Passage of information from parent to offspring

Mark Scheme 1

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Inherited change
Sub Topic	Passage of information from parent to offspring
Booklet	Theory
Paper Type	Mark Scheme 1

Time Allowed : **56 minutes**

Score : **/ 46**

Percentage : **/100**

Grade Boundaries:

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

1 **(a** gene mutation **;**

a change in the, base(s) / nucleotide(s) **;**
e.g. base, substitution / deletion / addition [2]

(b) *parental genotypes*
CC^aBb x C^hC^aBb ;

gametes
CB Cb C^aB ^ab x ^hB C^hb C^aB C^ab ; *allow on Punnett square*

offspring genotypes **; ;** *deduct one mark for each error*
max 1 ecf for offspring genotypes if only 4 given

offspring phenotypes **;**

phenotypes linked to genotypes **;**

	C^hB	**^aB**	**^hb**	**^ab**
CB	**CC^hBB** full black	**CC^aBB** full black	**CC^hBb** full black	**CC^aBb** full black
Cb	**CC^hBb** full black	**CC^aBb** full black	**CC^hbb** full red	**CC^abb** full red
C^aB	**C^aC^hBB** Him black	**C^aC^aBB** albino black	**C^aC^hBb** Him black	**C^aC^aBb** albino black
C^ab	**C^aC^hBb** Him black	**C^aC^aBb** albino black	**C^aC^hbb** Him red	**C^aC^abb** albino red

[6]

[Total:8]

2 **(a** centromere **;** [1]

(b) *idea that* different genes, are present / missing **; R** alleles

different, proteins / poypeptides, produced / missing **;** [2]

(c) XY **;**

X X_1 X Y **;**

XX $_1$ **;**

normal Tur **;** [4]

[Total:7]

3 **(a** details of electrophoresis **;;**

any 2 from
DNA cut by, restriction enzyme(s) / endonuclease(s)

loaded (into wells) at, negative end / cathode end, (of gel)

ref. buffer / electrolyte

(negatively charged) DNA attracted to, anode / positive electrode

separation due to, electric field / potential difference

short pieces / smaller mass, move further (in unit time) / move faster **ora**

fluorescent / radioactive, DNA probes

compare, DNA sequences / bands, (of male lizard and hatchling) **;** [3]

(b) (i) *body length*
no relationship (between body length and number of offspring) **;**

small / intermediate, body length produce more offspring **;**

sprint speed
lizards with greater sprint speed sire more offspring **;**

use of two paired figures from Fig. 4.3 to support relationship **;** [4]

(ii) lizards with longer (hind) legs will tend to have more offspring ;

so will have a greater chance of passing on their alleles ;

(over time) the frequency of alleles (for long hind leg) will increase ;

so mean hind leg length will increase ;

directional selection ; [max 3]

(c) no, breeding / allele flow / gene flow, between (lizard) populations ;

different selection pressures / different (environmental) conditions ;

mutations occur ;

advantageous alleles, selected for / passed on ;

change in, allele frequency / gene pool ;

genetic drift ;

(eventually) unable to interbreed ;

allopatric speciation ; [max 5]

[Total:15]

4 **(a)** symbols and key **;** e.g. A = NF allele and a = normal allele

parental genotypes **and** gametes **;** e.g. parental genotypes Aa x aa
gametes A a x a a

offspring genotypes **and** phenotypes **linked ;** e.g. Aa has NF and aa is unaffected [3]

(b) spontaneous / random / chance **;**

mutation of, gene / allele **;**

AVP **;** e.g. named mutagen / detail of mutation / in oocyte / in sperm [max 2]

(c) compresses nerve **;**

damages, myelin sheaths / Schwann cells **;**

prevents, setting up of local circuits / saltatory conduction **;**

stops Na^+ / K^+ pumps from working **;**

blocks blood supply**;**

qualified **;** e.g. effect on, oxygen supply / glucose supply / ATP production

AVP **;** e.g. may stop ion channels opening [max 3]

[Total:8]

5 **(a** *sex-linked*
(gene) carried on, one sex chromosome/**X,** and not on, the other/**Y;**

gene
section of DNA/sequence of nucleotides/sequence of bases,
that codes for a (particular) polypeptide**;** [2]

(b)

parental phenotypes	*tortoiseshell female*		*black male*	
parental genotypes	X^BX^O		X^BY;	
gametes	X^B	X^O	X^B	Y;
offspring genotypes	X^BX^B	X^BY	$^BX^O$	X^OY;
offspring phenotypes	**black female**	**black male**	**tortoiseshell female**	**orange male;**

[4]

(c) tortoiseshell is heterozygous**;**

males, heterogametic/only one **X** chromosome**;**

(therefore) only one copy of gene/only black or orange allele present**;** [max 2]

[Total: 8]