AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.3 THE DEVELOPMENT OF UNDERSTANDING OF GENETICS AND EVOLUTION (PACK 3)

SCORE	PERCENTAGE
/139	%

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Q1.

3 of e.g.
new predators
new diseases
new competitors
environmental changes (initiated by Man)

each for 1 mark

[3]

Q2.

(a) (i) bones [and feathers]

1

for 1 mark

(ii) hard parts do not decay

for 1 mark each

2

(iii) has feathers

for 1 mark

1

(b) (i) all of kind have died out

for 1 mark

1

(ii) e.g. change of habitat

for 1 mark

1

(iii) named extinct organism, e.g. Dinosaur

1

for 1 mark

[7]

Q3.

(a) mutation

for 1 mark

1

(b) fall,
idea that resistant beetles more likely to survive to breed,
∴ their offspring more likely to appear in the next generation

for 1 mark each

3

(c) inbreeding between resistant brothers and sister,
will produce some individuals with 2 copies of the resistance allele,
if 2 of these individuals breed all their offspring will be resistant

for 1 mark each

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3

[7]

Q4.

(a) (i) D

for 1 mark

1

(ii) D Y (*both*) or C X (*both*) or B W (*both*)

for 1 mark

1

(b) *N.B. answers must relate to fossils providing evidence*
show types of animals / plants that no longer exist / named ref eg dinosaur
show changes in types *(of animals / plants)*
similar fossils found in rocks of similar age
reference to sequence of change
or example
e.g. horse / limb

any two for 1 mark each

2

[4]

Q5.

(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 √1, √2, √3)*
1. different sorts of moths / pale and dark moths
2. ideal 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]

Q6.

(a) 550 – 650

for one mark

1

(b) skulls
preserved as fossils / measure skull volume

for 1 mark each

2

(c) range of brain size / bigger brains arose by mutation
more with large brains more likely to survive
because more intelligent / survival advantage described
their genes passed to next generation / offspring inherited large brains

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any three for 1 mark each

3

[6]

Q7.

(a) mud

1

decayed

1

skeleton

1

rock

1

(b) idea that living things have changed (over time)

*do **not** allow 'dating'*
*do **not** credit 'evolved'*
allow 'compare the skeleton'

1

[5]

Q8.

(a) **Quality of written communication**
The answer to this question requires ideas in good English in a sensible order with correct use of scientific terms. Quality of written communication should be considered in crediting points in the mark scheme

idea of mutation ***or*** variation

*do **not** allow 'bacteria get used to antibiotics' **or** idea that antibiotics change the bacteria **or** 'bacteria become immune' **or** references to adaptation or evolution*

1

(resistant cells) survive antibiotic

1

(resistant cells) breed

1

(b) **EITHER** (yes)

keep animals disease free (1) so grow faster (1 mark) **or** live longer

OR (no)

resistant bacteria may develop (1)
risk to human **or** animal health (1)

allow bacteria become resistant / immune

2

[5]

Q9.

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idea of variation
Darwin's theory based on range of variation in organisms

accept some (birds) have long legs and some have short legs
do not credit inherited characteristics
mention of genes etc – neutral

1

idea of acquisition
Lamarck's based on characteristics **or** long legs acquired during lifetime

e.g. legs stretch during lifetime
*do **not** credit grow*

1

idea of survival of fittest
Darwin's theory based on survival of organisms with beneficial variation

accept reference to survival of the fittest
accept ones with longer legs will survive

1

idea of inheritance
Lamarck's based on inheritance of acquired characteristics

accept reverse point that Darwin recognised that acquired characteristics are not inherited
*do **not** credit reference to other animals*
e.g. giraffes

1

[4]

Q10.

(a) agilisaurus / camarasaurus / ornitholestes

1

(b) eorapter

allow lagosuchus

1

(c) lagusuchus (it) walks on hind limbs / two limbs / alamosaurus has <u>longer</u> neck / lagusuchus has back legs longer than front but alamosaurus has the reverse

1

(d) (i) alamosaurus

1

(ii) increased

1

(e) from hard parts / bones / imprints
e.g. footprints / parts replaced by other materials / conditions for decay absent or example

buried is neutral

1

(f) simple

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1

billion

1

[8]

Q11.

(a) any **three** from:

factor for colour has two forms

accept gene for factor and allele for form

yellow dominant since <u>all</u> first generation yellow

accept F1 for first generation

green recessive since reappears in second generation

accept F2 for second generation

3

(b) (i) genes

accept alleles / genetic

1

(ii) nucleus

accept chromosomes / DNA

1

[5]

Q12.

