AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.1 REPRODUCTION (PACK 4)

SCORE	PERCENTAGE
/212	%

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Q1.

D
idea that twins have come from one (fertilised) egg
idea that Y sperm / Y chromosome produces boys

each for 1 mark
*allow 1 mark if candidate selects **A and** states that Y sperm / Y chromosome produce boys (reject Y gene unqualified) OR*
*allow 1 mark if candidate selects **C and** states that twins must have come from one (fertilised) egg*

[3]

Q2.

(a) (i) mitosis

for 1 mark

1

(ii) 1
fertilised egg cell has 1 albino gene from father splits to produce identical cells / produced by mitosis

each for 1 mark

3

(b) (i) less protection from UV light / UV radiation

for 1 mark

1

(ii) ideas of uncontrolled multiplication of mutated cells reject fast / rapid cell division cells invade of other parts / cells transported in blood

each for 1 mark

2

[7]

Q3.

(a) *ideas that*
embryos develop from cells with sheep nuclei / chromosomes / DNA which contains genetic information / information for development
OR placental cells (from goat) provide only e.g. nutrition

any two for mark each

2

(b) *Max. 3 pros e.g. ideas that* avoids extinction of rare breeds
rapid method for plants large numbers with same features can be produced
preserves features produced by genetic engineering *e.g. Tracey*
maintains particular genetic strains *e.g. produced by extensive selective breeding*
reject simple idea of identical offspring unless qualified as above

any three each for one mark

3

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Max. 3 cons e.g. ideas that moral / ethical objections animal 'rights'
identical individuals less adaptable to change or changing needs
reduced gene pool

any three each for one mark

3

[8]

Q4.

(a) chromosomes
genes (*reject* alleles)
alleles

for 1 mark each

3

(b) (i) sexual / sex

for one mark

1

(ii) egg / gamete / sex cell / ovum (*reject* ovule)

for one mark

1

(c) (i) information / genes / DNA passed from parents (*reject* chromosomes)

for one mark

1

(ii) genes / genetic information / chromosomes from <u>two</u> parents
alleles may be different
environmental effect / named may have been mutation

any two for 1 mark each

2

[8]

Q5.

(a) woman XX
man XY

for 1 mark each

2

(b) 50% / 1 in 2 / evens / 0.5 / 50:50

for 1 mark

<u>mark scheme for genetic diagram</u>

gametes all correct
genotypes of offspring all correct in relation to <u>gametes</u>

for 1 mark each

1

<u>mark scheme for written explanation</u>

half sperm have X chromosome, half have Y
and
all eggs have X chromosome

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50% / 1 in 2 / evens / 0.5 chance of egg being fertilised by X or Y sperm

for 1 mark each

2

[5]

Q6.

(a) (i) sexual / sex

(ii) egg / gamete / sex cell / ovum (*reject* ovule)

for 1 mark each

2

(b) (i) meiosis / reduction

(ii) mitosis / somatic

for 1 mark each

2

(c) twice as many (*reject* answers based on 23 / 46 chromosomes)

for one mark

1

(d) (i) information / genes / DNA passed from parents (chromosomes neutral)

for one mark

1

(ii) genes / genetic information / chromosomes from two parents
<u>alleles</u> may be different
environmental effect / named may have been mutation

any two for 1 mark each

2

[8]

Q7.

parental genotypes both correct – both Bb
gamete genotypes all correct B and b B and b
genotype of bb offspring correctly related to gametes
bb offspring identified as small bolls

for 1 mark each

[4]

Q8.

(i) DNA (*accept* RNA)

for one mark

1

(ii) DNA carries <u>coded</u> information
which controls the order of amino acids
in proteins

for 1 mark each

3

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[4]

Q9.

dominant

1

recessive

1

genes

1

gametes

1

environmental

1

[5]

Q10.

(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]

Q11.

