AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.2.5

Cloning (biology only)

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**36**
Available paper years	**2007–2024**

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.

4.6.2.5 Cloning (biology only)

Answer 01 · Mark scheme March 2007 | BLY1B | Original Q6 | Legacy

Six	**A**	A cloned human could have an identical twin 30 years younger than	**4**
	B	Many cloned animals have died early in their lives.	**3**
	C	The first scientist to clone a human will be famous.	**2**
	D	The techniques needed to clone humans could be used to produce human	**1**

	A	**B**	**C**	**D**

Answer 02 · Mark scheme June 2007 | BLY1B | Original Q6 | Legacy

Six	**A**	fusion of two gametes	**1**
	B	fusion cell cloning	**3**
	C	transplanting embryos	**2**
	D	tissue culture	**4**

	A	**B**	**C**	**D**

Answer 03 · Mark scheme June 2007 | BLY1F | Original Q3 | Legacy

The full source mark scheme begins on page 41. Follow original question 3 in that document.

Answer 04 · Mark scheme November 2007 | BLY1B | Original Q2 | Legacy

Two	**A**	egg cell nucleus removed	**4**
	B	intestinal cell nucleus inserted into egg cell	**2**
	C	cells from the intestine removed from frog	**1**
	D	egg develops into an embryo	**3**

Answer 05 · Mark scheme November 2007 | BLY1B | Original Q5 | Legacy

Five	**A**	tissue culture	**2**
	B	taking cuttings	**1**
	C	sexual reproduction	**3**
	D	transplanting embryos	**4**

4.6.2.5 Cloning (biology only)

Answer 06 · Mark scheme

Question 5

	answers	extra information	mark
(a)	genes chromosomes		1 1
(b)(i)	higher yield less use of pesticides		1 1
(b)(ii)	any **two** from: • uncertain about effects on health • fewer bees • might breed with wild plant • seeds only from one manufacturer		2
total			6

4.6.2.5 Cloning (biology only)

Answer 06 · Mark scheme January 2008 | BLY1F | Original Q5 | Legacy

BLY1F

Answer 07 · Mark scheme March 2008 | BLY1BP | Original Q2 | Legacy

Two	**A**	genes	**2**
	B	gametes	**3**
	C	embryos	**4**
	D	characteristics	**1**

Answer 08 · Mark scheme March 2008 | BLY1BP | Original Q9 | Legacy

Nine	**3**	**2**	**4**	**3**

Answer 09 · Mark scheme June 2008 | BLY1BP | Original Q3 | Legacy

Three	**A**	sexual reproduction	**1**
	B	taking cuttings	**2**
	C	tissue culture	**4**
	D	transplanting embryos	**3**

Answer 10 · Mark scheme June 2008 | BLY1BP | Original Q6 | Legacy

Six	**A**	nucleus transferred from skin cell of Dog Y	**2**
	B	electric shock applied	**3**
	C	ball of cells inserted into womb of female	**4**
	D	nucleus removed from egg cell	**1**

	A	**B**	**C**	**D**

Answer 11 · Mark scheme November 2008 | BLY1BP | Original Q3 | Legacy

Three	**A**	A	**1**
	B	B	**3**
	C	C	**2**
	D	D	**4**

4.6.2.5 Cloning (biology only)

Answer 12 · Mark scheme

January 2009 | BLY1F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)	sexual reproduction		1
5(b)	any **three** from: • coat colour inherited / controlled by genes • it has horse and zebra features • gets gametes from both parents • genes / DNA / chromosomes / genetic information in gametes • zorse receives genes / DNA / chromosomes / genetic information from parents		3
Total			**4**

4.6.2.5 Cloning (biology only)

Answer 12 · Mark scheme

January 2009 | BLY1F | Original Q5 | Legacy

Biology BLY1F - AQA GCSE Mark Scheme 2009 January Series

COMPONENT NUMBER: BLY1F

COMPONENT NAME: Science B / Biology

STATUS: Final

DATE: January 2009

Answer 13 · Mark scheme

June 2009 | BLY1BP | Original Q5 | Legacy

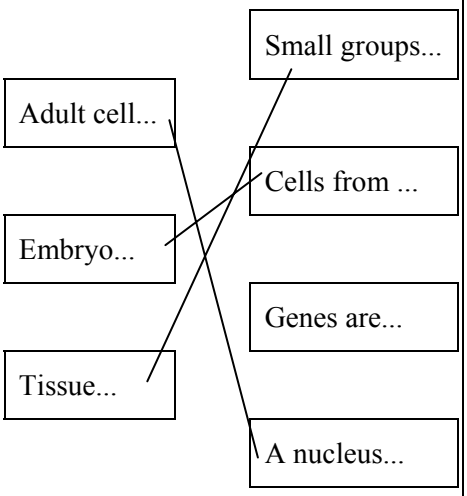
Five	**A** adult cell cloning **2** **B** embryo transplants **1** **C** taking cuttings **4** **D** tissue culture **3**			
	A	**B**	**C**	**D**

