

MARK SCHEME

GCSE

BIOLOGY

AQA - COMBINED SCIENCE

B 6 - TEST 5

INHERITANCE, VARIATION AND EVOLUTION

Advanced

Mark schemes

- 1.** variation exists in the population / a mutation occurred
ignore adaptation 1
- so some head lice resistant to chemical / not killed by it
ignore immune 1
- these survive and breed
or
pass on gene / allele / DNA (for resistance) to next generation
ignore characteristic / chromosome 1
- [3]**
- 2.** (a) chromosome
accept chromosomes 1
- (b) drawing shows: 1
- just 2 chromosomes
one long + one short 1
- [3]**
- 3.** (i)
- | | | |
|---|----|----|
| R | r | |
| | | |
| R | RR | Rr |
| | | |
| r | rR | rr |
- a cross over diagram is also acceptable 1 mark for the separation of alleles to form the two axes (gametes)
1 mark for the four combinations* 2
- (ii) 25 **or** 1 in 4 **or** 1:3
accept ¼ do not credit 1 to 4 1
- [3]**

- 4.** any **four** from:
- mutation (produces striped fur)
 - do not allow intention to mutate*
 - there is variation in fur pattern / colour
 - camouflaged / striped animals (more likely to) survive **or** catch food / prey
 - do not allow intention to adapt / become camouflaged*
 - allow stripes give a selective advantage*
 - ignore natural selection unqualified*
 - (survivors) reproduce / breed
 - allow mate*
 - gene / allele / mutation passed on to offspring / next generation.
 - max 3 marks if no reference to tiger / stripes*
 - allow characteristic / trait passed on **or** inherited by next generation*

4

[4]

- 5.** (a) wing pattern similar to *Amauris* 1
- birds assume it will have foul taste 1
- (b) mutation / variation produced wing pattern similar to *Amauris*
- do not accept breeds with *Amauris** 1
 - do not accept idea of intentional adaptation*
- these butterflies survived 1
- breed / genes passed to next generation 1

[5]

- 6.** (a) different numbers of people were surveyed (in each country)
- allow difference in number shown using quoted figures* 1
- (b) (i) 62.77(%)
- allow 62.8 or 62.771 or 63*
 - allow 1 mark only for 62.7 / 62.78*
 - allow 1 mark for $(145 / 231) \times 100$*
 - or*
 - $100 - (9.52 + 8.23 + 19.48)$*
 - or $100 - 37.23$*

2

(ii) any **one** from:

- blue eye colour is less common in Italy than in other countries
- brown eye colour is more common in Italy than in other countries
- green eye colour is the least common in all the countries
- *Ireland has the highest percentage of blue and / or green eyes*

answers should compare the different countries

allow ecf from (i)

1

(iii) any **one** from:

- survey more people
ignore survey same number of people from each country
ignore survey more countries
- record the other eye colours separately (rather than group them together)
allow carry out a random survey

1

[5]

7.

(a) same name to everyone

1

(genus) part gives information on ancestry

1

(b) any **one** from:

- DNA / RNA analysis
- improvements to (electron) microscopes
- improved understanding of biochemical processes
- evidence of internal structures being more developed

1

(c) primitive bacteria / prokaryotes

1

(often) from extreme environments / extremophiles

1

[5]

8.

(sexual reproduction involves) the joining / fusion of (male and female) gametes / sex cells / named gametes

accept fertilisation of gametes / sex cells / named gametes for 2 marks

allow fertilisation for 1 mark

allow gametes / sex cells / named gametes for 1 mark

2

(so) genetic information / genes / DNA / chromosomes

1

(from) two parents / mother and father / organisms / individuals (is mixed)

allow (from) each parent / her parents / their parents

1

[4]

9.

- (a) greater proportion of dark moths survive in polluted woods
Greater proportion of pale moths survive in unpolluted woods
% survival on underside of branch is greater in both situations

each for 1 mark

3

- (b) *ideas that (please indicate in body of answer by $\sqrt{1}$, $\sqrt{2}$, $\sqrt{3}$)*

1. different sorts of moths / pale and dark moths
2. idea of differential survival in different habitats
3. this is evidence for natural selection / survival of the fittest
or idea that feature likely to be passed on

each for 1 mark

3

[6]

10.

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

- to combine / use amino acids
do not allow to make amino acids
- in specific / particular / correct / right order
- to manufacture protein / enzymes / hormones
allow examples of proteins / enzymes / hormones

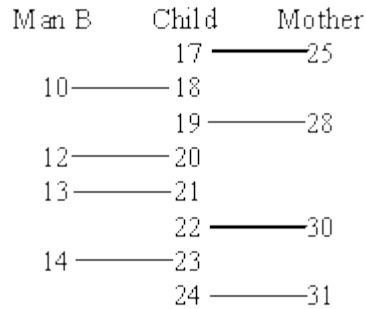
2

(b) (i) (man) B

*no mark for this **but** max 2 marks if A given*

any **three** from:

- child gets DNA / bars / lines from mother and father / parents
ignore genes / chromosomes
- (child has) mother's 25 / 28 / 30 / 31
or child gets 17 / 19 / 22 / 24 from mother
- (child has) man B's 10 / 12 / 13 / 14
or child gets 18 / 20 / 21 / 23 from B



