Evolution

Mark Scheme 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Selection and evolution
Sub Topic	Evolution
Booklet	Theory
Paper Type	Mark Scheme 1

Time Allowed : **60 minutes**

Score : **/ 50**

Percentage : **/100**

Grade Boundaries:

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

1 **(a** 1. allopatric speciation;

2. fish populations isolated;

3. geographical / physical / land, barrier;

4. no, breeding / allele flow / gene flow, between populations;

5. mutations occur;

6. different selection pressures / different (environmental) conditions;

7. advantageous alleles selected for / advantageous alleles passed on**;**

8. change in, allele frequency / gene pool;

9. (can result in) different chromosome numbers;

10. genetic drift;

11. ultimately, reproductively isolated / cannot interbreed; [5 max]

(b) 1. conditions remain the same within the pool;

2. best adapted fish (to conditions in pool) survive;

3. extreme phenotypes, selected against / do not survive; [2 max]

(c) 1. numbers of all species increase initially;

2. due to more, breeding space / food;

3. competition between (four) species**;**

4. (possible) reduction in numbers within, some / all, species;

5. not all species (may) survive;

6. different species, restricted to different areas / occupy different niches;

7. interbreeding / hybridisation;

8. AVP; e.g. ref. new selection pressure [3 max]

[Total: 10]

2 **(a** divergence values less for *persimilis* than for *pseudoobscura* (at all DNA regions) **; ora** use of figures **;** [2]

(b) 1 some regions of DNA more prone to mutation than others **;**

2 mutation in some regions likely to be fatal (so not seen in populations) **;**

3 there tends to be less divergence if DNA is part of an important gene/**ora ;**

4 detail **;** e.g. causes change in essential protein [2 max]

(c) 1 allopatric speciation **;**

2 geographical/physical, barrier **;**

3 no, breeding/gene flow, between populations **;**

4 mutations occur **;**

5 different selection pressures/different (environmental) conditions **;**

6 genetic change **;** e.g. different alleles selected for/change in allele frequency/change in gene pool/advantageous alleles passed on **;**

7 genetic drift **;**

8 (ultimately) cannot interbreed/reproductively isolated **;** [4 max]

[Total: 8]

3 **(a** 1. human ;
2. applies selection pressure
3. for benefit of human
4. choose / breed, parents with suitable trait
5. named example (species and characteristic)
6. select offspring
7. repeat over several generations
8. increased allele frequency [4 max]

(b) (i) 140 (%) ;;
2 marks for correct answer
(14/10 x 100 = 1 mark) [2]

(ii) genetic variation ;
ref. polygenes ;
environmental variation ;
AVP ; e.g. sampling / experimental, error [2 max]

[Total: 8]

4 **(a (i)** 1. coelacanth α chain has higher percentage of matches ;

2. with both adult and larval amphibians

3. coelacanth β chain has higher percentage of matches with larval amphibians (rather than adults) ;

4. figures to support mp1 or mp3 or mp6 (comparing coelacanth with lungfish

5. supports closer relationship of coelacanth and amphibia

6. (but) lungfis β chain has higher percentage of matches with adult amphibian (than coelacanths) ;

7. does not support suggestion / supports closer relationship lungfish and amphibia [max 4]

(ii) 1. larvae aquatic **and** adults (partly) terrestrial / AW ;

2. different oxygen concentration available

3. need haemoglobins with different oxygen affinities [max 2]

(b) (i) 1. idea of, unchanging / constant, environment ;

2. oxygen concentration acts as a selective agent

3. organisms best adapted to these conditions survive ora

4. extreme (phenotypes) selected against

5. ref. narrow range of genetic variation / allele frequency maintained

6. sketch graph

7. ref. mutation [max 3]

(ii) 1. ref. change in oxygen concentration ;

2. (low) oxygen concentration acts as selective agent

3. some individuals (in population) are better adapted

4. these are more likely to survive ora

5. <u>directional selection</u>

6. sketch graph

7. populations develop in different concentrations of oxygen

8. <u>disruptive selection</u>

9. sketch graph

allow either mp6 or mp9 but not both [max 3]

(c) 1. (same) species separated into separate populations ;

2. (by) geographical isolation / named example

3. prevents interbreeding between populations / no gene flow

4. ref. to different selection pressures

5. change in allele frequencies

6. eventually do not successfully interbreed

7. <u>allopatric speciation</u> ;

8. ref. to genetic drift / founder effect / different mutations / (different) new alleles [max 3]

[Total: 15]

5 **(a)** allopatric **;** [1]

(b) 1. packs / populations, isolated from each other **;**
2. inbreeding / no interbreeding **;**
3. little mutation **;**
4. AVP **;** e.g. small population to start with / small gene pool to start with [2 max]

(c) 1. agriculture / buildings / AW **;**
2. *idea of* wolves dying **;**
3. hunting / trapping / AW **;**
4. hybridisation / infertility / change in (wolf) gene pool / loss of wolf alleles / AW **;** [4]

(d) 28(%) **;;** [2]
allow one mark for number not rounded up or incorrect answer but correct idea regarding working

[Total: 9]