4.6.2.5 Cloning (biology only)

Answer 14 · Mark scheme

June 2009 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	killed by poachers / killed for tusks less trees / leaves to eat land available disappearing	 ignore feed on lots of leaves 	1 1 1
4(b)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	max 3
Total			**6**

4.6.2.5 Cloning (biology only)

Answer 14 · Mark scheme June 2009 | BLY1F | Original Q4 | Legacy

BLY1F

Answer 15 · Mark scheme November 2009 | BLY1BP | Original Q3 | Legacy

Three	**A**	clones	**3**
	B	cuttings	**4**
	C	gametes	**1**
	D	variations	**2**

4.6.2.5 Cloning (biology only)

Answer 16 · Mark scheme

January 2010 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	sexual		1
4(b)	chromosome		1
4(c)(i)	any **two** from: • genetic-engineering can produce fast-growing food animals • genetic engineering can be used to clone animals in danger of extinction • using GM animals can reduce the number of animals used in medical research	ignore answers that do not relate to list	2
4(c)(ii)	GM animals might escape and breed with wild animals animals have the right to be free from genetic modification	ignore answers that do not relate to list	1 1
Total			**6**

4.6.2.5 Cloning (biology only)

Answer 16 · Mark scheme

January 2010 | BLY1F | Original Q4 | Legacy

BLY1F

Question5

Answer 17 · Mark scheme

March 2010 | BLY1BP | Original Q5 | Legacy

Five	**A**	sexual reproduction	**2**	
	B	tissue culture	**3**	
	C	embryo transplants	**1**	
	D	adult cell cloning	**4**	
	A	**B**	**C**	**D**

Answer 18 · Mark scheme

June 2010 | BLY1BP | Original Q3 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.6.2.5 Cloning (biology only)

Answer 19 · Mark scheme

June 2010 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	characteristic		1
4(a)(ii)	gene		1
4(a)(iii)	gamete		1
4(b)	sexual asexual clones		1 1 1
Total			**6**

4.6.2.5 Cloning (biology only)

Answer 19 · Mark scheme June 2010 | BLY1F | Original Q4 | Legacy

BLY 1F

Answer 20 · Mark scheme November 2010 | BLY1BP | Original Q2 | Legacy

Two	**A**	A skin cell is taken from a donor.	**1**
	B	The new cell divides to make a group of similar cells.	**3**
	C	Different types of body cell are produced.	**4**
	D	The nucleus is removed, leaving cytoplasm.	**2**

Answer 21 · Mark scheme November 2010 | BLY1BP | Original Q4 | Legacy

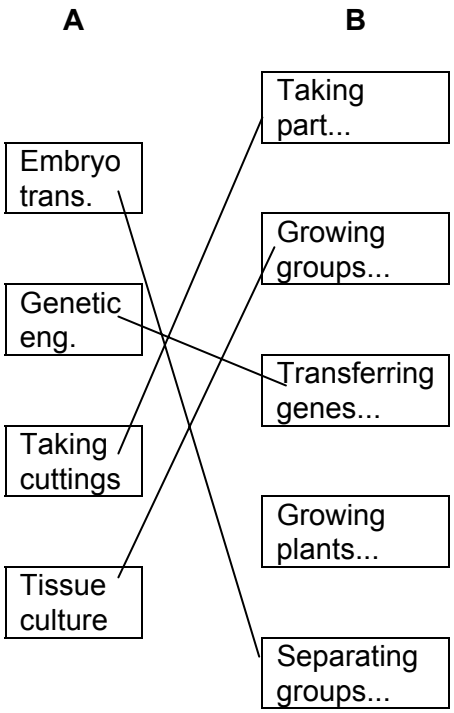
Four	**A**	chromosomes	**4**
	B	clones	**1**
	C	gametes	**3**
	D	genes	**2**

