AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.1.3

DNA and the genome

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**4**
Available paper years	**2018–2022**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.6.1.3 DNA and the genome

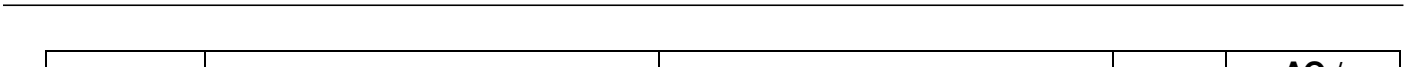
Answer 01 · Mark scheme June 2018 | 8464/B/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	a double helix a polymer		1 1	AO1 4.6.1.3
02.2	gene genome	in this order only	1 1	AO1 4.6.1.3
02.3	sperm **and** egg(s) / ova / ovum	in either order	1	AO1 4.6.1.1
02.4	fertilisation		1	AO1 4.6.1.2
02.5	the cell divides twice the new cells have half the number of chromosomes		1 1	AO2 4.6.1.2
Total			**8**	

4.6.1.3 DNA and the genome

Answer 01 · Mark scheme

June 2018 | 8464/B/2F | Original Q2



4.6.1.3 DNA and the genome

Answer 02 · Mark scheme

November 2020 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1			1	AO2 4.6.1.3
06.2	any **one** from: • 2 strands / chains that are twisted / coiled / spiralled • double helix • (long) polymer	allow cross links between 2 strands / chains allow reference to nucleotides or sugars, phosphates and bases	1	AO1 4.6.1.3
06.3	amino acids protein	in this order only allow polypeptide	1 1	AO1 4.6.1.3
06.4	all the genetic material (of an organism)	allow DNA / genes for genetic material ignore chromosomes	1	AO1 4.6.1.3
06.5	tracing how aboriginal people spread across Australia		1	AO2 4.6.1.3
06.6	variation	ignore genetic/environmental	1	AO1 4.6.2.1

4.6.1.3 DNA and the genome

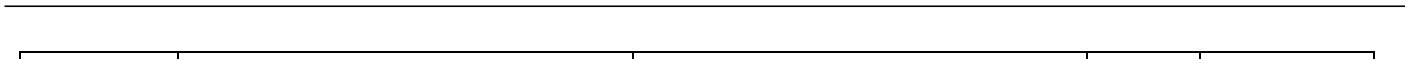
Answer 02 · Mark scheme

06.7	stronger / larger (shell) (so) more likely to (survive and) breed **or** (so) more likely to (survive and) pass on genes **OR** (better) camouflaged (1) (so) less likely to be eaten and will breed more (1)		1 1	AO2 4.6.2.2
Total			**9**	

4.6.1.3 DNA and the genome

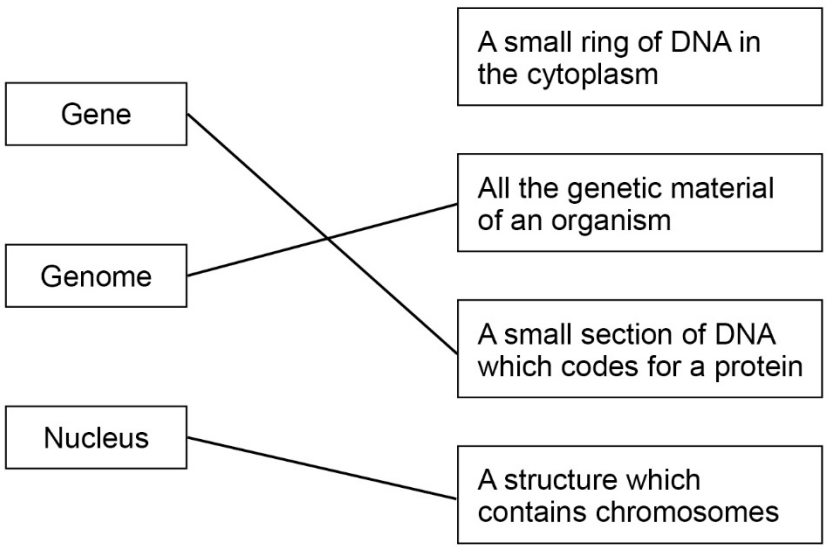
Answer 02 · Mark scheme

November 2020 | 8464/B/2F | Original Q6



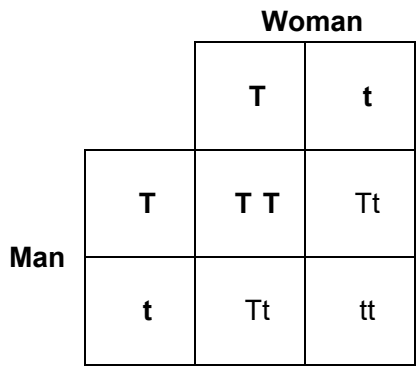
4.6.1.3 DNA and the genome

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	23		1	AO1 4.6.1.2
01.2	 additional line from a box on the left negates the mark for that box		1 1 1	AO1 4.6.1.4 4.6.1.3
01.3	any **one** from: • to survive • so you do not eat the plants • to stop you being harmed / poisoned	allow to protect them allow stop you getting ill / dying	1	AO2 4.7.1.4
01.4	heterozygous		1	AO2 4.6.1.4
01.5	tt	allow homozygous recessive	1	AO2 4.6.1.4

