AQA GCSE Biology | 8461

SPECIFICATION POINT 4.6.1.5

DNA structure (biology only)

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**6**
Available paper years	**2013–2025**

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:** _____

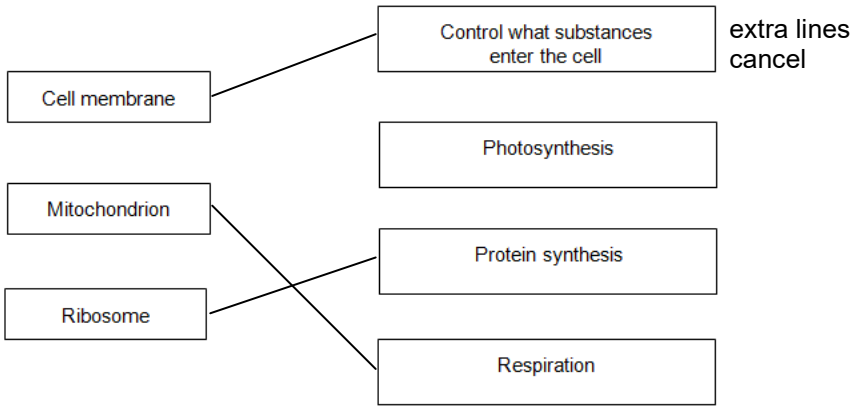
Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.6.1.5 DNA structure (biology only)

Answer 01 · Mark scheme

June 2013 | BL2FP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	A = cytoplasm B = (cell) membrane		1 1
1(a)(ii)	nucleus	accept chromosome / DNA / genes accept phonetic.	1
1(b)	 extra lines cancel		3
Total			6

4.6.1.5 DNA structure (biology only)

Answer 02 · Mark scheme June 2015 | BL2FP | Original Q9 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
9(a)(i)	in the chromosome(s) in the nucleus	ignore genes / alleles allow nuclei allow mitochondria	1 1	AO1 2.7.2f, 2.7.1b
9(a)(ii)	the DNA / chromosomes / genes are replicated / copied / multiplied / doubled / duplicated	allow DNA is cloned ignore same DNA / chromosomes / genes if unqualified	1	AO1 2.7.1a,c,n
9(b)(i)	1 / one		1	AO2 2.7.2c,e, 2.7.3a,c
9(b)(ii)	2 / two		1	AO2 2.7.2c,d, 2.7.3a,b
9(c)	**B**		1	AO3 2.7.2i
Total			**6**	

4.6.1.5 DNA structure (biology only)

Answer 03 · Mark scheme

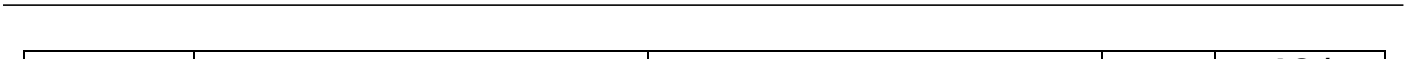
June 2019 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	chromosome(s)	allow gene(s) / allele(s)	1	AO1 4.6.1.4 4.1.2.1
08.2	X = sugar Y = nucleotide Z = base		1 1 1	AO1 4.6.1.5
08.3	double helix		1	AO1 4.6.1.4
08.4	3		1	AO2 4.6.1.5
08.5	any **two** from: • diagnosis of inherited / genetic disorder • gene therapy **or** treatment of inherited disorders • understanding (human) evolution **or** understanding ethnic origins (of a person) **or** understanding ancestry • tracing human migration patterns	allow descriptions or named examples allow research / understand genetic disorders allow other examples – eg identification of criminals (1) paternity determination (1)	2	AO1 4.6.1.4
Total			**8**	