4.6.2.5 Cloning (biology only)

Answer 22 · Mark scheme

January 2011 | BLY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4		**1** mark for each correct line mark each line from left hand box two lines from left hand box cancels mark for that box	4
Total			**4**

4.6.2.5 Cloning (biology only)

Answer 22 · Mark scheme January 2011 | BLY1F | Original Q4 | Legacy

BLY1F

Answer 23 · Mark scheme January 2011 | BLY3F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	wind temperature	answers in either order ignore weather	1 1
4(a)(ii)	different plants have different sizes / different numbers of leaves / different sizes of leaves / different plants take up different amounts of water	ignore reference to validity allow different plants need different amounts of water	1
4(b)	in table, in sequence: C B A	 all 3 correct = **2** marks 2 correct = **1** mark 0 **or** 1 correct = **0** mark	max 2
4(c)	transpiration		1
Total			**6**

Answer 23 · Mark scheme January 2011 | BLY3F | Original Q4 | Legacy

BLY3F

4.6.2.5 Cloning (biology only)

Answer 24 · Mark scheme

March 2011 | BLY1BP | Original Q5 | Legacy

Five	**A**	embryo transplants		**2**	
	B	sexual reproduction		**4**	
	C	taking cuttings		**1**	
	D	tissue culture		**3**	
	A		**B**	**C**	**D**

4.6.2.5 Cloning (biology only)

Answer 25 · Mark scheme

June 2011 | BLY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	**1** egg **2** embryo **3** nucleus **4** skin cell		1 1 1 1
3(b)	the child created by cloning would not have been able to give permission	extra boxes ticked cancels the mark	1
Total			**5**

4.6.2.5 Cloning (biology only)

Answer 25 · Mark scheme

June 2011 | BLY1F | Original Q3 | Legacy

BLY1F

Answer 26 · Mark scheme

November 2011 | BLY1BP | Original Q5 | Legacy

Five	**A**	adult cell cloning **4**
	B	sexual reproduction **2**
	C	taking cuttings **1**
	D	tissue culture **3**

	A	**B**	**C**	**D**

4.6.2.5 Cloning (biology only)

Answer 27 · Mark scheme

January 2012 | BL1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(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
7(a)(ii)	(mixture of) genes / DNA / genetic information / chromosomes from both parents / horse **and** zebra	ignore nucleus / inherited information but allow second mark if given dependent on sensible attempt at 1st mark	1 1

Question 7 continues on the next page . . .

4.6.2.5 Cloning (biology only)

BL1FP

Question 7 continued

7(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 also refer to the information on page 2, and apply a 'best-fit' approach to the marking.		
0 marks	**Level 1 (1–2 marks)**	**Level 2 (3–4 marks)**	**Level 3 (5–6 marks)**
No relevant content	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.	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.	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

Total			**9**

4.6.2.5 Cloning (biology only)

Answer 27 · Mark scheme

January 2012 | BL1FP | Original Q7 | Legacy

BL1FP

4.6.2.5 Cloning (biology only)

Answer 28 · Mark scheme

June 2012 | BL1FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4 (a)	too cold / very cold **or** oxygen / microbes cannot reach it	allow not enough energy / heat / warmth ignore frozen	1
	for microorganisms / microbes / bacteria / fungi / enzyme / reaction (to work)	ignore other consumers	1
4 (b)	no longer exist **or** no more left **or** died out / all died	ignore died unqualified	1
4 (c)(i)	egg cell		1
4 (c)(ii)	nucleus		1
4 (c)(iii)	given an electric shock		1
4 (c)(iv)	womb		1
4 (d)	has mammoth genes / chromosomes	accept genetic information / DNA / alleles / nucleus accept converse	1
Total			**8**

4.6.2.5 Cloning (biology only)

Answer 28 · Mark scheme

June 2012 | BL1FP | Original Q4 | Legacy

BL1FP

4.6.2.5 Cloning (biology only)

Answer 29 · Mark scheme

June 2013 | BL1FP | Original Q4 | Legacy

Question 4

question	answers	extra information	Mark
4(a)	sulfur dioxide		1
4(b)(i)	mutation		1
4(b)(ii)	pale form now (more) easily seen (by predators) **or** dark form now less easily seen (by predators) so pale form (more) likely to be eaten **or** dark form less likely to be eaten so dark form (more likely to) breed / pass on genes **or** pale form less likely to breed / pass on genes	accept ref to camouflage	1 1 1
4(c)(i)	pyramid of three layers of diminishing size three labels in food chain order	either way up award 2 marks only if the pyramid is correctly labelled accept trees / birch accept (peppered) moth(s) / larvae	1 1
4(c)(ii)	some material is lost in waste from the birds peppered moth larvae do not eat all the leaves from the trees		1 1
Total			9

