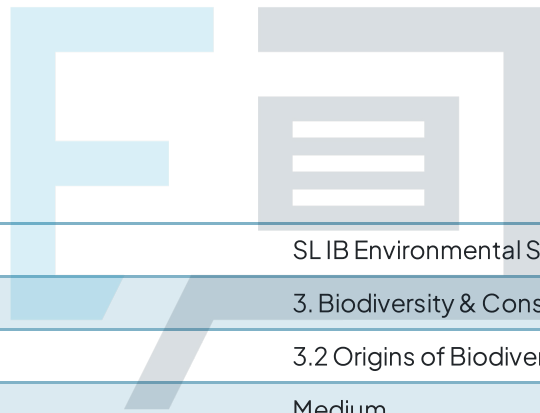




3.2 Origins of Biodiversity

Mark Schemes



Course	SL IB Environmental Systems & Societies (ESS)
Section	3. Biodiversity & Conservation
Topic	3.2 Origins of Biodiversity
Difficulty	Medium

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

1a

Indicative Content	Commentary
<p><i>The biologists could use the islands without snakes:</i></p> <ul style="list-style-type: none"> • For comparison / as a control; [1 mark] • To demonstrate that the claw length (of the mice) is unchanged in the absence of snakes OR to demonstrate that it is the presence of snakes (and not any other variable) that leads to the changes in claw length; [1 mark] 	<p>In scientific experiments, the control is the group of subjects / organisms that receive no treatment or a standardised treatment</p> <p>Without the control group, there would be nothing to compare the treatment group to, and so no way of being sure that the change in the measured variable is due to the experimental treatment; in this case the presence of snakes</p>

1b

Indicative Content	Commentary
<p><i>The claw length of the mice on the island will be:</i></p> <ul style="list-style-type: none"> • Increasing in length / getting longer; [1 mark] <p><i>This change is taking place because:</i></p> <p>Any two from the following:</p> <ul style="list-style-type: none"> • Mice with longer claws have an advantage as they can climb trees to escape the new flood events while shorter clawed individuals cannot; [1 mark] 	<p>This is a question about the process of natural selection</p> <p>It is essential that you can describe this process in general terms, but also that you can apply it to any example with which you are provided</p> <p>Natural selection is the process by which individuals with traits that provide a survival or reproductive advantage in a particular environment are more likely to</p>

<ul style="list-style-type: none"> • Mice with longer claws are more likely to survive and reproduce; [1 mark] • The (advantageous/beneficial) gene for long claws is passed onto offspring / offspring inherit (advantageous/beneficial) gene for long claws; [1 mark] 	<p>survive and pass on their genes to the next generation</p> <p>For example, the long claws that can help mice to adapt more to their environmental conditions</p>
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2a

Indicative Content	Commentary
<p><i>Adaptive features of the Pyrenean desman could include:</i></p> <p>Any two of the following:</p> <ul style="list-style-type: none"> • An elongated nose to probe soil / sediment / mud for food / to help navigate around its environment/habitat; [1 mark] • A thick coat for insulation in the (cold) water / cold mountain air; [1 mark] • Large feet to aid movement through water / for swimming; [1 mark] • Claws / clawed feet for digging soil/sediment/mud OR for gripping when on land; [1 mark] • A thick tail to aid steering in the water / balance on land; [1 mark] 	<p>As the question asks you to 'outline' adaptive features (rather than 'suggest' or 'identify') you should name the feature as well as note how it is adaptive</p>

2b

Indicative Content	Commentary
<p><i>The original desman species may have split into two different species via the following steps:</i></p> <p>Any three from the following:</p> <ul style="list-style-type: none">• Geographical isolation of the populations occurs / two populations are isolated / separated (by the mountains); [1 mark]• There is genetic / heritable variation present in the populations; [1 mark]• Different genes are passed to offspring in each population (due to different selection pressures or due to genetic drift); [1 mark]• There is a change in the genetic diversity / frequency of genes in each population; [1 mark]• (After many generations / years) populations may no longer be able to interbreed to produce fertile offspring; [1 mark]	<p>Genetic isolation results in the separation of populations or individuals, preventing or limiting gene flow between them. This isolation can lead to several important consequences in the context of evolutionary biology and population genetics.</p>

3

Indicative Content

Overall changes in global rates of extinction over time can be described as follows:

Any **three** from the following:

- Global rates of extinction have generally remained relatively constant over long (geological time) periods; [1 mark]
- In general, extinction rates have historically been relatively low / balanced by rates of speciation, maintaining a stable biodiversity; [1 mark]
- However, there have been (five) significant / sudden peaks in extinction known as extinction events / mass extinctions, with unusually high extinction rates; [1 mark]
- Mass extinctions have been associated with abrupt changes in natural global/biogeochemical cycles e.g. ice ages / volcanic activity / plate tectonics; [1 mark]
- Catastrophic events e.g. asteroid impacts, have also triggered mass extinctions in the past; [1 mark]
- Recent/current/ongoing peak in extinction rates is due to human activities / we are currently entering a 6th mass extinction (event); [1 mark]
- Anthropogenic factors e.g. hunting / urbanisation / greenhouse gas emissions / global warming / habitat destruction are responsible for the current rise in extinction rates above the background/historical/natural/average level; [1 mark]

4a

Indicative Content	Commentary
<i>The flies from the different populations experienced difficulty breeding successfully because:</i>	The different selection pressures that each population experiences lead to the accumulation of

<p>Any three from the following:</p> <ul style="list-style-type: none"> • The two populations were separated by a physical/geographical barrier OR were isolated from each other; [1 mark] • No / limited gene flow / exchange of genes was possible between the two populations; [1 mark] • Different (advantageous/beneficial) genes are selected for each population (due to different environmental conditions);[1 mark] • Natural selection leads to the development of two species / a new species (from the original one); [1 mark] • <u>Speciation</u> has occurred between the two populations; [1 mark] 	<p>genetic differences between them that will ultimately lead to the formation of new species</p>
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4b

Indicative Content	Commentary
<p><i>i) Organisms can evolve through the process of natural selection by:</i></p> <p>Any four from the following:</p>	<p>Part (i) describes an example of natural selection because the bacteria did not initially have the ability to metabolise nylon</p>

- Individuals that have the best adaptive features / most advantageous characteristics are the most likely to survive and reproduce; [1 mark]
- Mutations (in genes) can lead to variation; [1 mark]
- New/mutated genes may offer an advantage to the organism; [1 mark]
- The new/mutated (advantageous/beneficial) genes are passed to the offspring; [1 mark]
- Individuals best suited to a particular environment have a higher chance of survival; [1 mark]
- In subsequent generations there will be a greater number of individuals with the advantageous feature/characteristic/trait; [1 mark]
- Offspring / subsequent generations will be better suited to the environment; [1 mark]

Bacteria can multiply rapidly resulting in great variation and a high number of mutations in a population

If the chance mutation offers a selective advantage e.g. the ability to utilise nylon as an energy source, then bacteria that lack that characteristic will not survive and reproduce

Eventually, the whole bacterial population have the new feature / characteristic / trait (ability to use nylon as an energy source)

ii) Selection pressure means:

Any **pair** from the following pairs

- An external factor that impacts the ability of the individual/organism/bacteria to survive and reproduce; [1 mark]
- Some individuals/organisms/bacteria are selected for as they are able to survive whilst others will die as they are selected against; [1 mark]



OR

- (The presence of the antibiotic) selects/chooses which individuals/organisms/bacteria will survive / which will die/not be able to reproduce; [1 mark]
- Non-resistant individuals/bacteria will die / will not be able to reproduce; [1 mark]



Exam Papers Practice