*contradictions disqualify 2nd and / or 3rd marking points
ignore genes / chromosomes*

- no bars / DNA / lines from man A correspond to child

3

(ii) any **two** from:

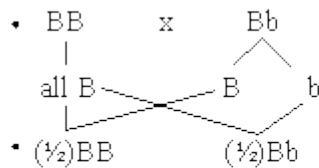
- gametes / eggs / sperm
- contain only half of (mother's / father's) DNA / chromosomes / genes / genetic information
- due to meiosis

2

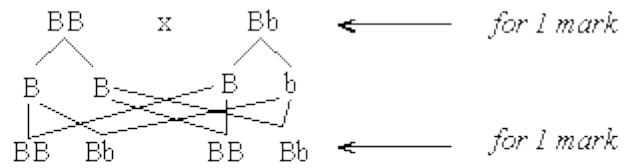
[7]

11.

(a) First Generation



or



(order may vary)

or as matrix

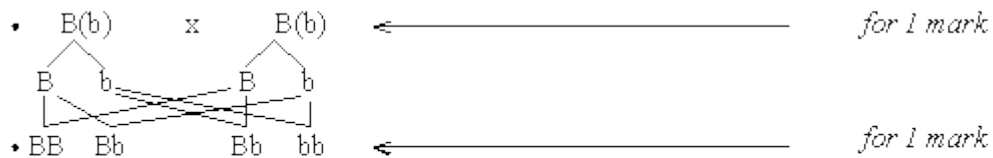
	B	B
B	BB	BB
b	Bb	Bb

1 mark for correct column and row headings

1 mark for correct outcomes

allow one mark for being able to produce a correct genetic cross (even if from an incorrect starting point)

Second generation



() = picking out this idea gets both marks

or as a matrix

	B	b
B	BB	Bb
b	Bb	bb

1 mark for correct column and row headings

1 mark for correct outcomes

4

- (b)
- green colour gives an advantage/camouflage
 - more green flies than black flies survive to breed*
 - pass on their genes to the next generation
 - (* but implied by 3rd bullet point)
- for 1 mark each

3

[7]

12.

- (a) idea of survival of the fittest 1
- (b) (the hypothesis should be rejected because)
- having a long neck for feeding would not be an advantage for feeding in the dry season 1
 - and would not be an advantage most of the time for females 1
 - therefore the feature would be unlikely to be selected for 1
- (c)
- the feature that could explain the evolution of long neck is that males with longer necks are more likely to win fights with other males 1
 - the winning males are more likely to mate with females 1
 - this means the allele for long neck is more likely to be passed to the next generation 1

[7]

13.

- (a) both parents **Aa**
- accept other upper and lower case letters without key or symbols with a key*
- allow shown as gametes in punnet square* 1
- aa** in offspring correctly derived from parents /
aa correctly derived from the parents given
- ignore other offspring / gametes for this mark parents do not have to be correct* 1
- offspring **aa** identified as having cystic fibrosis
- may be the only offspring shown **or** circled / highlighted / described* 1

(b) (i) any **one** from:

accept converse if clear eg if you (only) took one it might have cystic fibrosis / might not be fertilised

- sure / greater chance of healthy / non-cystic fibrosis egg / embryo / child
accept some may have the allele
reference to suitable embryo is insufficient
- greater chance of fertilisation

1

(ii) **to gain 3 marks both advantages and disadvantages must be given**

advantages

any **two** from

ignore references to abortion unless qualified by later screening

- greater / certain chance of having child / embryo without cystic fibrosis / healthy
- child with cystic fibrosis difficult / expensive to bring up
- cystic fibrosis (gene / allele) not passed on through generations

disadvantages

any **two** from:

- operation dangers eg infection
ignore risk unqualified
- ethical or religious issues linked to killing embryos
accept wrong / cruel to kill embryos accept right to life
- (high) cost
- possible damage to embryo (during testing for cystic fibrosis / during operation)

3

plus

conclusion

a statement that implies a valued, qualified judgement

eg it is right because the risk of infection is small

or

eg it is wrong because embryos are killed

Note: *the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage has (already) been made*

*do **not** award the mark if the conclusion only states that advantages outweigh disadvantages*

1

[8]

14.

(a) (i) any **two** from:

- (dead) animal buried in sediment
allow imprint in mud
- hard parts / bones do not decay **or** soft parts do decay
allow (one of) the conditions for decay is missing – accept example, eg oxygen / water / correct temperature / bacteria
- mineralisation (of hard parts / bones)
allow replacement by other materials

2

(ii) any **two** from:

- conditions not right for fossilisation
ignore references to soft-bodied
- geological activity has destroyed fossils / has destroyed evidence
allow a named / described example – eg vulcanism / earth movements / erosion
- fossils not yet found
allow description of why not yet found

2

(b) any **four** from:

- separation / isolation (of different populations)
- different environmental conditions (between locations)
- mutation(s) occur **or** genetic variation (within each population)
- better adapted survive **or** natural selection occurs
 - allow 'survival of the fittest'*
 - ignore animals adapt to their environment*
 - ignore reference to stronger survive*
- favourable alleles passed on (in each population)
 - allow genes for alleles*
- eventually different populations unable to breed successfully with each other
 - allow unable to produce fertile offspring*

4

[8]