4.6.2.5 Cloning (biology only)

Answer 30 · Mark scheme

June 2013 | BL1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	Mark
6(a)	sexual reproduction		1
6(b)(i)	genes		1
6(b)(ii)	gametes		1
6(c)(i)	any **two** from: • more meat (per cow) • more milk each day • can be milked for more time after giving birth / greater proportion of time	answers must be comparative ignore bigger unqualified 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
6(c)(ii)	(milk contains) more protein less time before having a calf when no milk produced	answers must be comparative	1 1
6(d)(i)	genes from one organism are transferred to a different organism		1
6(d)(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
Total			9

4.6.2.5 Cloning (biology only)

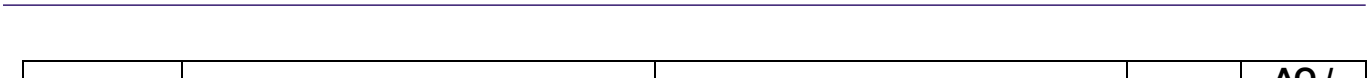
Answer 31 · Mark scheme

Question	Answers	Extra information	Mark	AO / spec ref.
1(a)(i)	Chromosomes		1	AO1 1.7.1b
1(a)(ii)	Characteristics		1	AO1 1.7.1b
1(a)(iii)	Classify		1	AO1 1.8.1d
1(b)	Plants	ignore algae	1	AO1 1.8.1d
Total			4	

4.6.2.5 Cloning (biology only)

Answer 31 · Mark scheme

June 2014 | BL1FP | Original Q1 | Legacy



4.6.2.5 Cloning (biology only)

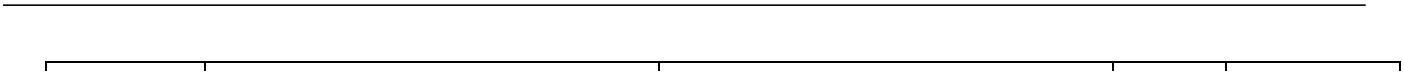
Answer 32 · Mark scheme June 2015 | BL1FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	Taking cuttings from plants		1	AO1 1.7.2a/b
4(b)(i)	Adult cell cloning		1	AO2 1.7.2c
4(b)(ii)	an egg cell		1	AO2 1.7.2c
4(b)(iii)	nucleus		1	AO1 1.7.2c
4(b)(iv)	an electric shock		1	AO1 1.7.2c
4(b)(v)	uterus / womb	accept phonetic spelling	1	AO1 1.7.2c
4(c)	any **two** from: • unethical / immoral • cloned child would have to give up a kidney • possible operation complications	 allow 'rights' of the cloned child allow against religious teachings allow illegal allow parents may not want another child allow a long time to wait (for the kidney)	2	AO3 1.7
Total			**8**	

4.6.2.5 Cloning (biology only)

Answer 32 · Mark scheme

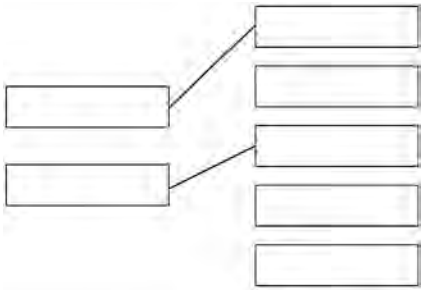
June 2015 | BL1FP | Original Q4 | Legacy



4.6.2.5 Cloning (biology only)

Answer 33 · Mark scheme

June 2018 | 8461/1F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1		additional line from a level of organisation negates the mark for that level of organisation	2	AO1 4.2.1 4.2.3.1
02.2	palisade mesophyll		1	AO2 4.2.3.1
02.3	$\frac{50}{8}$ 6 / 6.25 / 6.3 (micrometres)	an answer of 6 / 6.25 / 6.3 scores **2** marks	1 1	AO2 4.1.1.2
02.4	they have no chloroplasts / chlorophyll	allow they are underground allow they don't get (access to) light allow (because) photosynthesis needs light allow they can't absorb light ignore 'sun' ignore 'it is dark'	1	AO2 4.1.1.3 4.4.1.1
02.5	differentiation		1	AO1 4.1.1.4 4.1.2.3
02.6	to protect endangered plants from extinction		1	AO1 4.1.2.3

