AQA GCSE BIOLOGY (HIGHER) · 8461

BIOLOGY



MARK SCHEME

4.6.1 REPRODUCTION (PACK 2)

SCORE	PERCENTAGE
/117	%

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Q1.

(a) both parents **Aa**

*accept other upper and lower case letter without key **or** symbols with a key*

allow as gametes shown in Punnett square

1

aa in offspring correctly derived from parents
or
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

- (more) sure / greater chance of healthy / non-cystic fibrosis egg / embryo / child

  accept some may have the allele

  reference to 'suitable / good embryo' is insufficient

- greater chance of fertilisation

1

(ii) **advantages**

to gain 3 marks both advantage(s) <u>and</u> disadvantage(s) must be given

max 3

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 to future generations

disadvantages

any **two** from:

- operation dangers / named eg infection

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ignore risk unqualified

- ethical or religious issues linked with killing embryos
  accept wrong / cruel to embryos accept right to life argument
  ignore embryos are destroyed

- (high) cost of procedure

- possible damage to embryo (during testing for cystic fibrosis / operation)

plus

conclusion

a statement that implies a qualified value judgement
eg it is right because the child will (probably) not have cystic fibrosis even though it is expensive
or
eg it is wrong because embryos are killed despite a greater chance of having a healthy baby

***note**: the conclusion mark cannot be given unless a reasonable attempt to give both an advantage and a disadvantage is made*

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

1

(c) any **three** from:

- osmosis / diffusion
  *do **not** accept movement of ions / solution by osmosis / diffusion*

- more concentrated solution outside cell / in mucus
  assume concentration is concentration of solute unless answer indicates otherwise or accept correct description of 'water concentration'

- water moves from dilute to more concentrated solution
  allow correct references to movement of water in relation to concentration gradient

- partially permeable membrane (of cell)
  allow semi / selectively permeable

3

[11]

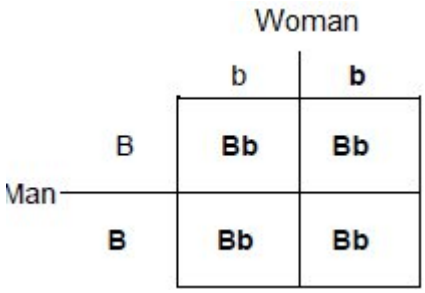
Q2.

(a) (i) correct parental genotypes (man BB and woman bb)

1

all offspring Bb

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ignore 'brown' or 'brown eyes' on diagram

1

(ii) they have one B / dominant allele / heterozygous

or

B / brown allele / dominant allele is expressed even if only on one chromosome

1

(b) correct parental genotypes (both Bb)

can be shown in a diagram

can be shown as gametes

1

correct derivation of offspring genotypes from gametes

allow correct derivation from wrong gametes

1

bb identified as blue-eyed

1

[6]

Q3.

(a) sexual reproduction

1

(b) (i) genes

1

(ii) gametes

1

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

answers must be comparative

- more meat (per cow)
  ignore bigger unqualified
- more milk each day
- can be milked for more time after giving birth / greater proportion of time
  *accept '(produce) more milk', for **1** mark, if neither more milk each day nor can be milked for more time after giving birth are given*

2

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(ii) (milk contains) more protein

answers must be comparative

1

less time before having a calf when no milk produced

1

(d) (i) genes from one organism are transferred to a different organism

1

(ii) (possible) harm to babies' long term health

allow don't know long-term / side effects (on baby)

accept idea that there may be other things in (genetically engineered) cow's milk that might harm babies' health e.g. bacteria

ignore ethical / religious arguments

1

[9]

Q4.

(a) auxin

accept other named plant hormones

1

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

- no (fusion of) gametes / fertilisation
  *allow no meiosis **or** new cells only produced by mitosis*
- only one parent
  allow not two parents
- no mixing of genetic material
- no genetic variation **or** genetically identical offspring
  allow clones

3

(ii) more / many offspring / plants (produced from one parent plant)

allow less damage to parent plant

ignore speed / cost

1

[5]

Q5.

