

Passage of information from parent to offspring

Mark Scheme 3

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 3

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) *allele*
(different) form of a gene ; **A** variety / version
ignore refs to locus / mutation [1]

recessive

allele which does **not** have its effect in heterozygote / allele which (only) has its effect in homozygote / affects phenotype if dominant allele is absent ; [1]

- (b) gene / allele, on X chromosome / sex linkage ;

female, needs 2 RGC alleles / homozygous recessive / can be heterozygous ;

male needs 1 RGC allele ;

[2 max]

- (c) 1 – $X^R X^r / Rr$;

4 – $X^R Y / R / R^0 / R^-$;

6 – $X^r Y / r / r^0 / r^-$;

7 – $X^R X^r / Rr$;

[4]

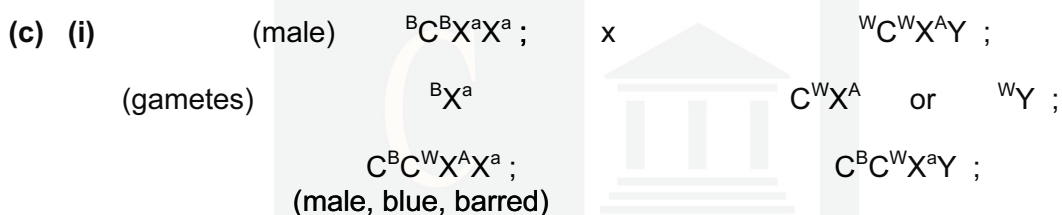
if X and Y not used then mark to max 3

[Total:8]

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— TUITION —

- 2 (a) both alleles, influence phenotype / are expressed ;
 ref. more than 2 phenotypes possible ;
 phenotype of heterozygote different from either homozygote ; [3]

- (b) son receives Y chromosome from father ;
 Y chromosome does not carry haemophilia allele ;
 father will pass haemophilia allele to daughter(s) ;
 daughter will be, a carrier / heterozygous / $X^H X^h$;
 daughter may pass allele to, her son / his grandson ; *accept on diagram* [3 max]



accept other symbols but only with key
if male XY and female XX then mark gametes and offspring genotypes to max 2
if other symbols used but no key then mark to max 2 [5]

- (ii) blue colour is heterozygous / $C^B C^W$;
test cross ;
 with non-barred female ;
 if all offspring barred, must be $X^A X^A$ / homozygous ;
 if some offspring non-barred, must be $X^A X^a$ / heterozygous ; [3 max]

[Total: 14]

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 — TUITION —

Question 3

(a)

black female X orange male

$X^B X^B$ $X^O Y$;

tortoiseshell female black male

$X^B X^O$ $X^B Y$; *

orange female X black male

$X^O X^O$ $X^B Y$;

tortoiseshell female orange male

$X^B X^O$ $X^O Y$; *

(* must also have either gametes / construction lines / punnet square).

(b)

tortoiseshell female

$X^B X^O$;

black female

$X^B X^B$;

black male

$X^B Y$;

orange male

$X^O Y$;

(phenotypes and genotypes must be linked otherwise max 2).
(penalize **once** for lack of gender).

(c) X chromosome inactivated randomly early in development / AVP ;

1

Total : 9

- 4 (a) *recessive*
only expressed in homozygote/two copies of the allele needed to be expressed/
not expressed in heterozygote/not expressed in presence of dominant allele ;

mutation

change in the structure of, DNA/gene/allele

or

change in, base/nucleotide, sequence ;

[2]

- (b) suitable symbols and key ; e.g. A = allele for normal (non PKU)
a = allele for PKU

correct parental genotypes **plus** correct gametes ;

offspring phenotypes linked to correct offspring genotypes ;

[3]

- (c) 1 fewer amino acids ;
2 change in primary structure ; **A** different amino acid sequence
3 different, tertiary structure/3D shape ;
4 *ref.* to active site of, PAH/enzyme, changed/absent ;
5 PAH/enzyme/protein, non-functional/AW ; **A** different function

[max 3]

[Total: 8]

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— TUITION —

5 (a) allele – variation / different form, of a gene ;

dominant – (allele) always expresses itself (in the phenotype when present) ; [2]

(b) the greater the number of (CAG) repeats the earlier the symptoms first appear / inversely proportional / negative correlation ;

paired figures ; [2]

(c) 1. fear of needles ;

2. fear of positive result ;

3. fear of effect of result on other members of famil ;

4. no desire to have childre ;

5. financial / insurance, concerns / A ;

6. possibility of false result ;

7. cost of tes ;

8. not worth having test because of no treatmen ;

[max 3]

[Total: 7]

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— TUITION —