4.6.2.5 Cloning (biology only)

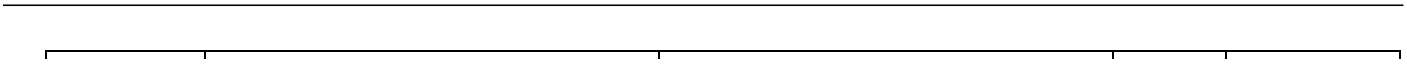
Answer 33 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	plants can be produced quickly		1	AO1 4.1.2.3
02.8	any **one** from: • glucose / sugars / starch • amino acids / protein • hormones • ions / minerals • vitamins • water	allow named hormones eg auxin allow magnesium / nitrate allow named vitamins e.g. vitamin B allow H_2O / H2O ignore oxygen / carbon dioxide / agar / nutrients / fertiliser	1	AO2 4.1.2.3
Total			**10**	

4.6.2.5 Cloning (biology only)

Answer 33 · Mark scheme

June 2018 | 8461/1F | Original Q2



4.6.2.5 Cloning (biology only)

Answer 34 · Mark scheme

June 2019 | 8461/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	Raphus		1	AO2 4.6.4
05.2	any **two** from: • humans hunted / killed / ate the dodo **or** dodo easy to catch • humans ate / collected eggs • humans ate the dodo's food • animals brought by humans ate dodo / eggs • diseases introduced by humans **or** by imported animals • humans destroyed dodo's habitat / nests	allow examples – eg cats / dogs / pigs / rats allow deforestation	2	AO2 4.6.3.6
05.3	any **one** from: • growing crops / biofuels • grazing animals • building houses • quarrying / mining • dumping waste	allow farming / agriculture allow other correct examples – eg building roads	1	AO1 4.7.3.3 4.7.3.4
05.4	there is less photosynthesis the trees are burned		1 1	AO2 4.4.1.1 4.4.1.2 4.7.3.4 4.7.3.5
05.5	increase		1	AO1 4.7.3.5
05.6	9 × 30 270	an answer of 270 scores **2** marks	1 1	AO2 4.7.3.4 4.7.3.6

4.6.2.5 Cloning (biology only)

Answer 34 · Mark scheme

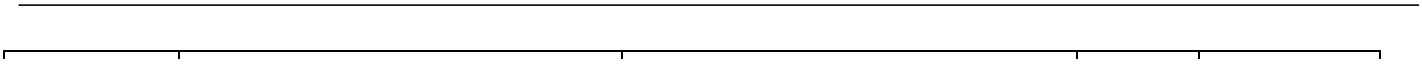
June 2019 | 8461/2F | Original Q5

Question	Answers	Mark	AO / Spec. Ref.
05.7	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO3
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	
	No relevant content	0	
	Indicative content • displaced animals can move to adjacent areas • where suitable habitat is found **or** where the trees have not been cut down • seeds return to deforested area • from other (forested) areas • plants / trees begin to grow back • so provide food / shelter / nest sites / suitable habitat for animals • animals return to re-growing area • from other (forested) areas • sufficient time for regeneration • old growth area is a source of recolonising organisms		4.7.3.1 4.7.3.4 4.7.3.6
Total			**13**

4.6.2.5 Cloning (biology only)

Answer 34 · Mark scheme

June 2019 | 8461/2F | Original Q5



4.6.2.5 Cloning (biology only)

Answer 35 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	any **one** from: • variation of a named / described (desirable) characteristic • not all susceptible to the same disease / pathogen • maintain / increase gene pool	allow eg different flavour / colour allow different customer preferences	1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	any **one** from: • they have the same named /(desirable) characteristic(s) • they grow at the same rate • they ready to harvest at same time	allow eg all high yield **or** all disease-resistant **or** same (desirable) flavour	1	AO2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(a group of) cells are grown (into a new organism)	ignore clones	1	AO1 4.6.2.5

