AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.2 VARIATION AND EVOLUTION (PACK 4)

SCORE	PERCENTAGE
/149	%

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Q1.

dominant

1

recessive

1

genes

1

gametes

1

environmental

1

[5]

Q2.

(a) asexual

mitosis is neutral

1

(b) (body cell)
nucleus *is* from body cell

no mark for just body cell – mark the explanation
allow converse nucleus from egg cell is removed

1

nucleus contains (genetic) information / instructions / chromosomes / genes / DNA / allele

*do **not** credit 'contains characteristics'*

1

(c) splitting apart (cells from clonal) embryo

*do **not** credit 'repeat process'*

1

[4]

Q3.

chromosomes

1

enzymes

1

[2]

Q4.

(a) genetically identical / same genetic information / same DNA

accept identical / same chromosomes / alleles / genes

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allow 1 mark for identical same characteristics

2

(b) Quality of written communication:
Correct sequence
split → transfer

1

any **two** from

- split apart cells (from embryo)
- before specialised
  allow early stage
- implant / transplant
- into host / mother / uterus / womb

2

[5]

Q5.

(a) agilisaurus / camarasaurus / ornitholestes

1

(b) eorapter
allow lagosuchus

1

(c) lagusuchus (it) walks on hind limbs / two limbs / alamosaurus has longer 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

1

billion

1

[8]

Q6.

(a) genes

1

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asexual

1

clones

1

(b) keeps cuttings damp / prevents wilting

allow keeps warm / acts like a greenhouse
allow keeps pests off

1

[4]

Q7.

(a) (i) meiosis

1

(ii) mitosis

1

(c) (i) **X** pituitary

1

Y FSH

1

(ii) stimulates LH production

1

inhibits FSH production / production of **Y**

1

[6]

Q8.

(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

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

their genes more likely to pass to next generation

accept long necks inherited or offspring have long necks

2

[4]

Q9.

(a) (i) to go under teeth **or** mower

accept not damaged by grazing animals

accept do not get cut or bitten

accept reduces competition by other plants

do not credit maximum surface of leaves facing Sun

1

(ii) any **one** from

it can force its way through grass roots

accept in competition with grass roots

it is a store of food (to help the plant recover)

do not credit a good store of water

to reach down to water

to give good anchorage

accept it is hard to pull up

1

(iii) any **one** from

to reach more light

*accept to get out of the shadow of the hedge **or** tall grass*

to let seeds be caught on animals' coats (more easily)

*accept improves access **or** visibility **or** ease for pollination*

do not credit to help it grow up the hedge

1

(iv) any one from

(they reach out from hedge) to find water

accept increase surface area

*accept to find nutrients **or** minerals*

do not award mark if food mentioned

to give good anchorage

1

(b) (i) gene **or** allele

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do not credit chromosome

1

(ii) any **one** from

they do not crossbreed **or** interbreed

*accept different species do not breed together **or** do not fertilise each other*

do not produce fertile offspring

have different numbers or types of chromosomes

accept genes are incompatible

*do not credit have different genes **or** are genetically different*

do not credit do not pollinate each other

1

(c) one mark is for the adaptation and one is for an appropriate reason

have white fur

for camouflage

are huge

for large volume to surfae area

thick layer of fat

*for insulation or to reduce heat loss **or** retain heat*

*do not credit to stop it losing heat **or** withstand the cold **or** keep it warm*

have thick fur

*for insulation **or** to reduce heat loss **or** retain heat*

hibernate

to avoid the coldest part of year

is a carnivore

because animals provide high energy food

has big paws **or** claws

to be able to walk on snow

have small ears

to reduce heat loss

have furry feet

for insulation from the snow

2

[8]

Q10.

any **four** from

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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]

Q11.

