AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.6.1.1

Sexual and asexual reproduction

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**3**
Available paper years	**2020–2024**

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.

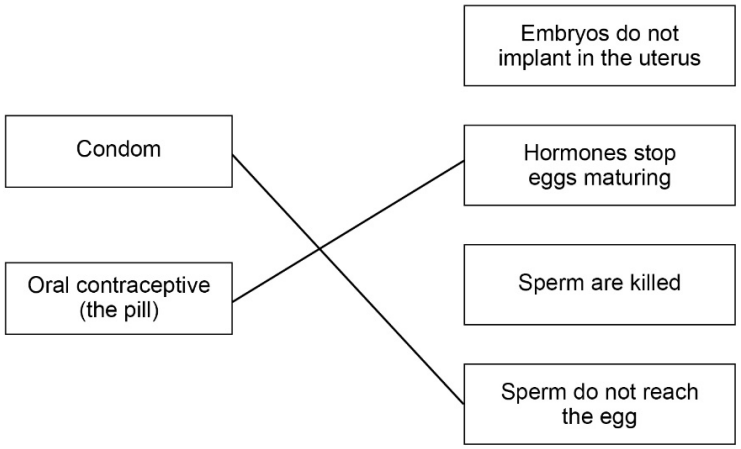
4.6.1.1 Sexual and asexual reproduction

Answer 01 · Mark scheme November 2020 | 8464/B/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	gametes are formed sperm and egg fuse		1 1	AO1 4.6.1.1
01.2	Y gamete for father **Mother**: X, X **Father**: X → XX, **XX**; **Y** → **XY**, **XY**	all derivations correct = 2 marks 1 or 2 correct = 1 mark allow correct derivations from incorrect gamete	1 2	AO2 4.6.1.6
01.3	rings drawn around all XY	allow one ring drawn around both XY ignore ring drawn around father's genotype ecf any letter for Y, except X	1	AO2 4.6.1.6
01.4	**Hormone** / **Change that hormone causes at puberty** Oestrogen → Breasts develop Oestrogen → Skin turns lighter Testosterone → Voice becomes deeper Wisdom teeth appear If more than one line from a hormone no mark for that hormone		1 1	AO2 4.5.3.3

4.6.1.1 Sexual and asexual reproduction

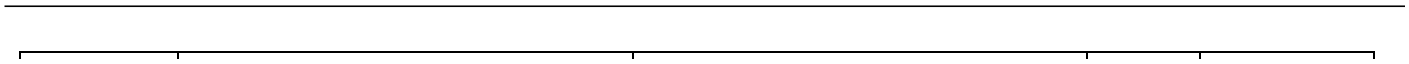
Answer 01 · Mark scheme

01.5	**Method of contraception** / **How the method prevents pregnancy**  If more than one line from a method of contraception no mark for that method		1 1	AO1 4.5.3.4
01.6	advantage – any **one** from: • very reliable • easy to take • do not have to rely on partner • helps to treat acne or period pain disadvantage – any **one** from: • may cause side effects • may affect her fertility later • have to remember to take it (every day) • does not protect against STIs	ignore you do not get pregnant allow described eg headaches, nausea, putting on weight allow you have to take it every day	1 1	AO3 4.5.3.4
Total			**12**	

4.6.1.1 Sexual and asexual reproduction

Answer 01 · Mark scheme

November 2020 | 8464/B/2F | Original Q1



4.6.1.1 Sexual and asexual reproduction

Answer 02 · Mark scheme

June 2023 | 8464/B/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	meiosis	allow phonetic spelling	1	AO1 4.6.1.1 4.6.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	gametes / eggs / sperm are not (genetically) identical	allow gametes / eggs / sperm are (genetically) different allow cells produced by meiosis are not (genetically) identical	1	AO1 4.6.1.1 4.6.1.2
	(there is) mixing of genetic information / genes / DNA **or** genetic information / genes / DNA from two / both parents	allow genetic information / genes / DNA from each parent ignore gametes fuse unqualified ignore two parents unqualified if no other mark awarded allow **1** mark for mutations	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	heterozygous	ignore dominant / recessive	1	AO2 4.6.1.4

4.6.1.1 Sexual and asexual reproduction

Answer 02 · Mark scheme

June 2023 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(parents gamete genotypes shown) **D d** and **d d**	allow in either position in Punnett square	1	AO2
	(possible offspring genotypes correctly derived) **Dd Dd dd dd**	allow correct derivation of offspring genotypes from incorrect gametes allow 3 correct offspring genotypes for **1** mark	2	AO2
	correct identification of **Dd** offspring as having polydactyly	if derivation not correct and shows **DD** and **Dd**, both must be identified as having polydactyly	1	AO2
	probability must match derived offspring genotypes	if no derivation shown allow 0.5 **or** 50% **or** 1 in 2 **or** 1:1 **or** ½ do **not** accept 1:2 allow correct probability from incorrectly derived offspring	1	AO3 4.6.1.4 4.6.1.5