4.6.2.5 Cloning (biology only)

Answer 35 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	any **one** from: different • water • minerals / ions • light • herbivores • disease • plant density • soil pH	 allow rain allow named example ignore nutrients ignore sun unqualified allow named example allow named example allow different temperature allow different environmental conditions	1	AO2 4.6.2.1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	male gametes = **X** + **Y** female gametes = **X** + **X** offspring genotypes correctly derived from gametes	if neither mark awarded, allow **1** mark for male = **X** + **X and** female = **X** + **Y** allow correct for chromosome assignment in mp1 & mp2	1 1 1	AO1 AO1 AO2 4.6.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	any **one** from: • half are XX and half are XY • equal probability of X or Y sperm fertilising an egg • (the Punnett square shows) 50% (chance of) male / female		1	AO2 4.6.1.8

4.6.2.5 Cloning (biology only)

Answer 35 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	any **two** from: • temperature • type / amount of food • light • whether chickens are kept indoors or outdoors • amount of movement / space (allowed) • time of year	 allow (volume / amount of) water allow same stocking density allow same number of each type ignore same number unqualified allow mass at start allow age of chicken(s) allow same medication **or** all healthy	2	AO2 4.6.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.8	any **one** from: • (more) valid / representative **or** reduce the effect of anomalies • (more) accurate mean	 allow can calculate a valid mean allow (more) accurate results allow (more) reliable mean / results	1	AO2 4.6.2.3

4.6.2.5 Cloning (biology only)

Answer 35 · Mark scheme

June 2023 | 8461/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.9	breed best of **A** and **B** (together)	allow cross / mate best of **A** and **B**	1	AO2
	select offspring with highest egg numbers **and** heaviest / fastest growing	allow select the best offspring for both desired characteristics	1	AO1
	breed (these) offspring together		1	AO1
	repeat over many / several generations	do **not** accept reference to repeated breeding of the original parents	1	AO1 4.6.2.3

Total Question 9	**15**

4.6.2.5 Cloning (biology only)

Answer 36 · Mark scheme

June 2024 | 8461/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.1	to compare (with the other tubes) **or** to show the effect of chemical **Q**	ignore as a control do **not** accept control variable allow to show the difference	1	AO2 4.6.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.2	$\frac{100}{0.01}$ 10 000 / 10^4 (times)		1 1	AO2 4.6.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.3	0.1 arbitrary units		1	AO3 4.6.2.5

Question	Answers	Extra information	Mark	AO / Spec Ref.
07.4	reduced / no (root) growth at high(er) concentrations	allow no (root) growth in tube 6 / 100 allow answer in terms of specific tubes / concentrations ignore the higher the concentration, the fewer roots grow unqualified	1	AO3 4.6.2.5

4.6.2.5 Cloning (biology only)

Answer 36 · Mark scheme

Question	Answers	Mark	AO / Spec Ref.
07.5	**Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	3–4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical thinking.	1–2	AO3
	No relevant content	0	
	Indicative content *Taking cuttings:* • quicker o (because) do not have to wait as long for flowers / fruits / seeds (to form) • all offspring identical (in appearance) **or** all have large / brightly-coloured flowers o (because) all have the same alleles / genes / DNA • asexual reproduction **or** not sexual reproduction **or** cloning o (so) no fusing of gametes o (so) no mixing of alleles / genes from two parents o (so) offspring are identical (in appearance) • involves mitosis o (which) copies genetic material / chromosomes • does not involve meiosis o (which) gives different genetic material / chromosomes • avoids variation in flowers o due to pollination / cross pollination (from other geraniums) o (as) no mixing of alleles / genes from two parents • increased profitability o less resources needed o quicker turnover o consistent quality of plants / flowers		4.6.1.1 4.6.1.3 4.6.2.1 4.6.2.5

Total Question 7	9

4.6.2.5 Cloning (biology only)

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Biology 4411

BLY1F Unit Biology 1

Mark Scheme

2007 examination - June series

4.6.2.5 Cloning (biology only)

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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Dr Michael Cresswell, Director General.