(a) (reject)

if support then zero marks

any **two** from:

giraffe spend almost all of the dry season feeding from low bushes

only in the wet season do they feed from tall trees, when new leaves are plentiful

females spend over 50% of their time feeding with their necks horizontal

both sexes feed faster and most often with their necks bent

2

(b) any **two** from:

<u>mutations</u> produce male giraffes with longer necks

either

male giraffes with longer neck more likely to win fight / more likely to mate with female

or

females prefer long necks / more likely to mate with long necked male

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their genes more likely to pass to next generation

accept long necks inherited or offspring have long necks

2

[4]

Q13.

any **four** from

dark were better adapted to survive **or**
dark ones can hide in dirty environment

*dark is the survival of the fittest **or** they are better camouflaged*

those which survive breed

they are able to pass on their genes

light ones more easy to see on smoky surfaces (so get eaten)

birds can see light ones more easily

as environment becomes cleaner or less smoky light ones hide easier

those which survive breed **or** increase the population

accept the converse argument

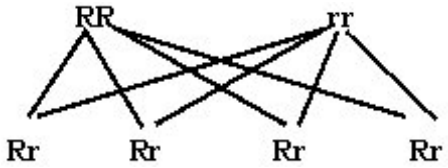
[4]

Q14.

(a) white

1

(b)



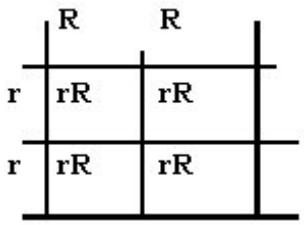
or a Punnett square

1 mark for parents and separation of genes

*1 mark correct set of four pairs, **rR***

1

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1

all are red **or** R is red **or** Rr are red

1 mark for explanation of colour

1

(c) any **two** from

accept allele for gene

to stop cross pollination

*credit so they could not breed with other flowers **or** colours*

to control the gene pool **or** prevent other genes getting in

*credit characteristics **or** factors*

do not accept to use the same genes again

to see which genes were present

credit factors

to test if F_1 **or** they contained any genes for white **or** recessive genes

credit a suitable Punnett square

referenced to white

*credit to see if there was variation in the genes **or** to see if he got any white flowers*

do not accept for a fair test

2

(d) white

1

(e)

the term gene may be in place of allele

the situation mark

red is dominant so masks any white alleles **or** could be heterozygous

credit some (may) have both alleles

credit you do not know if a white allele is there

the consequence marks

1

EITHER

if a recessive **or** white allele is present there is a chance of a white flower

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credit if white alleles are there the recessive can show

OR

chance of white flower could be 1 in 4
if all red flowers contain a dominant and a recessive allele

1

[9]

Q15.

fossils

gains 1 mark

but
extinct

gains 2 marks

fossils
rocks/coal

each for 1 mark

[4]

Q16.

extinct (NOT fossils)
fossils
bones
rocks

each for 1 mark

[4]

Q17.

(a) idea

- unbanded dominant/plain **or** banded recessive
- because banded appears in young/
- parents heterozygous/Bb
- offspring BB } Bb } Bb } bb } credit response consistent with parents even if not both heterozygous

  Accept any clear and consistently used notation
- identify BB, Bb as plain
- identify bb as banded
- ratio 3:1 unbanded/banded (stated or clearly implied
- matches 35:12 results e.g. <u>all</u> the outcomes clearly identified as banded/unbanded)

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for 1 mark each

7

(b) *idea*

- many genes control [accept “continuous variation”]
- many alleles for a gene/large genepool
- snails can inherit lots of different combinations
- mutation (gives rise to many alleles)
  allow selection allows alleles to be passed on unless [very]disadvantageous or if advantageous

any 4 for 1 mark each

[Also credit, for 1 mark each, up to 2 causes of mutation, e.g. mistakes in cell division, radiation]

4

[11]

Q18.

idea

- banded snails camouflaged/less easily seen
- fewer banded eaten [by birds]
- more banded survive to breed
- more genes for banded passed on
  or more banded snails in population

for 1 mark each

N.B.
Accept reverse of all above for plain snails
*All 4 marks may be gained by a relatively short response

[4]

Q19.

(a) (i) *ideas that*

- remains of animal/plant of specific organism
- (from) many years ago/thousands or millions of years
- found in rocks/covered by sediments

for 1 mark each
Mark (a) as a whole to a total of 5 marks.