(a) gene or allele

1

chromosome

*do not credit cell **or** pancreatic cell **or** genome*

1

DNA

accept plasmid

1

(b) any **two** from

bacteria grow **or** reproduce

a growth related point

DNA ring **or** plasmid **or** insulin gene
produced each time

***a** genetic related point*

insulin gene (in ring instructs bacteria
to) make insulin

2

(c) any **two** from

same match to human insulin

*accept animal insulin may be rejected **or** may not suit humans*

no crossing species risk

accept no risk of BSE type species crossing

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more easy to obtain **or** can be made in large quantities

*accept it is cheaper to make in the long term **or** it's quicker*

do not credit it's cheap

an ethical answer such as no religious **or** cultural concerns

accept it is cheaper so can be made available to many more people

2

[7]

Q12.

(a) (i) any **one** from

mutations

discontinuous variation

1

(ii) gene

accept any clear indication such as a tick

1

(b) any **one** from
gamma radiation

accept radiation

X-rays

ultra violet rays

chemicals

accept mutagens

chance

1

(c) zebras breed (to produce)

1

fertile offspring

do not accept mating

1

[5]

Q13.

(i) vegetative/asexual/cloning

for 1 mark

(ii) clones/identical copies/all same

for 1 mark

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not clones if cloning in b(i)

[2]

Q14.

idea brown colour/plain shell inconspicuous

for 1 mark

less likely to be eaten

gains 1 mark

but
less likely to be eaten before breeding

gains 2 marks

so alleles (genes) passed on

for 1 mark
(N.B accept inverse of any of the above)

[4]

Q15.

(a) *ideas:*
frog 2
nucleus comes from this frog
DNA/genes/information in nucleus
this controls development

for 1 mark each

4

(b) *advantages:*
large number of identical offspring
guaranteed desired features
quick
economic

disadvantages:
may all succumb to unexpected disease/change in conditions
cut adaptation/reduce gene pool/limits variation

any 5 for 1 mark each

5

[9]

Q16.

(a) idea

- unbanded dominant/plain **or** banded recessive
- because banded appears in young/
- parents heterozygous/Bb

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- offspring BB }
  Bb } credit response consistent with parents
  Bb } even if not both heterozygous
  bb }

  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)

  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 <u>2</u> causes of mutation, e.g. mistakes in cell division, radiation]

4

[11]

Q17.

idea

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

  for 1 mark each

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

[4]

Q18.

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(a) *idea*
advantages

- large scale
- cheaper
- easy to grow/produce or quick to produce
- non-seasonal

disadvantages

- loss of farmers' income
- loss of foreign exchange
- less work in Kenya/developing country
- mass use of a of particular pyrethin
- can allow insect populations to become resistant

any 6 for1 mark each
maximum of 4 in
advantages/disadvantages

6

(b) *idea*
chromosomes /DNA carry genes
cut off gene/part of chromosome/DNA
insert into yeast chromosome/DNA/plasmid/nuclear
Accept DNA answers

for 1 mark each

3

[9]

Q19.

(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 favoured by natural selection or better chance to survive and breed
- so larger birds at an advantage
- any six for 1 mark each

6

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(b) *idea*

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

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

- mutation(s)

(credit idea of inheritance and environment as the two factors with 1 mark)
any two for 1 mark each

2

[8]

Q20.

idea

- gene cut out/taken
- put in bacterial (cell) do not allow “nucleus”)
- cells cultured / grown in bulk
1 mark each

(allow 1 mark for “genetic engineering” if no other marks gained)

[3]

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 **or** any reason for knowing the age of the rock
eg by the rock layers by RA dating (not C-dating)
for 1 mark

1

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(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

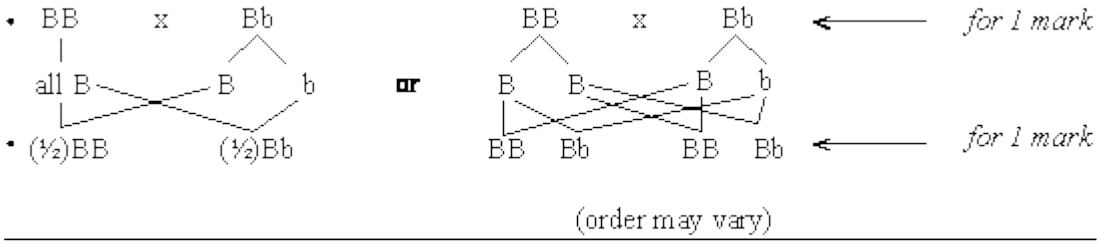
[First bullet point answer is required before marks can be awarded for others]

3

[7]

Q22.