(a) (i)

Feature	Mitosis only	Meiosis only
Produces new cells during growth and repair	✓	
Produces gametes (sex cells)		✓

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Produces genetically identical cells	✓	

All 3 correct = **2** marks

2 correct = **1** mark

0 or 1 correct = **0** marks

2

(ii) (a man) testis / testes
accept testicle(s)

1

(a woman) ovary / ovaries
*do **not** accept 'ova' / ovule*

1

(b) (i) XY / YX
or
X and Y

1

(ii) XX
or
X and X or 2 X's
accept X

1

(c) ½ / 0.5 / 50% / 1:1 / 1 in 2
*do **not** accept 1:2 / 50/50*
allow 50:50
allow 2 in 4

1

[7]

Q6.

(a) (i) 1

1

fertilisation / fusion
allow <u>sexual</u> reproduction
allow fertilise / fuse
ignore joining

1

(b) (i) **Dd**

1

(ii) **dd**

1

(c) (i) 1 in 2

1

(ii) 0

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1

[6]

Q7.

(a) changes code /sequences of bases
or
sequence of amino acids is different

1

the enzyme has different / wrong shape / structure

allow the active site is changed

1

so substrate will not fit into enzyme / will not join to enzyme

1

(b) (i) 46

allow 23 pairs

1

(ii) also inherited (from mother) normal chromosome 15 / normal allele / normal gene / boy is heterozygous / **Hh**

allow the boy is a carrier

1

(allele for) this disorder is recessive
or
the normal allele would give a working enzyme

ignore converse

1

(iii) genetic diagram including:

Parental gametes:

H and **h** from both parents

accept alternative symbols, if defined

1

derivation of offspring genotypes:

HH Hh Hh hh

allow alternative if correct for student's parental genotypes / gametes

1

identification of **hh** (having the disorder) if 1 in 4

1

[9]

Q8.

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

'it' = a chromosome

allow chromosomes replicate / duplicate / are copied

ignore chromosomes divide / split / double

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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]

Q9.

(a) (i) fusion / joining / combining of gametes / egg **and** sperm / sex cells

accept fertilisation

allow fusion / joining / combining DNA from two parents

ignore meeting / coming together / mixing of gametes etc

1

(ii) (mixture of) genes / DNA / genetic information / chromosomes

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ignore nucleus / inherited information but allow second mark if given

1

from both parents / horse **and** zebra

dependent on sensible attempt at 1st mark

1

(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should apply a 'best-fit' approach to the marking.

0 marks
No relevant content

Level 1 (1-2 marks)
There is simple description of the early stages of adult cell cloning. However there is little other detail and the description may be confused or inaccurate.

Level 2 (3-4 marks)
There is an almost complete description of the early stages of the process and description of some aspects of the later stages. The description may show some confusion or inaccuracies.

Level 3 (5-6 marks)
There is a clear, detailed and accurate description of all the major points of how adult cell cloning is carried out.

Examples of Biology points made in the response could include:

- skin cell from zorse
- (unfertilised) egg cell from horse
- remove nucleus from egg cell
- take nucleus from skin cell
- put into (empty) egg cell
- (then give) electric shock
- (causes) egg cell divides / embryo formed
- (then) place (embryo) in womb / uterus

6

[9]

Q10.

(a) <u>mutation</u>

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 <u>hatching</u> (of males)

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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]

Q11.

