# Biodiversity

## Mark Scheme 3

| | |
|---|---|
| **Level** | International A Level |
| **Subject** | Biology |
| **Exam Board** | CIE |
| **Topic** | Biodiversity, classification and conservation |
| **Sub Topic** | Biodiversity |
| **Booklet** | Theory |
| **Paper Type** | Mark Scheme 3 |

**Time Allowed :** **71 minutes**

**Score :** **/ 59**

**Percentage :** **/100**

**Grade Boundaries:**

| A* | A | B | C | D | E | U |
|---|---|---|---|---|---|---|
| >85% | '77.5% | 70% | 62.5% | 57.5% | 45% | <45% |

**1** **(a** **(i)** two peaks ;

dip in middle connected ; **R** no intermediates shown [2]

**(ii)** mates selected by size ;

few intermediates mate ;

intermediates selected against / extremes selected for ;

<u>alleles</u> for extreme phenotypes (more likely to be) passed on ; **ora**

AVP ; e.g. habitat for intermediate size no longer available / difference in predation [3 max]

**(iii)** <u>stabilising</u> ; [1]

**(b)** sympatric / occurs in same location **or**
allopatric **/** physical separation ;
ref. different selection pressures ;

eventual reproductive isolation / no longer interbreed ; [2 max]

**[Total: 8]**

2 **(a) (i)** may be of use in the future ;

(may produce) medicines / AW ;

resources (for humans) ;
e.g. wood for building / fibres for clothes **/** fuel **/** food / agriculture

maintain, gene pool / genetic diversity ;

to maintain stability in ecosystems ;

aesthetic reasons ;

(eco)tourism ; [3 max]

**(ii)** dried / kept cool ; [1 ]

**(b) (i)** positive correlation / number of plant genera increases as rainfall increases ;

paired figs ; *genera number & rainfall in 2 countries showing the trend*

China does not fit the pattern ; [2 max]

**(ii)** temperature ;

light intensity ; *ignore sunlight / light / sun*

day length ;

humidity ;

carbon dioxide concentration ;

wind ; [2 max]

**[Total: 8]**

3 **(a (i)** *habitat* = **B**
*ecosystem* = **A** ;
*abiotic component* = **C**
*ecological niche* = **F**
*population* = **E**
*community* = **D** ; [max 4]

**(b)** *seaweed* = (primary) producer **;** **A** first (trophic level)

| *limpet / P. vulgata* | *crab / C. maenas* |
|---|---|
| primary consumer | secondary consumer ; |
| **A** 1° consumer | **A** 2° consumer |
| **A** second (trophic | **A** third (trophic level) |

*max 3 for energy losses*

*energy losses in*
respiration **;**
heat loss, qualified **;** e.g. heat loss, from digestion / movement / metabolism
*heat loss in respiration = 1 mark*
indigestible parts **;** **A** named, e.g. cellulose
inedible parts **;**
excretion **;** **A** named excretory products
egestion **;** **I** waste
death, not eaten **;** [max 4]

**[Total: 8]**

4 **(a (i)** *any one from* **;**
hot springs
sulphur springs
geysers
geothermals
marine vent
volcanic area
hot desert [1]

**(ii)** 1. each bacterium grows at a different temperature (range) **;**
2. (the heap) heats up **;**
3. idea of when temperature kills one species of bacterium others are still active
**or**
as temperature increases process can continue **;**
4. increased oxidation of heap **;**
5. more productive / enables increased yield of gold **;** [3 max]

**(b) (i)** 1. *A. ferrooxidans* increases, oxidation of the ore / production of $Fe^{3+}$ ;
2. little difference in effect 0–5 days ;
3. greatest effect after 15 days ;
4. comparative figs for with and without *A. ferrooxidans* on a single day ; [3 max]

**(ii)** 1. cheaper (than other methods) ;
2. does not require energy input ;
3. does not require other chemicals to be purchased ;
4. does not require specialist equipment ;
5. can be done *in situ* ;
6. less labour needed ;
7. bacteria are self-replicating / AW ;
8. more environmentally friendly than other methods / no harmful emissions / AW ;
9. useful for extraction from, low grade ores / waste ; [3 max]

**(c)** *must have at least one D mark to score 4 marks*
D1 both strains give similar rate with and without arsenic ions ;
D2 both strains are arsenic-resistant ;
D3 strain 2, more active / higher oxidation rate, (than strain 1) ;
E4 arsenic acts as a selective, agent / pressure ;
E5 mutation / AW, produces <u>resistant</u> bacteria ;
E6 resistant bacteria survive / **ora** ;
E7 resistant <u>allele</u> passed on ;
E8 frequency of <u>allele</u> increases (in population) ; [4 max]

