

Variation and Evolution

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science – Trilogy - Biology
Exam Board	AQA
Topic	4.6 Inheritance Variation and Evolution
Sub-Topic	Variation and Evolution
Difficulty Level	Gold Level
Booklet	Mark Scheme 1

Time Allowed: 59 minutes

Score: / 57

Percentage: /100

Grade Boundaries:

M1.(a)	a change in the DNA / gene	1
(b)	produces a different protein / enzyme that is responsible for colour	1
(c)	parents genotype both Bb <i>allow correctly derived gametes</i>	1
	offspring genotypes correctly derived	1
	bb identified as blue <i>allow ring around bb only</i>	1
	65 000 <i>allow ecf or $260\,000 \times 0.25$</i>	1
	6.5×10^4	1
(d)	cross with bb / blue carp <i>allow annotated Punnett square diagram(s) of cross with bb carp</i>	1
	if any offspring are blue, the parent was Bb / heterozygous <i>allow converse</i>	1

allow cross with known **Bb** carp

if any offspring are blue, other parent was **Bb** / heterozygous

[9]

M2.(a) cross / breed / mate different breeds of horse

1

if the offspring are fertile then the two breeds are of the same species

1

(b) select the fastest male and female to cross / mate

allow any relevant characteristic, eg stamina

1

select the fastest offspring and breed them

1

repeat over several generations to produce faster horses

1

(c) gene for the Bt poison is cut from the bacterial DNA / plasmid / chromosome

ignore characteristic

accept *Bacillus thuringiensis*

1

using enzymes(s)

1

and transferred to cotton plant cells / DNA / chromosome

do **not** allow to cotton plant plasmid

1

(d) any **four** from:

must have both advantages and disadvantages for full marks

advantages

- increased yield as less eaten by insects
 - fewer pesticides need to be used
 - (so) producer can make more money
- this point may only be gained if linked to one of the points above*

Disadvantages:

- gene (for poison) could be passed on to wild plants
 - may kill useful insects
- allow named insect eg bees*
- ecosystem / food chain could be affected
 - gene pool of cotton plants could be reduced
- allow less variation in cotton plant population*

max. 4

[12]

M3.(a) wing pattern similar to *Amauris*

allow looks similar to Amauris

1

birds assume it will have an unpleasant taste

1

(b) mutation / variation produced wing pattern similar to *Amauris*

*do **not** accept breeds with Amauris*

*do **not** accept idea of intentional adaptation*

1

these butterflies not eaten (by birds)

1

these butterflies breed **or** their genes are passed to the next generation

1

[5]

M4.(a) (use of) enzymes

1

(b) asexual reproduction / no gametes / no fusion / only one parent
ignore clones

1

cells all contain same genetic information / same genes (as parent) / same DNA

1

(c) can spray crop with herbicide – only weeds killed
crop survives herbicide insufficient

1

(d) any **one** from:
allow 'think that GM food is bad for health'

- fears / lack of knowledge about effects of GM food on health
ignore not natural or against religion
- crop plants may pass on gene to wild plants
- encourages use of herbicides

1

[5]

M5.(a) (i) DNA replication / copies of genetic material were made

'it' = a chromosome

allow chromosomes replicate / duplicate / are copied

ignore chromosomes divide / split / double

1

- (ii) one copy of each (chromosome / chromatid / strand) to each offspring cell

ignore ref. to gametes and fertilisation

1

each offspring cell receives a complete set of / the same genetic material

allow 'so offspring (cells) are identical'

1

- (b) (i) meiosis

allow mieosis as the only alternative spelling

1

- (ii) Species A = 4 **and** Species B = 8

1

- (iii) sum of A + B from (b)(ii) e.g. 12

1

- (c) (i) similarities between chromosomes **or** similarities between flowers described

e.g. shape of petals / pattern on petals / colour / stamens

1

can breed / can sexually reproduce

allow can reproduce with each other / they can produce offspring

1

- (ii) any **two** from:

- offspring contain 3 copies of each gene / of each chromosome / odd number of each of the chromosomes
- some chromosomes unable to pair (in meiosis)
- (viable) gametes not formed / some gametes with extra / too many

genes / chromosomes

or some gametes with missing genes / chromosomes

2

[10]

M6. (a) mutation

correct spelling only

ignore other adjectives eg random / spontaneous

1

(b) *ignore references to X / Y chromosomes*

idea of mutant gene / new form / this allows hatching (of males)

1

(individual with advantage) (more) survive / (more) live / (more) don't die

allow immunity rather than resistance throughout

1

(so survivors) breed / reproduce

1

mutation / gene passed (from survivors) to offspring / next generation

allow resistance / characteristic for gene

'gene passed on' is insufficient

1

[5]

M7. (a) fusion of gametes / named gametes

allow meet / join / fertilise

1

results in mixing of genetic information / DNA / chromosomes

accept genetic information / DNA / chromosomes from two parents

1

(b) (i) use enzyme

1

to cut gene from pout chromosome / DNA

1

insert gene into salmon chromosome / DNA / egg / embryo / nucleus
accept use of plasmid as carrier
ignore salmon / cell

1

(ii) eg fear of gene transfer to wild salmon / extinction of wild salmon /
 fear of harmful effect on consumers / unsure of long term effects
ignore cruel / ethics / morals / religion / unnatural /
economics

1

[6]

M8. (a) (jellyfish) gene(s) cut out

1

ref to enzymes (at any stage)

1

(gene) transferred to zebra fish at early stage of development / embryo / egg
ignore removal of zebra fish genes

1

(b) any **two** from:

ignore unethical / religious / unnatural

- could transfer gene to other (fish) species
- effects on food chains
accept effects on other species / humans who eat them
- effects on zebra fish themselves, eg may out compete non GM zebra fish

2

[5]