(a) sexual

1

characteristic

1

mutation

1

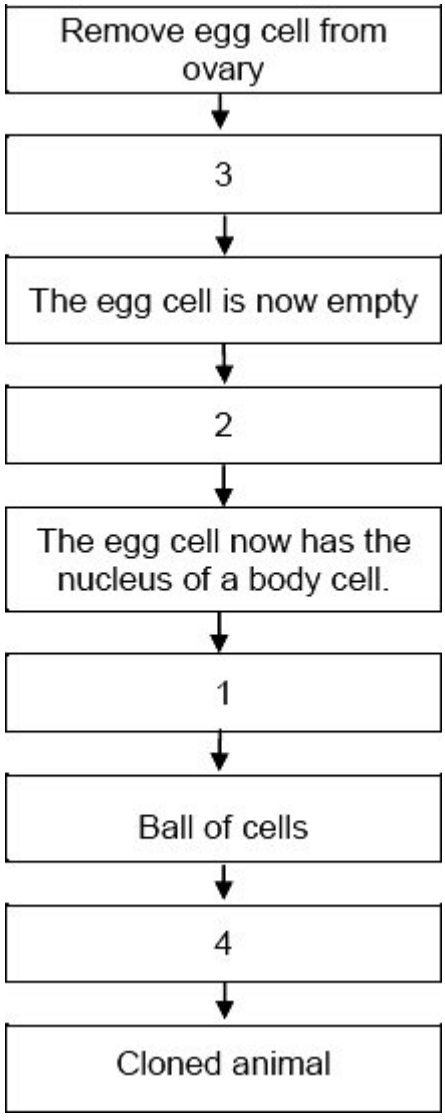
chromosome

this order only

1

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(b)



*four correct gains **3** marks*
*two or three correct gains **2** marks*
*one correct gains **1** mark*
accept correct connection between statement and box

3

[7]

Q12.

(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 <u>chromosome / DNA</u>

1

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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]

Q13.

(a) 

*the shape must be (roughly) circular **and** not shaded, for the mark*

accept the shape drawn in the key if it is not contradictory

1

(b) dominant

1

(c) (i) a half (50%)

1

(ii) Some of B's sperm cells have an X chromosome

1

[4]

Q14.

(a) gene / allele

1

(b) (in / on) ribosome(s)

1

(c) any **three** from:

- amino acids make up a protein
- (protein is) particular combination / sequence (of amino acids)
- bases form a code
- the bases work in threes or description

  accept bases work in triplet
- (code / three bases) for one amino acid

  *accept eg (bases) WXZ for amino acid J for **2** marks*

3

(d) (i) different / wrong amino acid (coded for) **or** different / wrong shape

ignore reference to amino acid 'made'

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ignore change unqualified
ignore different protein

1

(ii) different / example of different eye colour
allow protein may / would not be made / function (normally)

1

[7]

Q15.

(a) (i) 23

1

(ii) nucleus / 'the head'
allow phonetic spelling

1

(b) (i) **X** and **X**

1

(ii) **X** and **Y**

1

(c) 150 million / 150,000,000 / half (of them) / 50% / 1 in 2

1

[5]

Q16.

(a) (i) recessive allele

1

(ii) carriers

1

(b) (i) 6
allow nn

1

(ii) 1 in 4 / 0.25 / ¼ / 25 % / 1:3
*do **not** accept '3:1' / 1:4 / 1 in 3 / 25*

1

(c) **advantage:**

detect CF qualified – eg at early stage / before becoming pregnant **or** (only) healthy <u>children</u> produced
allow 'after <u>only</u> 3 days'
allow reduces health care costs

1

disadvantage:

some embryos are destroyed / may damage embryo

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allow increased risk of miscarriage
ignore not natural
ignore cost

1

[6]

Q17.

(a) (i) mitosis

correct spelling only

1

(ii) replicates / doubles / is copied / duplicates

accept cloned
ignore multiplied / reproduced

1

(b) fertilisation occurs / fusion (of gametes)

accept converse for asexual, eg none in asexual / just division in asexual

1

so leading to mixing of genetic information / genes / DNA / chromosomes

genes / DNA / chromosomes / genetic information comes from 1 parent in asexual
ignore characteristics

1

one copy (of each allele / gene / chromosome) from each parent
or
gametes produced by meiosis
or
meiosis causes variation

meiosis must be spelt correctly

1

[5]

Q18.

(a) (i) (alternative) forms / types of a / the same gene

1

(ii) only expressed if 2 copies inherited
or not expressed if other allele present

allow over ruled / over powered by the other allele

1

(b) (i) **Nn**

ignore heterozygous

1

(ii) genetic diagram including:

accept alternative symbols, if defined

gametes: **N** and **n** from both parents

accept alternative symbols if correct for answer to (b)(i)

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1

correct derivation of offspring genotypes:
NN Nn Nn nn

allow if correct for candidate's parental genotypes / gametes

1

identification of **nn** as having cystic fibrosis

1

(c) **Argued evaluation**

any **four** from:

- PGD higher financial cost
  accept CVS only costs £600
- PGD occurs before pregnancy / implantation
  accept detected at earlier stage so less unethical / less trauma
- PGD does not involve abortion so less trauma / less pain / ethical

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