3

(ii) *ideas that*

- hard parts/bones/shells/skeletons

link required

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- don't decay

or

- no decay
  link required

- conditions needed absent/no oxygen/no water

or

- parts replaced by rock mineral chemicals;
  Do not accept 'materials' or 'substances'.

- as they decay
  Accept 'hard' or 'soft' parts for 1 mark each

2

(b) *idea*

died out/none left/died off

Do not accept 'died' alone
for 1 mark

1

[6]

Q20.

(a) *ideas that*

- birds reached islands by flying
- some variation between these birds
- flight not needed to escape predators
- flight uses energy
- flight could result in death by drowning
- so non-flying birds <u>favoured by</u> natural selection
  or <u>better chance</u> to survive and breed
- so larger birds at an advantage
- any six for 1 mark each

6

(b) *idea*

- large number of genes per characteristic
- large range of alleles/large gene pool

  (credit for these points <u>not</u> to be given if they are made in (a))

- mutation(s)

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(credit idea of inheritance <u>and</u> environment as the two factors with 1 mark)

any two for 1 mark each

2

[8]

Q21.

(a) *idea about*

- environment change / habitat drier / climate change
- couldn't escape from predators / ref to predators / killed / eaten

  [Do not allow "died"]
- because feet not adapted to run on dry ground
- couldn't compete (with Merychippus) / more difficult to get food

[Use v + x = x principle]

any two for 1 mark each

2

(b) (i) fossil remains / from the bones

for 1 mark

1

(ii) (known) age of rock **<u>or</u>** any reason for knowing the age of the rock
eg by the rock layers by RA dating (not C-dating)

for 1 mark

1

(c) *idea that*
(present day) horses / species evolved / adapted / developed <u>from earlier species</u>/ <u>horses</u>

- over a long period of time / millions of years
- via many / gradual changes
- which gave a survival advantage /passed on genes / characteristics

any three for 1 mark each

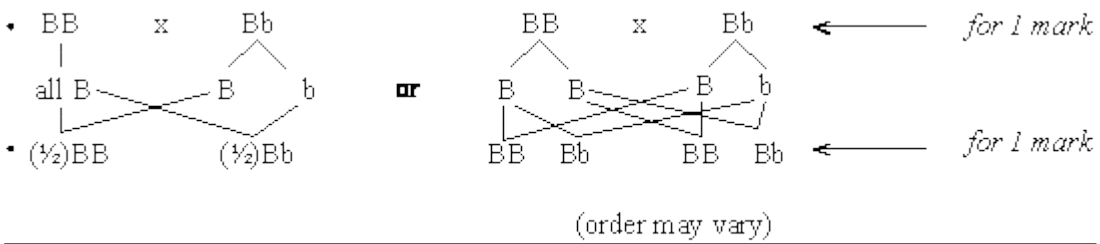
[First bullet point answer is required before marks can be awarded for others]

3

[7]

Q22.

(a) <u>First Generation</u>



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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



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 dm black flies survive to <u>breed*</u>
- pass on their genes to the next generation
- (* but implied by 3rd bullet point)

for 1 mark each

3

[7]

Q23.

(a) (i) (too) cold / all moisture / <u>water</u> frozen / no moisture / no warmth / conditions for decay are absent.

for 1 mark

(*No* oxygen is neutral)
(*Do not accept* frozen or ice has preserved them)

1

(ii)
- (bacteria have) no oxygen / air (because dead fish covered in mud)

(No moisture x)

(No moisture and no oxygen or warmth x)

- bones / hard parts do not decay easily

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idea that

- material of fish replaced by minerals

  any two for 1 mark each

2

(b) *ideas that*

- mammoths lived at the same time as humans / there was man in these times
- mammoths lived in the same place as humans
- humans hunted mammoths / ate mammoths / were carnivorous / for fur etc
- reference to later use of more advanced weapons
- humans needed to protect themselves from mammoths
- humans used flints / weapons / tools

  any two for 1 mark each

2

(c) *idea that*

- environment changed / became too cold / became too warm / vegetation changed / humans destroyed environment
- (new) predator / humans killed them
- new disease
- new competitor / type of elephant
- shortage of food / no food / ran out of prey
- mammoths reproduced too slowly
- mammoths didn't adapt to changes

  any two for 1 mark each

2

[7]

Q24.

idea that

- variations / mutations / differences in genes / alleles (in wild salmon population)
- adapted to own river
- any appropriate difference between rivers

  e.g. flow rate, waterfalls, pH, temperature, food supply, disease predators, competitors

- homing instinct

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for 1 mark each

survive to breed

gains 1 mark

but

pass on genes to offspring

gains 2 marks

[4]

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