4.6.1.5 DNA structure (biology only)

Answer 03 · Mark scheme

June 2019 | 8461/2F | Original Q8



4.6.1.5 DNA structure (biology only)

Answer 04 · Mark scheme

November 2020 | 8461/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	any **two** from: • double • helix • long / thin	allow two strands allow twisted / spiral / coiled	2	AO1 4.6.1.4
07.2	bases		1	AO1 4.6.1.5
07.3	protein		1	AO1 4.6.1.4 4.6.1.5
07.4	nucleotide		1	AO1 4.6.1.5
07.5 **mark with 07.6**	0.34 × 6 000 2040 (million nm)		1 1	AO2 4.6.1.4 4.6.1.5
07.6 **mark with 07.5**	answer from question **07.5** correctly converted	if no answer to question **07.5**, allow 2.04 (m)	1	AO2 4.6.1.4 4.6.1.5
07.7	any **one** of: • to determine if the cancer is genetic (or caused by lifestyle factors) • to inform / help treatment • to allow embryo screening to ensure allele is not passed on • to inform relatives if they have inherited (affected) gene / allele • to detect cancer early **or** before symptoms show • to understand cause of the cancer		1	AO3 4.6.1.7 4.2.2.7
Total			**9**	

4.6.1.5 DNA structure (biology only)

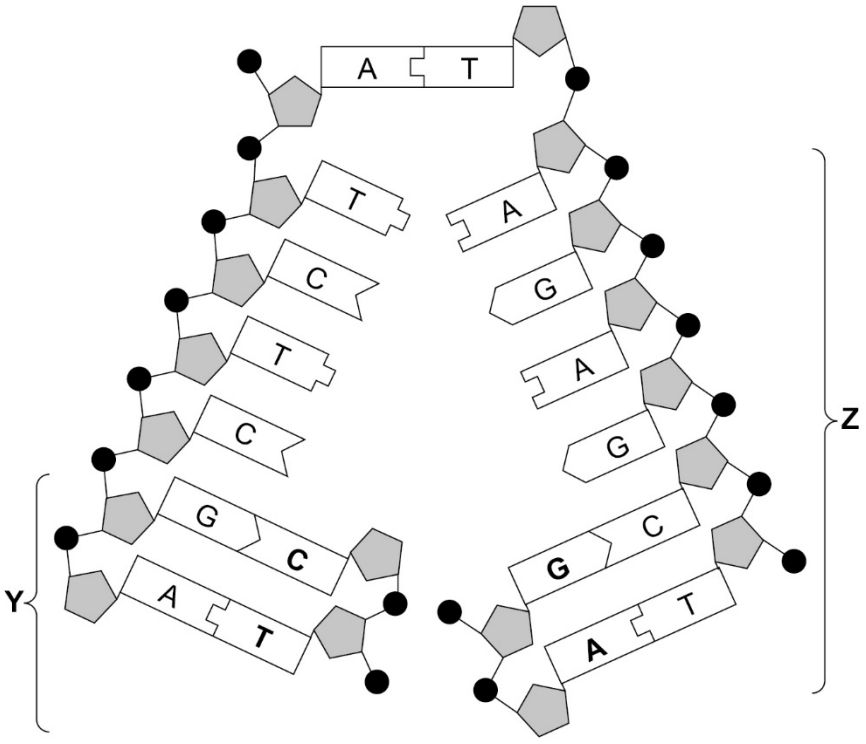
Answer 04 · Mark scheme

November 2020 | 8461/2F | Original Q7

4.6.1.5 DNA structure (biology only)

Answer 05 · Mark scheme

November 2021 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	chromosome(s)	allow chromatid(s) / gene(s) / allele(s)	1	AO1 4.6.1.4
08.2	sugar	allow deoxyribose allow pentose do **not** accept ribose	1	AO1 4.6.1.5
08.3	base(s)	allow nitrogenous base(s) allow adenine **and** cytosine **and** guanine **and** thymine	1	AO1 4.6.1.5
08.4	 all four required for the mark		1	AO3 4.6.1.5

4.6.1.5 DNA structure (biology only)

Answer 05 · Mark scheme

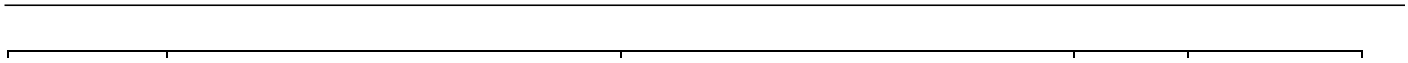
November 2021 | 8461/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	replication		1	AO3 4.6.1.5 4.1.2.2
08.6	protein	allow polypeptide	1	AO1 4.6.1.4
08.7	3×10^{-12} grams		1	AO2 4.6.1.2
08.8	meiosis		1	AO1 4.6.1.2
Total			**8**	

