry organic matter of living organisms or ecosystems

*G.2.2  Calculate values for gross production and net production using the equation: gross production – respiration = net production*



*G.2.3  Discuss the difficulties of classifying organisms in higher trophic levels*

There are a number of reasons why it may be difficult to classify organisms in higher trophic levels:

* Organisms may fit into more than one trophic level (as seen in food webs)
* Omnivores consume organisms from all levels of the food chain (plants *and* animals)
* There may be seasonal changes in trophic level depending on availability of food supplies
* Some organisms may alter their diet over the course of their life cycle (e.g. some amphibians)

*G.2.4  Explain the small biomass and low numbers of organisms in higher trophic levels*

* Energy transfer along a food chain is less that 100% efficient (~10% of energy is transferred between trophic levels)
* The remainder is lost as heat, used up in respiration, excreted (as faeces or urine) or simply not consumed
* Nutrient transfer is also less than 100% efficient between trophic levels
* Consequently, there is a reduced total amount of biomass available to higher order consumers (resulting in small biomass at these levels)
* Higher order consumers need to hunt prey to survive, adding an extra energy cost to the feeding process
* Because predators need to consumer larger quantities of prey to derive sufficient energy, more competition exists – resulting in lower numbers



*G.2.5  Construct a pyramid of energy, given appropriate information*

* A pyramid of energy is a graphical representation of the amount of energy of each tropic level in a food chain
* They are expressed in units of energy per area per time (e.g. kJ m2 year-1)
* Pyramids of energy will never appear inverted as some of the energy stored in one source is always lost when transferred to the next source
* This is an application of the second law of thermodynamics
* Each level of the pyramid of energy should be approximately one tenth the size of the level preceding it, as energy transformations are ~10% efficient

*G.2.6  Distinguish between primary and secondary succession, using an example of each*

Ecological succession describes the process by which a sequence of increasingly complex communities develop over time

* The climax community is reached when succession has ended and the community has all of its characteristics

**Primary Succession**

* Occurs when succession starts on entirely new land without any established soil – this may occur at river deltas, sand dunes or on exposed rock
* As the organisms which first colonise a region (pioneer community) die and decompose, they establish a layer of soil for future organisms to utilise
* On exposed rock, lichen and moss may initally colonise the area and provide a layer of soil for seeds to germinate, increasing species diversity

**Secondary Succession**

* Occurs when succession starts on existing soil following a natural or artificial upheaval of the primary succession
* Secondary succession occurs when the existing biota is removed from soil that is already formed – such as following a bushfire or earthquake
* During secondary succession, dominance is usually achieved by the fastest growing plants

Summary of Primary versus Secondary Succession



*G.2.7  Outline the changes in species diversity and production during primary succession*

* *Species diversity* will increase as primary succession proceeds
	+ Only a few species (lichen and moss) are capable of living in environments that have never sustained life before (pioneer species)
	+ As these species alter the environment, it becomes more habitable, leading to a larger diversity of species colonising the region
* *Production* – an increase in biomass or available energy – will also increase as primary succession proceeds
	+ In early succession, there are few plants, so gross production and net production are low
	+ As the number and density of plant species increases with more soil, productivity also becomes greater

*G.2.8  Explain the effects of living organisms on the abiotic environment, with reference to the changes occurring during primary succession*

* Primary succession begins on new land, with pioneer species breaking down substrate to create organic soil
* As plant species colonise the area, the litter produced by their growth and their decomposing remains will cause the following changes:
	+ Will increase soil depth (adds humus to soil)
	+ Will increase soil mineral content (and break down rock through root growth)
	+ Will aerate soil and alter the soil pH
	+ Will improve soil water retention and reduce draining
* This will allow for the growth of larger plants, which will provide shade and reduce erosion through the binding action of their roots

Summary of Changes During Primary Succession



*G.2.9  Distinguish between biome and biosphere*

**Biome:**  A geographical area that has a particular climate and sustains a specific community of plants and animals (i.e. a type of ecosystem)

**Biosphere:**  The total of all areas where living things are found (i.e. the totality of biomes)

*G.2.10  Explain how rainfall and temperature affect the distribution of biomes*

* The main factors affecting the distribution of biomes is temperature and rainfall
* These factors will vary according to latitude and longitude, elevation and proximity to the sea
* Temperature is influential because it affects the rate of metabolism – the phases in the life cycles of many organisms are temperature dependent
* In the same way, the availability of fresh water (both in the soil and in rivers and lakes) is critical to the growth and nutrition of organisms
* Rainfall and warmer temperatures are more common near the equator and less common at the poles



*G.2.11  Outline the characteristics of six major biomes*



Different Types of Biomes



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