4.6.1.1 Sexual and asexual reproduction

Answer 02 · Mark scheme

June 2023 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	any **two** from: • can find out if the embryo has an (inherited) disorder • can prepare for baby (with the disorder) • can decide whether to continue with the pregnancy • fewer people with (inherited) disorders over time	allow can find out if the embryo has inherited disease ignore can find out if the embryo has disease(s) allow description of preparation for the baby eg access to early treatment allow choice of (in vitro) embryos (to be implanted)	2	AO3 4.6.1.5

Total Question 6	11

4.6.1.1 Sexual and asexual reproduction

Answer 03 · Mark scheme

June 2024 | 8464/B/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	domain		1	AO1 4.6.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	offspring are genetically identical		1	AO1 4.6.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	a gamete contains half of the number of chromosomes		1	AO1 4.6.1.1 4.6.1.2

4.6.1.1 Sexual and asexual reproduction

Answer 03 · Mark scheme

June 2024 | 8464/B/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	any **one** from: • similar / same structure / characteristics / phenotype (as potatoes)	allow named similar structure / characteristics such as same shape / leaves / flowers / taste allow studied with microscopes ignore 'look the same / similar' unqualified	1	AO1 4.6.4
	• similar DNA / genes	allow DNA analysis allow analysis of genetic material allow similar genetic material ignore genetic information do **not** accept same DNA / genes		
	• similar / same biochemistry			
	• same first part of binomial (name)	allow same first part of Latin / scientific name		

Question	Answers	Mark	AO / Spec. Ref.
06.5	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content allow reference to named crop throughout **effects of climate change** • climate change will change weather patterns / trends • climate change causes flooding **or** drought **or** temperature change • farming land decreased by sea level rise / flooding / desertification • current crops cannot grow / survive (in changing conditions) **benefits of GM** ○ GM may allow crops to grow in wider range of conditions ○ GM may allow crops to be resistant to wider range of pests / diseases ○ GM may allow crops to be stored for longer ○ GM may increase crop yield **or** increase growth rate ○ to feed the increasing human population ○ useful if less area available for farming ○ larger human population needs more land for housing **other relevant content** ▪ variation amongst current crops reduced by asexual reproduction **or** selective breeding ▪ rate of evolution (by natural selection) may be slower than rate of climate change For **Level 3**, answers must explain effect(s) of climate change **and** benefit(s) of GM with logical link.		4.6.2.4 4.7.3.2 4.7.3.5 4.7.3.6

Total Question 6	**10**

4.6.1.1 Sexual and asexual reproduction

Answer 02 · Examiner comments

June 2023 | 8464/B/2F | Original Q6

Question 6 (Standard demand)

06.1 Phonetic spelling was allowed, and variations of many phonetically correct spellings were seen. Hybrid terms between meiosis and mitosis were not credited. The list principle was applied when students stated both meiosis and mitosis. See page 4 of the mark scheme for an explanation of how lists within responses are marked.

Whilst mitosis was a common error, there were many students who simply put any word that they could relate to sexual reproduction such as fertilisation, ovum, sperm, hormones.

06.2 Few students could give two reasons why sexual reproduction causes variation in the offspring. Marking point 2 was seen more frequently than marking point 1.

Responses that did not gain credit only referred to the offspring having different characteristics, such as eye colour.

For marking point 1 we were looking for the idea of variation in gametes from one parent, or for the variation in gametes more generally, such as 'the genes from the egg and sperm are different'. The word genetically was bracketed and therefore is not required, but could not be contradicted, such as 'the egg and sperm look different'. We cannot put every variation of how students could phrase this in the mark scheme. For example, the mark scheme allowed 'cells produced by meiosis are not identical', so if a student wrote 'cells produced by meiosis are different' that was also worth the mark.

A few students referred to chromosomes crossing over in meiosis. This was a correct response that is beyond the specification and scored marking point 1. There is no expectation for teachers to teach this idea.

We did not credit vague answers that were open to different interpretations such as:

- egg and sperm contain 50% DNA
- half is from mother, half is from father
- genetics is from mother and father
- one gene from each parent.

Errors were seen in some responses that referred to chromosomes. The response needed to be biologically correct to gain the mark. 'They get chromosomes from each parent' or 'Chromosomes mix' or '2 sets of chromosomes mix' was acceptable. However, '2 chromosomes mix' or 'pairs of chromosomes come from each parent' are incorrect. Likewise, '2 genes mix' was incorrect.

There was a fallback mark for 'mutations'. This mark was awarded only if no other mark was given.

4.6.1.1 Sexual and asexual reproduction

Answer 02 · Examiner comments June 2023 | 8464/B/2F | Original Q6

0 1 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 The off spring is a combination of DNA from mother and father

2 The DNA taken from mother and father is not always the same

0 6 . 2 Sexual reproduction produces offspring that are genetically different from each other.

