Natural and Artificial Selection

Mark Scheme 2

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Selection and evolution
Sub Topic	Natural and artificial selection
Booklet	Theory
Paper Type	Mark Scheme 2

Time Allowed : **68 minutes**

Score : **/ 56**

Percentage : **/100**

Grade Boundaries:

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

Question			Answers	Marks
1	(a	1	individuals in population have great reproductive potential / AW ;	
		2	numbers in population remain roughly constant ;	
		3	many fail to survive / die ;	
		4	do not reproduce ;	
		5	due to environmental factors / named factor ;	
		6	variation in members of population ;	
		7	those best adapted survive ;	
		8	reproduce / pass on alleles ; **R** genes	
		9	genetic variation leads to change in phenotype ;	
		10	ref: changes in gene pool ;	
		11	<u>over time</u> produces evolutionary change ;	
		12	new species arise from existing ones	**[8 max]**
	(b)	13	gene) example ; (sickle cell / PKU)	
		14	change in gene / DNA / base change ;	
		15	different amino acid ;	
		16	different polypeptide / different protein / non-functional protein ;	
		17	AVP ; details	
		18	AVP ; details	
		19	(chromosome) example ; (Down's, Turner's syndromes)	
		20	structural changes in chromosomes ;	
		21	change in number of chromosomes ;	
		22	change in sets of chromosomes / ref. polyploidy ;	
		23	AVP ; details	
		24	AVP ; details	**[7 max]**
				[Total: 15]

Question				Marks
2	**(a)**		*auxin = IAA*	
		1	auxin produced in apical bud / AW ;	
		2	diffuses down stem ;	
		3	active transport (cell to cell) ;	
		4	role of plasmodesmata ;	
		5	also in phloem ;	
		6	(auxin) inhibits growth of lateral buds ;	
		7	plant grows up instead of branching out ;	
		8	removal of apical bud allows lateral buds to grow ;	
		9	AVP ; e.g. auxin concentrated in lateral bud / auxin in low amounts in lateral bud	
		10	AVP ; e.g. correct ref to effect of ABA / cytokinins	**6 max**
	(b)	11	seed absorbs water ;	
		12	by osmosis ;	
		13	gibberellin produced by embryo plant ;	
		14	passes to aleurone layer ;	
		15	switches on / activation, transcription enzyme genes / AW ;	
		16	storage proteins broken down to amino acids ;	
		17	stimulates synthesis / release of amylase ;	
		18	amylase diffuses / moves into endosperm ;	
		19	breaks down / hydrolyses starch to maltose ;	
		20	maltose to glucose ;	
		21	glucose diffuses / moves into embryo plant ;	
		22	provides source of energy for growth of embryo plant ;	**9 max**
				Total: 15

Question3

(a) *Use **one** of the following schemes **1, 2 or 3.***

1 named example e.g. sickle cell anaemia / PKU
change base ;
may change amino acid ;
change folding / shape of protein ;
detail of affect of protein changes ;

2 named example e.g. PKU ; **R** sickle cell anaemia
lack of enzyme / non functioning enzyme ;
2 x phenotype changes / symptoms ;;

3 chromosome mutation ;
detail of mutation ;
named example e.g. Down's syndrome ;
2 x symptoms ;;

4 max

(b) homozygotes for sickle cell allele die from sickle cell anaemia ;
sickle cell allele frequent in malarial areas ;
heterozygotes are resistant to malaria / have selective advantage ;
therefore pass on sickle cell allele ;
homozygous normal suffer / die from malaria ;

4 max

Total : 8

4 **(a)** phenotype is the feature/characteristic;
results from interaction of genotype and environment on organism/ environment may alter the appearance of an organism;
genotype unaffected by environment;
genetic characteristics inherited/passed on to offspring/ora/represents alleles possessed;

2 max

(b) artificial selection carried out by humans;
choose organisms with useful characteristics/benefit to humans;
natural selection carried out by environment;
ref. survival (to breed);
ref. evolution;

3 max

(c) length of DNA/sequence of bases/locus on a chromosome;
coding for a characteristic/protein/polypeptide/enzyme;

2

(ii) alternative form of a gene;
determining contrasting characters/controls one form of a character;
occupies same locus;
ref. sequence of bases;
ref. dominance;

3 max

Total: 10

5 **(a)** 1 (ideal characteristics) selected by humans / AW **;**

2 one example of features **;** e.g. calm temperament / obedient / intelligent

3 allowed to mate / bred together **;**

4 offspring with ideal characteristics chosen to mate **;**

5 over (many) generations **;**

6 <u>allele</u> frequency (for ideal characteristics) increases **;**

7 directional selection **;** [max 4]

(b) **(i)** *jackal*
behavioural / reproductive / AW **;**

dingo
geographical / AW **;** [2]

(ii) *one species*
all breeds form fertile offspring with (domestic) dog **;**

separate species
idea of different types of jackal do not interbreed (to produce fertile offspring) **;** [2]

[Total: 8]