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



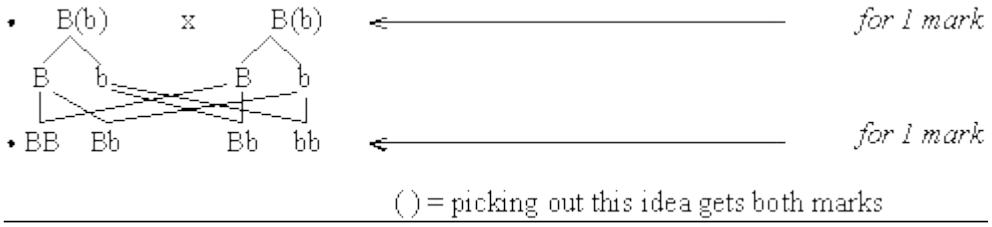
<u>or</u> as matrix

	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)

<u>Second generation</u>



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

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- 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) *ideas that*

- (toxin) gene cut out (from bacterium)
- of bacterial chromosome/DNA / plasmid (<u>not</u> nucleus)
- transferred to tomato chromosomes / cells/DNA/nucleus
- makes the toxin in the tomato plant

each for 1 mark

4

(b) **<u>For</u>:**

- good if we are sure that it only kills tomato pests, not bees etc
- humans will not be eating toxic insecticide
- don't have to buy insecticides
- less use of 'chemical' insecticides/less pollution
- reduce labour costs
- no hit or miss spraying
- spray washed off / needs respraying

(not to ensure better crop/better quality tomatoes \ Q asks.... in <u>this</u> way)

any two for 1 mark each

2

<u>Against</u>:

- not sure how the gene will affect other tomato genes/characteristics/named
- characteristic
- toxin might affect other organisms that feed on plant eg useful insects
- genetic engineering unethical/unnatural
- can't predict the effect of mutations
- could mutate to form a human toxin

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(not 'insects may develop resistance ∴ also applies to chemical insecticides)

NB Credit other sensible responses for/against

any two for 1 mark each

2

[8]

Q24.

(a) (i) moist (warm and cold are neutral)

for 1 mark

1

(ii) *idea that* roots / plants (only) grow with <u>moisture</u> (second condition negates answer)
idea that same (amount of growth) whether warm or cool

for 1 mark each

2

(b) *idea that* quicker / cheaper / more successful / same as the parent plant

for 1 mark

1

[4]

Q25.

(a) sexual / sex

for 1 mark

1

(b) *idea that*
sexual reproduction brings about a mixture of genes
or similar / different genes / parents / gametes / DNA / characteristics / chromosomes (*not* features)

for 1 mark

1

(c) (i) asexual / cloning (*allow* vegetative)

for 1 mark

1

(ii) (A) *idea that* (they are exactly the same). *Do not allow* similar or just <u>one</u> named feature.

for 1 mark

2

(B) different (*allow* similar but *do not allow* same).
Allow any one named difference

for 1 mark

(d) (i) greater the X-ray dose, greater the % of mutations
or % of mutations increases steadily / in proportion to X-ray dose

for 1 mark

1

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(ii) ionising radiations / ultra-violet light / alpha particles / beta particles / gamma rays / radio activity / chemicals / drugs / smoking / natural in meiosis / spontaneous / cell replication / toxic waste / pollution

1

Accept radioactivity but not radiations alone.

for 1 mark

[7]

Q26.

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

for 1 mark each

survive to breed

gains 1 mark

but

pass on genes to offspring

gains 2 marks

[4]

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