4.6.1.3 DNA and the genome

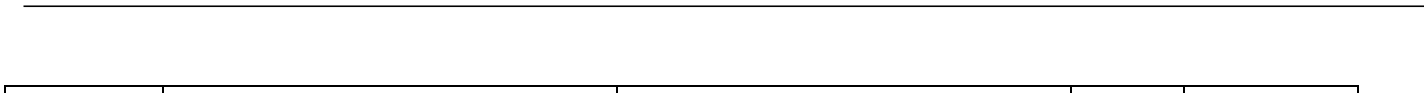
Answer 03 · Mark scheme

01.6		allow 1 or 2 genotypes correct for **1** mark	2	AO2 4.6.1.4
01.7	75%	allow **only** a probability consistent with student's derivation if no answer to question **01.6** allow 75%	1	AO3 4.6.1.4
Total			**10**	

4.6.1.3 DNA and the genome

Answer 03 · Mark scheme

November 2021 | 8464/B/2F | Original Q1



4.6.1.3 DNA and the genome

Answer 04 · Mark scheme

June 2022 | 8464/B/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	larger yields		1	AO1 4.6.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	GM crops will harm wildlife		1	AO1 4.6.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	gene(s)	allow allele(s)	1	AO1 4.6.1.3 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	protein		1	AO1 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	an allele that is only expressed if two copies are present		1	AO1 4.6.1.4

4.6.1.3 DNA and the genome

Answer 04 · Mark scheme

June 2022 | 8464/B/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	heterozygous		1	AO2 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7 mark with 1.8	offspring genotypes correctly derived hh circled Woman: H, h Man: H, h HH, Hh Hh, hh	allow **1** mark for 1 or 2 correct genotypes	2 1	AO2 4.6.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8 mark with 01.7	25%	probability must match derivations (hh) in question **01.7**	1	AO3 4.6.1.4

4.6.1.3 DNA and the genome

Answer 04 · Mark scheme

June 2022 | 8464/B/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9	any **one** from: • it might harm the embryo / baby / mother • it might cause a miscarriage • they do not want to make a choice about having an abortion • it is against their religious beliefs	ignore cost ignore harmful / dangerous unqualified allow against their religion	1	AO3 4.6.1.4 4.6.1.5

Total Question 1		**11**

4.6.1.3 DNA and the genome

Answer 03 · Examiner comments November 2021 | 8464/B/2F | Original Q1

Question 1 (low demand)

This question assessed the genetics section of the specification. Nearly all students could recall or calculate the number of chromosomes in a sperm cell when told the number of chromosomes in a human body cell. **01.2** was more challenging with few students being able to correctly link the words ‘gene’, ‘genome’ and ‘nucleus’ with the meaning of that word. Of these, nucleus was the most common correct response.

Most students knew the term heterozygous, but few could give the genotype in **01.5**. Many students correctly completed the Punnett square, however interpreting this to give the correct probability was more difficult, with an answer of 50% frequently seen.

Answer 04 · Examiner comments June 2022 | 8464/B/2F | Original Q1

Question 1 (low demand)

01.1 72% of students could identify larger yields as a useful characteristic that crops are genetically modified for.

01.2 Around half of students could identify a concern about GM crops.

01.3 40% of students could name ‘gene’ or ‘allele’ as a piece of DNA that codes for a characteristic. Frequently seen incorrect answers were chromosome, genome and phenotype.

01.4 Just over half of students knew that protein was made using the DNA code.

01.5 50% of students knew the definition of a recessive allele.

01.6 52% of students could identify that heterozygous was the appropriate term.

01.7 A quarter of students could correctly derive the three missing possible genotypes of the child and draw a ring around hh. Many students could derive the genotypes, but did not draw a ring, or circled Hh or HH.

4.6.1.3 DNA and the genome

Answer 04 · Examiner comments

June 2022 | 8464/B/2F | Original Q1

01.8 The probability selected here needed to match the proportion of hh in their response to **01.7**. Half of students achieved this.

01.9 Many students gave the first marking point, for the idea that there may be harm to the embryo. Some responses were too vague, such as 'religion' unqualified. 'They might not want to know' was considered insufficient. Despite the question context relating to cystic fibrosis, many students only referred to screening identifying the gender of the embryo. Some misconceptions were seen, such as embryo screening causing cancer and incorrect references to radiation were common.