(a) gametes A **or** a A **or** a

1

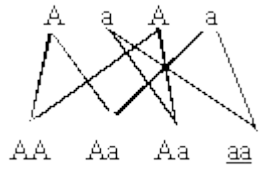
F_1 genotypes correctly derived

1

albino identified

OR

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gametes – 1

F1 genotypes corresponding to 'lines' – 1
lines must be correct

Albino (aa) identified – 1 (lower case)

1

OR

	A	a
A	AA	Aa
a	Aa	aa

gametes –1
boxes all correct –1
albino (aa) identified –1

(b) $\frac{1}{2}$ / half / 50% evens / 1 in 2

*do **not** credit 1 to 2 or 50/50*

1

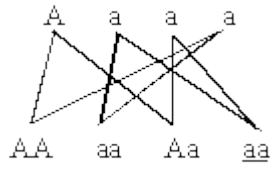
gametes A **or** a a **or** a or one parent heterozygous, one parent homozygous recessive

1

F_1 genotypes correctly derived

OR

(R) (S)



gametes correctly identified – 1

F_1 genotypes correctly derived – 1

OR

(R)

(S)		A	a
	a	Aa	aa
	a	Aa	aa

gametes correctly derived – 1

F_1 genotypes correctly derived – 1

1

[6]

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Q12.

man XY

allow (chromosomes) different

1

woman XX

allow (chromosomes) same
genes and alleles are neutral
allow 1 mark for one is XX and one is XY

1

[2]

Q13.

(a) any **two** from

- copies of chromosomes made
- cell divides twice **or** 4 cells formed
- each gamete / cell now has single set of chromosomes
  allow chromosome number halved /
  cells haploid / cells n

2

(b) any **two** from

- sex cells / gametes fuse / fertilisation
- offspring receive genes or chromosomes or alleles from both parents / DNA
- alleles in a pair may vary

2

(c) (i) new form of gene
allow change in genetic material / DNA / chromosomes / gene

1

(ii) (no)

any **two** from

- some neutral
- exemplified
  e.g. extra digit
- some increase chances of survival / reference to natural selection or evolution
- exemplified
  e.g. example of disease resistance

2

[7]

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Q14.

(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]

Q15.

(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]

Q16.

(a) (i) testis

1

ovary

1

(b) fertilisation **or** fertilise(d) / (ing)
accept fusion
*do not credit conception **or** intercourse*

1

(c) (i) the same, identical

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do not credit very similar make clear
their genetic material is the same
do not credit the same number of chromosomes or genes

1

(ii) the same, identical

make clear their genetic material is the same
do not credit the same number of chromosomes or genes

1

[5]

Q17.

(a) (i) XX XY XY XX

female male male female

the four correct genotypes and sex are required they may be in any order

1

(ii) meiosis

correct spelling required but
accept meisosis not miosis or meosis

1

(iii) 23

1

(iv) 23

1

(b) (i) any **two** from

(introduces) variation

*accept can crossbreed **or** offspring may gain beneficial characteristics*

prevents the risk of all being the same
and a disease wiping out population
or prevent monoculture

two parents to raise offspring

2

(ii) both parents carry a recessive allele
or gene **or** are heterozygous

accept both parents are carriers

1

[7]

Q18.

(a) **A A a a**

Aa allele correctly separated

1

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B b B b

Bb allele arranged to form four different pairings
all four pairings must be correct for the second mark

1

(b) **A A**

the two cells the same as the parent cell

a a

B B

b b

1 mark for each cell

2

(c) (i) 46

accept 23 pairs

1

(ii) 23

accept half if c(i)

1

(iii) 46

accept save as c(i)

1

[7]

Q19.

(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]

Q20.

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

accept not damaged by grazing animals
accept do not get cut or bitten

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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

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

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*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]

Q21.

(a) fertilisation

credit conception

1

(b) (i) sperm

*do not accept offensive answers **or** those in the vernacular*

1

testes **or** testicles

1

(ii) ovum **or** ova **or** eggs

do not accept ovules

1

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ovary

1

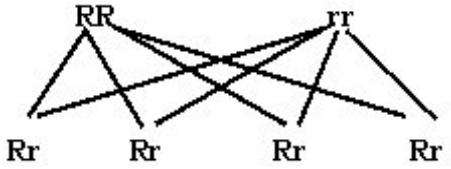
[5]

Q22.

(a) white

1

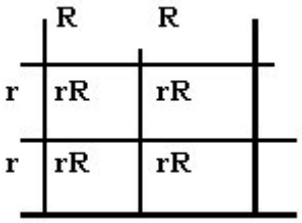
(b)



or a Punnett square

1 mark for parents and separation of genes
*1 mark correct set of four pairs, **rR***

1



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

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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
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]

Q23.

(a) circles round right hand **X** and **Y** gametes
*put two ticks **or** crosses by the circles*

2

(b) 50:50 **or** 1:1 **or** 50% **or** 0.5 **or** ½ equal **or** evens
credit even
*do not accept 2:1 **or** 50 / 50*

1

(c) (i) 23

1

(ii) 23
credit the same as the one above to be marked consequential

1

(d) DNA
do not accept nucleic acid

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1

(e) same

1

[7]

Q24.