4.6.1.5 DNA structure (biology only)

Answer 05 · Mark scheme

November 2021 | 8461/2F | Original Q8



4.6.1.5 DNA structure (biology only)

Answer 06 · Mark scheme

June 2025 | 8461/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	bases		1	AO1 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	3 / three		1	AO2 4.6.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	mutation		1	AO1 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	*figures from graph* 40 and 1 *correct equation* $\frac{40 - 1}{12}$ *correct answer* 3.25 (cases per million people per year)	 allow $\frac{39}{12}$ 	 1 1 1	AO2 4.6.3.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	resistant		1	AO1 4.6.3.7

4.6.1.5 DNA structure (biology only)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	any **one** from: • discovery of a new antibiotic / drug / treatment • vaccination • isolation of patients • better / improved education about MRSA • better hygiene	 allow social distancing allow increased awareness of MRSA allow examples such as more / better hand washing (in hospitals)	1	AO2 4.6.3.7

Total Question 5	**8**

4.6.1.5 DNA structure (biology only)

Answer 04 · Examiner comments

November 2020 | 8461/2F | Original Q7

Question 7 (low & standard demand)

This question was about DNA. In **07.1** many students knew the term ‘double helix’ and gained both of the available marks. Other students attempted to describe the figure lower down on the page, but usually did so in terms of the labelled components of the structure. Various acceptable terms were used as synonyms for ‘helix’.

For **07.5** all sorts of mathematical manipulations were carried out with the two numbers in the question. Although these often correctly involved multiplication, the values were sometimes written down incorrectly or the million in the question was interpreted as thousands or billions or anything in between. Consequently, the correct answer was not commonly given. The answer line showed that it was unnecessary to expand the millions in the question, although many attempted to do so. In **07.6** many students carried out further calculations with no reference to the answer they had given in the previous part, introducing all sorts of numbers with no evidence as to their origin. Some multiplied by a factor of 10^9, whilst others omitted the millions in question 07.5 and simply divided what they had written by 10^9.

Answer 06 · Examiner comments

Question 5 (Low and Standard demand)

05.1
Almost 75% of students knew that A, C, G and T are called bases.

05.2
Only 40% of students correctly calculated that 3 amino acids were coded for by the section of DNA given. The most common wrong answers were 2, 4 and 9. Some students who gave 2 as their answer had highlighted the two copies of AGTA within the sequence.

05.3
Almost three quarters of students knew that a change in DNA is called a mutation.

05.4
Students were given a graph showing cases of MRSA in one country and asked to calculate the mean rate of increase for a period of 12 years. There was a lot of confusion about how to do this calculation and only 10% of students achieved full marks.
The most common incorrect answer was seen when students chose to add up the cases per million for each year from 1993 to 2003 and divide by either 12 (years) or 7 (number of readings). Although their list of readings from the graph would have included 1 and 40, MP 1 could only be awarded if the student went on to indicate that these were the relevant readings for this question.

There was a number of incorrect readings from the graph that could not gain credit for mark point 1 – but did not preclude the student from gaining subsequent mark points. Other common errors were forgetting to subtract the 1 or reading the graph as 1 million and 40 million rather than 1 and 40. Many students gained mark point 1 for the correct readings from the graph but then proceeded to do the wrong calculation. Some students gained mark point 1 for getting 39 by adding together the increase between each straight section of the graph; '5 + 5 + 2 + 6 + 6 + 15' rather than doing 40 – 1.
10% of students chose not to attempt this calculation.

05.5
Nearly 60% of students knew that the word resistant describes bacteria that are not killed by antibiotics.

05.6
Students were asked to suggest a reason for the decrease in MRSA cases after 2006. A pleasing 60% of students were able to do so with all bullet points seen across the range of responses. By far the most common correct answer was to do with vaccination. Many students also implied the discovery of a new antibiotic/drug by referring to one that works to kill the bacteria (as opposed to the current ones that do not). Some students missed out on the mark by just referring to 'a cure being found' – which was too vague.