4.6.2.5 Cloning (biology only)

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

2. Emboldening

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which candidates have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

4.6.2.5 Cloning (biology only)

Example 1: What is the pH of an acidic solution? (1 mark)

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

Example 2: Name two planets in the solar system. (2 marks)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.6.2.5 Cloning (biology only)

BLY1F Question 1

	answers	extra information	mark
(a)(i)	any **two** from: • light • water • space • nutrients / ions / minerals / named • carbon dioxide / CO_2	list principle ignore oxygen / food / sun	2
(ii)	less competition for water **or** more water / nutrients / minerals available	ignore space / light / food	1
(b)	camouflage / same shape as leaf / looks like a leaf	allow ‘blends in’ ignore colour	1
total			4

4.6.2.5 Cloning (biology only)

BLY1F Question 2

	answers	extra information	mark
(a)	any **three** from: • water • ions / minerals / salts • temperature • blood sugar • heart rate • blood pressure	 allow breathing / oxygen / carbon dioxide allow sodium / chloride, other ions neutral allow heat ignore urea	3
(b)	contraceptive drug fertility drug		1 1
(c)(i)	eg nicotine, alcohol, cocaine, heroin, painkillers, tranquilisers, LSD	allow cannabis / weed or other alternative names allow tobacco ignore smoking / ecstasy	1
(ii)	alters body chemistry **or** craving / needing / dependence withdrawal symptoms on stopping	allow psychological dependence allow withdrawal described allow ‘feel ill without it’	1 1
total			8

4.6.2.5 Cloning (biology only)

BLY1F Question 3

	answers	extra information	mark
	joining		1
	sexual		1
	identical		1
	asexual		1
	clones		1
total			5

BLY1F Question 4

	answers	extra information	mark
(a)	7.8		1
(b)	14 / 13.6	allow answer 13 without working for **1** mark 7500 ÷ 550 gains **1** mark	2
(c)	produces / increases blood cholesterol	ignore obesity	1
	affects heart **or** affects blood vessels **or** affects blood pressure	 accept clogs blood vessels	1
(d)	(increases) blood pressure	ignore references to heart / blood vessels	1
total			6

4.6.2.5 Cloning (biology only)

BLY1F Question 5

	answers	extra information	mark
(a)	fossils / teeth / bones / skeleton / foot prints	allow cave drawings do **not** accept scientists have seen them	1
(b)	only (some) bones remain / soft parts have decayed	accept 'no-one has ever seen one' allow no photos, no pictures, no drawings	1
(c)	any **two** from: • hunted by human • (new) predator • (new) competitor • (new) disease • environment changed / named environmental change • prey extinct / loss of food supply	 allow more predators allow natural disaster ignore not enough food	2
total			4

4.6.2.5 Cloning (biology only)

BLY1F Question 6

	answers	extra information	mark
(a)(i)	56	accept 54 – 58	1
(ii)	increased		1
	reasonable qualification eg slowly then more quickly **or** to 174 / 176 **or** by 138 / 140		1
(b)	any **two** from:		2
	• no immunity **or** antibodies ineffective	accept no resistance	
	• no vaccines **or** humans not immunised		
	• idea of large scale contact **or** large scale travel	do **not** accept passed on ignore no cure	
total			5

4.6.2.5 Cloning (biology only)

BLY1F Question 7

	answers	extra information	mark
(a)	scientists figures based on research / calculations / data **or** scientists sample whole area	ignore reasons based on bias	1
	fishermen based on impression / hearsay / experience **or** fishermen fish in well-stocked / limited areas	scientists sample a wider area = **2** marks fishermen only fish in well-stocked areas = **2** marks if no marks gained fishermens' opinion **and** scientists' opinion gains **1** mark	1
(b)	any **two** from: • economic considerations • political impact • pressure groups **or** fears of extinction	 eg fear for jobs, profits, big demand for cod eg allow EU / government decide or laws will be passed	2
total			4

4.6.2.5 Cloning (biology only)

BLY1F Question 8

	answers	extra information	mark
(a)	any **two** from: • area of bed sampled • sampling time • size of net • kicking action • net position	control variables from information given	2
(b)	any **two** from: • some animals not dislodged • some animals missed / through / escaped net • invertebrates difficult to identify • invertebrates from outside area	must be ideas related to a sample ignore reliability etc	2
(c)	10 to 99 **or** 10 – 99 **or** 99 to 10 **or** 99 – 10		1
(d)	any **two** from: • increased / goes up • 0 at sample 4 • to (more than) 100	allow increase implied from all data described	2
(e)	mayfly because not found downstream of point where sewage enters stream **or** only in the unpolluted water		1 1
total			9

4.6.2.5 Cloning (biology only)

Answer 35 · Examiner comments

June 2023 | 8461/2F | Original Q9

Question 9

This was the third of the three questions common to both the Foundation and Higher Tier papers. The topic was reproduction and selective breeding.

