## Passage of information from parent to offspring Mark Scheme 5

| 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 5 |


| Time Allowed: | 48 minutes |
| :--- | :--- |
| Score $:$ | $/ 40$ |
| Percentage : | $/ 100$ |
|  |  |

Grade Boundaries:

| A $^{*}$ | A | B | C | D | E | U |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| $>85 \%$ | $77.5 \%$ | $70 \%$ | $62.5 \%$ | $57.5 \%$ | $45 \%$ | $<45 \%$ |


| 1 | (a) |  | AABBCC ; | [1] |
| :---: | :---: | :---: | :---: | :---: |
|  | (b) | 1 2 3 4 | if doubling of chromosomes has not occurred chromosomes would not be able to pair ; because chromosomes in the two sets are not homologous ; during, prophase 1 / meiosis 1 ; (therefore) gametes cannot be produced ; | [3 max] |
|  | (c) | 1 2 3 | unable to, breed / reproduce ; to produce fertile offspring ; reproductively isolated ; | [2 max] |
|  | (d) | 1 2 3 4 5 | species split into two populations by (geographical) barrier ; different, selection pressures / (environmental) conditions, (on the two populations) ; <br> different features, selected / advantageous ; <br> change in, gene pools / allele frequencies ; <br> (over time) become unable to interbreed; | [3 max] |
|  |  |  |  | [Total: 9] |

2 (a (i) acts as chloride channel; $\mathrm{ACl}^{-} \quad \mathbf{R}$ chlorine
$\mathrm{Cl}^{-}$moves out (of cell) ;
active transport / binding site for ATP ;
(ii) E on diagram / upper face, because this is where, oligosaccharides / glycocalyx / carbohydrate chains, are present ;
A glycoprotein $\quad \mathbf{R}$ glycolipid
(b) (i) form / variety / version, of a gene;
only affects phenotype when dominant allele not present / AW ;
(ii) 1. thick / sticky / dehydrated, mucus produced ;
2. mucus not moved effectively by cilia / mucus accumulate ;
3. reduced gaseous exchange / longer diffusion pathwa ;
4. difficulty in breathin ;
5. more infections / (mucus) traps bacteri ;
6. lungs are scarre ;
(c) viral DNA carries normal (CFTR), allele / gene ;

R RNA A recombinant DNA
virus binds (with lung cells) ;
viral DNA put into, (lung) cells / host DNA ;
(d) (i) 1. translation will not occur normally ;
2. no amino acid added to chain when stop codon reache ;
3. protein chain not completed / protein only partially mad ;
(ii)

| PTC124 |  | gene therapy |
| :--- | :--- | :--- |
| 1. can be taken oral | or | delivered (by vector) into <br> respiratory tract ; |
| 2. self administer | or | requires medical treatment ; |
| 3. is readily taken up by cel | or | poor take up by cells ; |
| 4. no vectors needed / fewer <br> no side effects | or | possibilty of side effects (from <br> vectors) / named side effect ; |
| 5. only needs to ent <br> cytoplasm | or | difficulty in inserting gene into <br> host DNA ; |
| 6. no need to switch on ge | or | difficulty in switching on gene ; |

$1 \mathrm{CC}^{a} \mathrm{Bb} \times \mathrm{C}^{\mathrm{h}} \mathrm{C}^{a} \mathrm{Bb}$;
$2 \quad \mathrm{CB} \quad \mathrm{Cb} \quad \mathrm{C}^{\mathrm{a}} \mathrm{B} \quad \mathrm{C}^{\mathrm{a}} \mathrm{b} \quad \mathrm{x} \quad{ }^{\mathrm{h}} \mathrm{B} \quad \mathrm{C}^{\mathrm{h}} \mathrm{b} \quad{ }^{\mathrm{a}} \mathrm{B} \quad{ }^{\mathrm{a}} \mathrm{b}$;
3 offspring phenotypes:
full black : full red : himalayan black : himalayan red : albino black : albino red ;
4 phenotype ratio:
$6: 2$ : 3 : 1 : 3 : 1 ;
5/6 offspring genotypes in Punnett square ;;
ecf
if incorrect symbols penalise the parent genotypes (pt 1) and mark rest of cross up to max 4
ecf
if one gene only used then mark to max 2
[Total: 6]

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Question E Answers Marks
4 (a) (i) black red;
1 :
(ii) black cop
    2 :
(iii) red copp
3 1
(b) (i) test / back, cross; with, copper / \(A^{t} A^{t} /\) homozygous recessive ;
(ii) if all offspring red, homozygous ;
if some offspring copper, heterozygous ; ref. equal proportions of offspring ;```