**[Total: 14]**

5 **(a)** *north island*

1. fewer / less abundant, hedgehogs allow increase (in both lapwing and redshank) **;**
2. breeding pair figs for either bird for 1983 and 2000 **or**
   % change in population over that time for either bird **;**

*south island*

3. presence of hedgehogs causes decrease (in both lapwing and redshank) **;**
4. breeding pair figs for either bird for 1983 and 2000 **or**
   % change in population over that time for either bird **;** [3 max]

**(b)** 1. (oystercatchers have) less competition **;**
2. hedgehogs mostly eat lapwing and redshank eggs / hedgehogs don't eat oystercatcher eggs **;**
3. (oystercatcher) eggs are, too large / camouflaged / inaccessible / distasteful
   ***or***
   oystercatchers defend their, nests / eggs **;** [2 max]

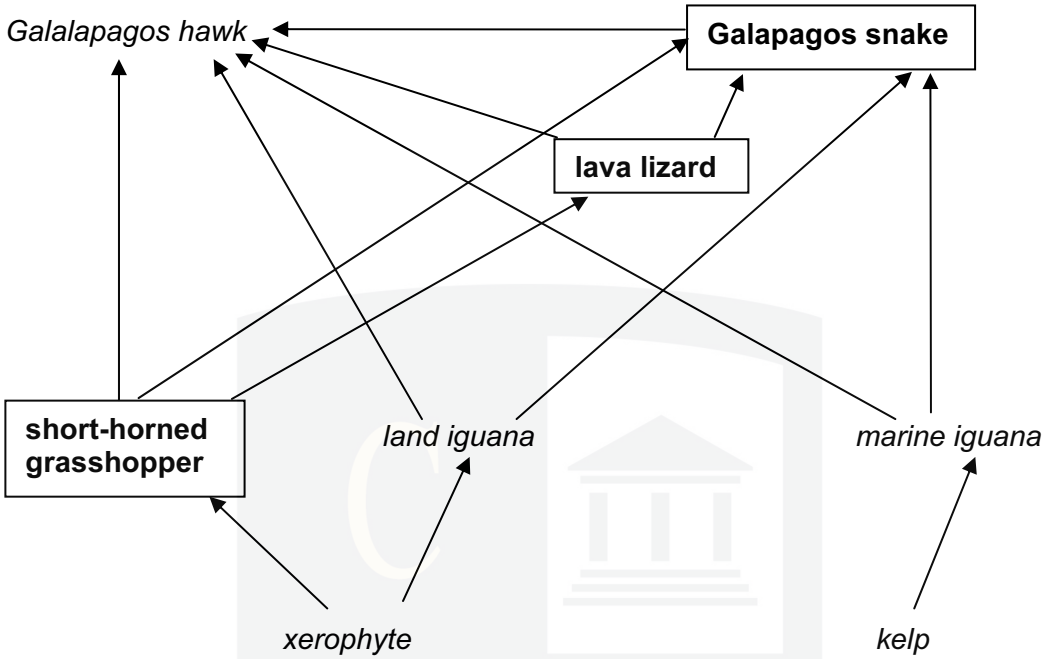
**(c)** 1. idea of geographical isolation **;**
2. no interbreeding / gene flow, between <u>populations</u> **;**
3. mutations occur **;**
4. different, selection pressures / environmental conditions **;**
5. genetic change / AW **;**
6. genetic drift **;**
7. (eventually) reproductive isolation **;**
8. <u>allopatric</u> speciation **;** [4 max]

**[Total: 9]**

**6** **(a)** nitrogen fixation ;
**J** nitrification / oxidation ;
**K** denitrification / reduction ; [3]

**(b)** provide source of, fixed nitrogen / usable nitrogen / organic nitrogen / amino acids / ammonia / ammonium ions / AW ; **R** nitrate
ref. to protein production in legume ;
legume can, colonise / grow in, nitrogen / nitrate, deficient *or* poor soils ;
**A** not dependent on nitrate in soil
compete successfully with non-leguminous plants ; [2 max]

**[Total: 5]**

7 **(a** 


animals in correct boxes **;**
all five animals to hawk **;**
all animals except hawk to snake **;**

(only) short-horned grasshopper to lava lizard
xerophyte to short-horned grasshopper and land iguana **;**
kelp to marine iguana

*max 3 if all correct but one arrow head missing*
*max 2 if arrow heads, mixed in incorrect direction/missing* [4]

**(b)** kelp and xerophytes **;** *allow ecf for next two mps if only one organism*
both, photosynthetic/autotrophic/fix carbon/AW **; A** both have chlorophyll
both are, at the start of the food web/at the first trophic level/the source of energy to rest of food web/AW **;** [3]

**[Total: 7]**