(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]

Q25.

(a) 23

1

(b) chromosome nucleus gene cell
2 3 1 4

1

(c) (i) any **one** from

(cells which are bigger) take up more space

(cells) have to get bigger **or** mature to divide

1

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(ii) chromosomes duplicate **or**
make exact copies of self
accept forms pairs of chromatids

1

nuclei divide
*accept chromatids **or***
chromosomes separate

1

identical (daughter) cells formed
accept for example, skin cells make
*more skin cells **or** cells are clones*

1

(d) any **two** from

Differentiation mark
babies need **or** are made of different types of cells **or** cells that have different functions
accept different cells are needed
for different organs

Division or specialisation mark
as fertilised egg starts to divide each cell specialises to form a part of the body
accept specialised cells make
different parts of the body

Growth mark
specialised cells undergo mitosis to grow further cells
*accept cells divide **or** reproduce*
to form identical cells

2

[8]

Q26.

(i) vegetative/asexual/cloning
for 1 mark

(ii) clones/identical copies/all same
for 1 mark

not clones if cloning in b(i)

[2]

Q27.

(a) *idea that*
thicker/sticky/viscous mucus;
difficult breathing/trachea blocked;
digestion difficult/glands blocked

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each for 1 mark

3

(b) *idea*
'normal' gene/allele dominant
or
cystic fibrosis gene/allele recessive;

idea that
parents heterozygous/carrier;
children heterozygous, homozygous dominant,
homozygous recessive (clearly implied by diagram);
idea one in four chance of cystic fibrosis

each for 1 mark

4

[7]

Q28.

(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]

Q29.

(a) idea

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

  Accept any clear and consistently used notation
- identify BB, Bb as plain

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- 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]

Q30.

(a) *idea*
advantages

- large scale
- cheaper
- easy to grow/produce <u>or</u> 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

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cut off gene/part of chromosome/DNA
insert into yeast chromosome/DNA/plasmid/nuclear
Accept DNA answers

for 1 mark each

3

[9]

Q31.

(a) alleles in parents Bb Bb

alleles in sperms/eggs (*) B b B b

alleles in children (*) BB Bb bB bb

hair colour black black black red

(*) NB ecf
Allow other letters if a clear key

each line correct for 1 mark each

4

(b) evens/50:50/equal/half (e.c.f. from cross below)

for 1 mark

parents J Smart (Bb) M Jones (bb)

children Bb Bb (black) bb bb (red) *(ecf)

each line correct for 1 mark each

3

J Smart must be BB or Bb
M Jones must be bb or from (a)

Credit cross shown in a matrix:

	B	b
b	Bb	bb
b	Bb	bb

for 2 marks

Bb identified as black hair
bb identified as red hair
or
2 red : 2 black

for 1 mark

1

[8]

Q32.

(a) *idea*

identical (do <u>not</u> allow simply “the same number”)

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for 1 mark

1

(b) *idea*

chromosomes double/duplicate/copies made

for 1 mark

separate into 2 sets/divide*

gains 1 mark

but

separate into 4 sets/divide twice*

gains 2 marks

number halved compared to bodycell

or

single set (only) 16

accept in terms of cells but only if chromosomes referred to in first and/or last items)

for 1 mark

4

[5]

Q33.

idea

- (gene) in DNA (i.e. mention of DNA)
- (DNA) contains bases
- (bases) code for amino acids (in protein)
- (amino acids) in correct order
- to make the (spider) protein

any four for 1 mark each

(No credit for double helix, **pairs** of bases - but no penalty)

[4]

Q34.

(a) (i) nucleus

(ii) chromosome

(iii) gene

each for 1 mark

3

(b) a body cell

for 1 mark

1

[4]

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Q35.

(a) (i) asexual / non-sexual / cloning *[not artificial]*

for 1 mark

1

(ii) gene / allele / chromosome / DNA

for 1 mark

1

(iii) A) same / look alike / similar

gains 1 mark

but same sex / all female / all black / identical / clones

gains 2 marks

B) same as the black (female)

for 1 mark

3

(b) (i) ovaries [not reproductive organs]

for 1 mark

1

(ii) hormones / fertility drugs / FSH

for 1 mark

Allow LH

[Do not allow oestrogen / fertility treatment]

1

[7]

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