09.1 The most common advantage given for growing genetically-different tomatoes was that some might be less susceptible to disease, although others, such as producing different-sized tomatoes, were also given. Just over one-third of students gave a suitable answer.

09.2 Deciding on an advantage for growing genetically-identical tomatoes proved more problematic and only one-fifth could suggest a feature such as all growing at the same rate or all having the same named desirable feature such as high yield, disease resistance or flavour.

09.3 Very few students could successfully describe what is meant by tissue culture. Use of tissue as the starting material was deemed inadequate and required amplification in terms of cells being grown. Only around 2 percent gave an appropriate answer.

09.4 Almost half of all students were able to suggest why genetically-identical tomatoes growing in a garden might not all attain the same height – for example, due to variations in light intensity, ions, water or temperature in different areas of the garden.

09.5 This question was about sex determination in dogs. Students had to use the symbols X and Y to complete a blank Punnett square. Most knew that the male dog would produce gametes containing either an X or a Y chromosome, and that all the female gametes would contain an X chromosome, and over a quarter were successful in the completion of all aspects of the Punnett square.

09.6 The explanation of why a litter of six puppies might be expected to consist of three males and three females was straightforward for only a minority of students: either in terms of the expected 1:1 ratio of males and females or the inheritance of a Y chromosome by only half of the offspring (as demonstrated in a correct answer to the previous question).

09.7 This question was about the breeding of chickens for meat production and egg production. Given the results of an investigation in Figure 5 which showed that chicken variety A had high egg production while variety B grew more quickly, students had to suggest two control variables for the investigation. Many answers were rather vague – such as the same ‘living conditions’ / ‘environment’. More specific conditions, such as temperature, lighting, amount or type of food, all being kept indoors or all outdoors, were required. The most common correct answer related to the chickens’ food. Fewer than half of the students could suggest at least one suitable control variable, and only 1 in 8 could give two.

09.8 The data in the investigation had come from 500 chickens of each variety and students had to give a reason why such a large number had been used. Acceptable answers included the idea this would be more representative, or would give a more valid mean, or would reduce the effects of any anomalies (and not that it would ‘eliminate’ anomalies). A little over one-third of students were successful.

09.9 In this question, students had to describe how selective breeding of the two chicken varieties might produce a new variety of chicken that was good for both meat production and egg production. Many answers lacked precision: thus it was not often evident that only the best from varieties A and B would be mated and that the best (for both qualities) from the offspring would then be selected and mated, and that this would be continued over several generations. Often, it was impossible to tell from students’ answers which generation of chickens was being used: the original parents, the first generation offspring or subsequent generations of offspring. The term ‘repeat’ was often used in an ambiguous context. Thus only 1 in 500 students scored all 4 marks, and only 1 in 25 gained at least half-marks.

4.6.2.5 Cloning (biology only)

Answer 35 · Examiner comments

June 2023 | 8461/2F | Original Q9

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.6.2.5 Cloning (biology only)

Answer 36 · Examiner comments

June 2024 | 8461/2F | Original Q7

Question 7 (low and standard demand)

07.1 Just over 40% of students knew that the gardener included a control in the investigation to allow a comparison to be made or to show the effect of chemical Q.

07.2 Students were asked to calculate how many times more concentrated chemical Q was in tube 6 than in tube 2. 60% of students correctly completed the calculation and scored two marks. Most common errors were doing a subtraction or counting the number of places that the decimal point needed to move so ending up with an answer of 4.

07.3 90% of students correctly identified 0.1 arbitrary units as the best concentration for root growth.

07.4 There were many good answers seen, with 60% of students gaining the mark – most by giving a specific example in terms of no growth in tube 6. Those that missed the mark often did so by saying that 'as the concentration increased fewer roots grew' which is not correct, without indicating this occurred after tube 3.

07.5 This was an extended response question involving two levels. 15% of student responses accessed Level 2 with the majority falling into Level 1. Students needed to link ideas to access Level 2, and while there were many attempts at linking seen, often the outcome was vague and not clearly relating to the question which was about cuttings.

Students are reminded to read the question carefully and ensure their response is in the correct context. Many of those who gained marks realised that using cuttings would lead to identical offspring being produced but did not link this to a creditworthy explanation of how this came about; there were very few responses regarding genetic variation and almost none about meiosis or mitosis.