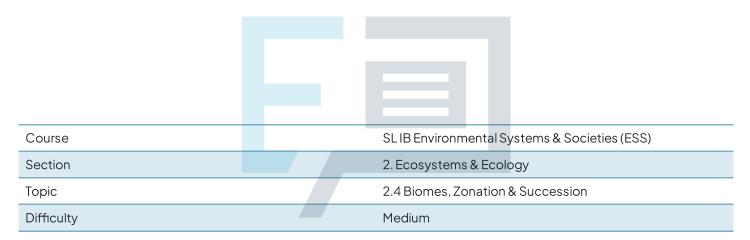


### 2.4 Biomes, Zonation & Succession

### **Mark Schemes**



# **Exam Papers Practice**

To be used by all students preparing for SL IB Environmental Systems & Societies (ESS) Students of other boards may also find this useful



Indicative Content	Commentary
i) The ecological term used to describe the distinct	You would still gain a
pattern of changes in vegetation is:	mark for identifying
(Altitudinal) zonation; [1 mark]	one vegetation type from the figure and
ii) Global warming might affect the pattern of	suggesting how it
vegetation in the following ways:	would be found at a
	higher location /
Any <b>one</b> from the following:	greater altitude
<ul> <li>The zones of vegetation will increase in altitude / move further up the mountain; [1 mark]</li> <li>The upper zones of vegetation (e.g. grass/herbs/shrubs) may decrease / disappear (completely); [1 mark]</li> <li>Any vegetation zone may experience an increase in growth/abundance or declines due to changing rainfall patterns / increasing temperatures (above optimal range); [1 mark]</li> </ul>	You would not gain a mark for referring to 'melting of snow', unless you directly relate this to a change in vegetation

1b

#### Indicative Content

Rising temperatures caused by global warming may affect the food production systems of Andean communities living at an altitude of around 2500 m in the following ways:

Any **three** from the following:



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- Rising temperatures may increase the altitude at which these food crops can be grown/produced OR rising temperature may change/raise the lower/upper altitudinal limits at which these food crops can be grown/produced; [] mark]
- (These communities) may be able to start growing/producing coffee and bananas; [1 mark]
- (These communities) may be able to grow/produce more apples/grapes; [1 mark]
- (These communities) may be able to grow/produce less wheat/barley/potatoes (if the lower altitude limits of these crops moves up/increases); [1 mark]
- It is hard to predict because rising temperature may cause changes in other climatic factors (e.g. rainfall patterns), which may affect crop production in other/unpredictable ways; [1 mark]
- Llama pasture may decrease in size/area so less meat (production); [1 mark]
- Maize production is unlikely to be affected (as it grows at a broad range of altitudes/temperatures); [1 mark]

2a

#### Indicative Content

Tundra and tropical rainforest biomes can be distinguished as follows:

Any three from the following:

- Temperature: tundra has (relatively) low(er) mean annual temperatures, whereas tropical rainforest is warm(er) / has (relatively) high mean annual temperatures OR tundra experiences 6–10 months of freezing temperatures, whereas tropical rainforest experiences constant warm(er) temperatures throughout the year; [1 mark]
- Insolation: tundra has (relatively) low(er) insolation, whereas tropical rainforest has the highest insolation of all biomes OR tundra experiences long/dark winters, whereas tropical rainforest experiences constant insolation throughout the year; [1 mark]
- Precipitation: tundra experiences precipitation as low as in deserts, whereas tropical rainforest experiences the largest annual



precipitation compared to any biome **OR** tundra precipitation occurs mostly in the form of snow / tundra has a characteristic layer of frozen ground below the surface/permafrost, whereas tropical rainforest has almost constant rainfall throughout the year / never experiences snow/frost/frozen ground; [] mark]

- Biodiversity: tundra has (relatively) low(er) biodiversity, whereas tropical rainforest has the highest biodiversity of all biomes / supports a wide variety of plant/animal species; [] mark]
- Geographic location: tundra is found at the poles (Arctic/Antarctic regions), whereas tropical rainforest is found near the equator (both north and south / between the Tropic of Cancer and Tropic of Capricorn); [1 mark]

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#### Indicative Content

The atmospheric s<mark>ystem</mark> influences the distribution of biomes in the following ways:

#### Any four from the following:

- Atmospheric circulation / tri-cellular circulation / Hadley, Ferrel, and polar cells create climate patterns that determine dominant vegetation types in different regions; [] mark]
- Intense heating / high insolation at the equator creates low pressure / rising moist air, leading to high precipitation and the formation of rainforests; [] mark]
- Air moving towards poles (at high altitude) cools/sinks and this descending / dry air (at 20–30° latitude / tropics) creates highpressure zones, resulting in arid/water-limiting conditions and the formation of deserts; [1 mark]
- Air continues moving towards poles and this transfers heat from the (sub-)tropics to mid-latitudes, contributing to the formation of temperate biomes; [1 mark]
- Descending/dry air at high latitudes / in polar regions creates waterlimiting conditions in tundra; [1 mark]



- Water vapour from mid-latitudes / temperate regions moves to high(er) latitudes, leading to heavy precipitation / snowfall in boreal forests; [] mark]
- Water vapour from ocean surfaces is transferred overland, contributing to the formation of freshwater aquatic systems; [] mark]
- High to low pressure / prevailing wind / jet stream brings precipitation to specific regions, influencing the presence of biomes e.g. temperate rainforests in mountainous areas; [] mark]
- High mountains create a rain shadow effect, causing dry winds on the leeward side, resulting in arid or semi-arid biomes (e.g., Tibetan Plateau / Mongolian Gobi desert / steppes); [1 mark]
- The atmosphere's changing patterns / global warming can lead to shifts in biomes over time; [] mark]

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7	2
J	a

	Indicative Content	Commentary
Species diversity i	increases towards the later stages o	of Usually, the
succession becau	ise:	greater the
		number of
Any <b>three</b> from the	e following:	species
<ul> <li>As the ecosys</li> </ul>	tem becomes more complex, more	present in an
-	ne available; [] mark]	ecosystem,
	pre species to coexist within the san	ne the higher the
	ecosystem / offers more diverse	species
	portunities for different species; []	diversity
mark]		However,
<ul> <li>New species r</li> </ul>	move or are transported into the are	
arrival of new	species through migration/dispersa	al; [] takes into
mark]		account how
• (Towards later	stages of succession) primary	evenly
productivity in	ncreases, providing more	distributed
energy/resou	rces/support for a greater variety o	
species; [] ma	irk]	are (i.e. an



- Nutrient cycling becomes more developed as succession proceeds, leading to better nutrient availability and supporting a greater variety of species; [] mark]
- There is an increase in the evenness and richness of species, meaning a more balanced distribution of individuals / a higher number of different species coexisting; [] mark]
- Facilitation among species / symbiotic relationships becomes more prevalent in later stages, providing favourable conditions for additional species to thrive; [1 mark]
- As the ecosystem becomes more established, abiotic stress factors may decrease (e.g. shrubs and trees provide shade/shelter) allowing a broader range of species to survive / colonise the area; [] mark]
- In earlier stages, intense competition may limit the number of coexisting species, but as succession progresses, competitive exclusion may diminish, enabling more species to coexist; [] mark]

ecosystem that contains ten species butis dominated by one or two species will have a lower diversity than an ecosystem with the same number of species, as long as these ten species are more even in numbers)

Another example of this concept can be found

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3b

#### Indicative Content

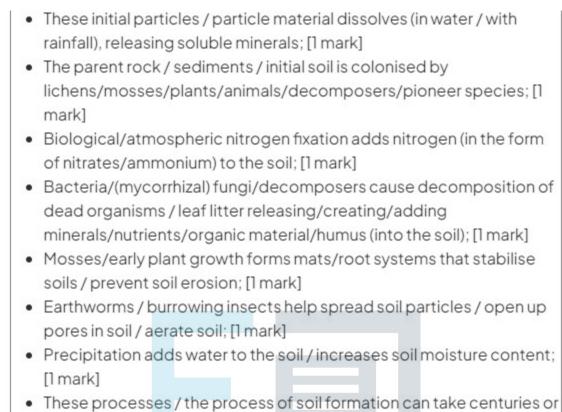
The processes involved in the formation of fertile soils from bare rock include:

Any four from the following:

- Mechanical/chemical weathering/breaking down of parent rock into smaller particles; [1 mark]
- Sediment/eroded material is deposited on bare rock, increasing the depth of the soil; [1 mark]



Practice



 These processes / the process of soil formation can take centuries of millennia; [1 mark]

4a

The table should be completed as follows:

• Each correct row; [1 mark]

Feature	r-strategist species	K-strategist species
Reproductive rate	High	Low
Growthrate	High	Low
Investment in offspring (parental care)	Low	High



Survivalrate	Low	High
Level of specialisation	Low	High

4b



- The lower species diversity in monocultures makes the food web more susceptible to collapse when disturbed; [1 mark]
- Coniferous species in monocultures are often water-intensive, making them less resilient in drought conditions [1 mark]

ecosystem to recover from a disturbance and return to its original state

Unnatural systems, like monocultures, often have low resilience