Give **two** reasons why sexual reproduction causes variation in the offspring.

[2 marks]

1 Each sperm and egg cell carry different genes.

2 Mother's and father's ~~are~~ genes are combined differently each time.

The first response (from a Higher tier paper) gave marking point 2 twice, therefore only 1 mark was awarded. The second response (from a Foundation tier paper) gave marking point 1 and marking point 2 for 2 marks.

06.3 This was very well answered. Phonetic spelling was allowed. See page 5 of the mark scheme for information on marking phonetic spelling.

06.4 On the Foundation tier, few students achieved all 5 marks, but partial credit was given frequently, such as correct derivation from incorrect gametes.

On the Higher tier, most students could complete the Punnett square and state the probability of the child having polydactyly. However, few students identified which offspring genotype would result in polydactyly. This could be indicated on any or all offspring, with a circle, line, key or label or any other clear method of identification.

06.5 Clear responses most frequently knew that embryo screening enables us to find out whether an embryo has an inherited disorder. Some confusion was seen between the term disorder and the terms diseases or disabilities.

Many responses were vague, such as 'to see if the embryo is healthy'. Some incorrect responses incorrectly implied that embryo screening is ultrasound screening.

Very few students took the marking point 4 approach of the implications to the population over time.

4.6.1.1 Sexual and asexual reproduction

Answer 02 · Examiner comments June 2023 | 8464/B/2F | Original Q6

A general misconception was that embryo screening is the same as genetic counselling, so students referred to finding out the likelihood of the embryo having an inherited disorder. The misconception that embryo screening can change DNA or treat inherited disorders was also seen.

Answer 03 · Examiner comments June 2024 | 8464/B/2F | Original Q6

Question 6 (standard demand)

06.1 30% of students could select that the classification group 'Eukaryota' is a domain.

06.2 50% of students knew that asexual reproduction produces genetically identical offspring.

06.3 Just over 50% of students knew that a gamete contains half the number of chromosomes compared to the other cells in a potato plant.

06.4 Most students could describe how a new plant species could be identified as being in the same genus as potatoes. DNA analysis or similar characteristics were the most common correct answers.

Misconceptions were seen, such as the idea that the species would have identical DNA. On the Foundation tier, some answers were much too vague, such as 'by testing'.

© 2024 AQA and its licensors. All rights reserved.

4.6.1.1 Sexual and asexual reproduction

Answer 03 · Examiner comments June 2024 | 8464/B/2F | Original Q6

06.5 Few students appeared to follow the direction of the question, beyond stating that GM crops can be made to grow even if the climate changes. Some students were aware of food insecurity as a result of climate change, and this could be given credit for the idea that current crops will not be able to grow/survive.

Few students made links between climate change and the possible benefits of GM crops. Lists of possible benefits of GM with no link to climate were limited to Level 1. Some students made very good attempts at this question and a few recognised some of the effects of climate change and were able to link these to the idea that current crops would struggle to grow in these conditions. This was an attempt at a logical link and achieved a Level 2 mark.

Some students further developed this idea, and clearly had a grasp of the question being asked, as they then went on to describe how GM would enable crops (or potatoes) to survive the conditions that climate change brings. They could further strengthen their account with suggestions that more crops could be grown or crops could be grown faster. These responses were detailed and logically linked accounts and were therefore Level 3 responses.

Some students wrongly gave explanations of causes of climate change.

0 6 . 5 Scientists have collected and stored seeds from species in the same genus as potatoes.

In the future, these seeds may be used for genetic modification of potato plants.

Genetically modified potato plants could help supply food to the human population as the climate changes.

Explain why genetic modification of crop plants may be important for the human population to survive climate change.

[6 marks]

the genetically modified plants can photosynthesise ~~more~~ better leading to more Oxygen in the ~~plant~~ planet as the plants are reducing the Carbon Dioxide amount

Genetically Modified plants can grow faster, so providing more food to the population

Genetically Modified plants can thrive better without the needs that any other plant need.

In the second paragraph, this student has given the idea that GM crops may grow faster and therefore provide more yield. This is indicated on the mark scheme as one idea for a benefit of GM crops in this context. There is no attempt to link this idea with effects of climate change, therefore the response is within Level 1 and 1 mark was awarded.

© 2024 AQA and its licensors. All rights reserved.

4.6.1.1 Sexual and asexual reproduction

Answer 03 · Examiner comments

June 2024 | 8464/B/2F | Original Q6

Contact us

Our friendly team will be happy to support you between 8am and 5pm, Monday to Friday.

Tel: 01483 477756
Email: gcsescience@aqa.org.uk

aqa.org.uk

© 2024 AQA and its licensors. All rights reserved.