



General Certificate of Secondary Education
2019

**Double Award Science
Biology**

Unit B2

Higher Tier

[GDW42]

FRIDAY 7 JUNE, MORNING

**MARK
SCHEME**

General Marking Instructions

Introduction

Mark schemes are intended to ensure that the GCSE examinations are marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria which they should apply in allocating marks to candidates' responses.

Assessment objectives

Below are the assessment objectives for GCSE Double Award Science.

Candidates must:

- AO1** Demonstrate knowledge and understanding of:
- scientific ideas; and
 - scientific techniques and procedures;
- AO2** Apply knowledge and understanding of and develop skills in:
- scientific ideas; and
 - scientific enquiry, techniques and procedures; and
- AO3** Analyse scientific information and ideas to:
- interpret and evaluate;
 - make judgements and draw conclusions; and
 - develop and improve experimental procedures.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality of response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners are encouraged to be positive in their marking, giving appropriate credit for what candidates know, understand and can do rather than penalising candidates for errors or omissions. The exception to this for GCSE Double Award Science is when examiners are marking complex calculations when the Examiners are briefed to mark by error or omission. Examiners should make use of the whole of the available mark range for any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Marking Calculations

In marking answers involving calculations, examiners should apply the 'carry error through' rule so that candidates are not penalised more than once for a computational error. To avoid a candidate being penalised, marks can be awarded where correct conclusions or inferences are made from their incorrect calculations.

Types of mark schemes

Mark schemes for tasks or questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

Levels of response

In deciding which level of response to award, examiners should look for the number of indicative content points in candidate responses to ensure that the answer has been written to coincide with the question. In deciding which mark within a particular level to award to any response, quality of communication will be assessed and examiners are expected to use their professional judgement.

The following guidance is provided to assist examiners.

- **Threshold performance:** Response which just merits inclusion in the level and should be awarded a mark at or near the bottom of the range.
- **High performance:** Response which fully satisfies the level description and should be awarded a mark at or near the top of the range.

Quality of written communication

Quality of written communication is taken into account in assessing candidates' responses to all tasks and questions that require them to respond in extended written form. These tasks and questions are marked on the basis of bands of response. The description for each band of response includes reference to the quality of written communication.

For conciseness, quality of written communication is distinguished within bands of response as follows:

- Band A: Quality of written communication is excellent.
- Band B: Quality of written communication is good.
- Band C: Quality of written communication is basic.
- Band D: Response not worthy of credit.

In interpreting these band descriptions, examiners should refer to the more detailed guidance provided below:

Band A (Excellent): Excellent reference to scientific terminology. The candidate successfully selects and uses the most appropriate form and style of writing. Relevant material is organised with a high degree of clarity and coherence. There is widespread and accurate use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are of a sufficiently high standard to make meaning clear.

Band B (Good): Good reference to scientific terminology. The candidate makes a reasonable selection and use of an appropriate form and style of writing. Relevant material is organised with some clarity and coherence. There is some use of appropriate specialist vocabulary. Presentation, spelling, punctuation and grammar are sufficiently competent to make meaning clear.

Band C (Basic): Basic reference to scientific terminology. The candidate makes only a limited selection and use of an appropriate form and style of writing. The organisation of material may lack clarity and coherence. There is little use of specialist vocabulary. Presentation, spelling, punctuation and grammar may be such that intended meaning is not clear.

			AVAILABLE MARKS	
1	(a) (i)	(contraceptive) implant	[1]	9
	(ii)	forget to take the pill/stomach upset or described/antibiotic use/did not take at same time each day	[1]	
	(b)	release hormones	[2]	
	(c) (i)	does not provide a barrier (to the organisms that cause STIs)/only condom stops STI	[1]	
	(ii)	difficult to reverse/irreversible/permanent	[1]	
2	(d)	ovulation; on day 14; ensures no sperm are present to fertilise (the egg)/eggs and sperm cannot meet/any sperm there before day 9 die	[3]	6
	(a) (i)	widen the artery	[1]	
	(ii)	stent	[1]	
	(b) (i)	reduce cholesterol; prevent blockage in arteries/allows blood to flow more easily	[2]	
	(ii)	thins blood; less likely to get a clot/makes it less sticky	[2]	
3	(a) (i)	straight line with the same gradient	[1]	7
	(ii)	35 minutes (34.5 – 35.5)	[1]	
	(b)	lowest pulse rate before exercise/lower pulse rate than other boys before exercise/correct data to illustrate this; lowest pulse rate during exercise/lower pulse rate than other two boys during exercise/correct data to illustrate this; pulse returns to normal quickest/quicker than other two boys/correct data to illustrate this	[3]	
	(c)	strengthened (heart) muscle ; increased cardiac output/pumps more blood per beat/increased stroke volume	[2]	

4 Indicative content

Any **five** from:

Arteries and veins – assume arteries being discussed

- arteries have thicker wall than veins/artery wall is thick or very thick/arteries;
- **more** muscle/elastic fibres/than veins;
- arteries do not have valves;
- arteries have narrower lumen than veins

(**accept** converse if discussing veins)

Veins and capillaries

- veins have valves;
- veins have muscle/elastic fibres;
- veins have a wider lumen;
- veins have thicker walls

(**accept** converse if discussing capillaries)

Band	Response	Mark
A	Candidates use appropriate terms throughout to give at least five points from the indicative content. They use good spelling, punctuation and grammar skills. Form and style are of a high standard.	[5]–[6]
B	Candidates use appropriate terms throughout to give three or four points from the indicative content. They use satisfactory spelling, punctuation and grammar. Form and style are of a satisfactory standard.	[3]–[4]
C	Candidates use appropriate terms throughout to give one or two points from the indicative content. They use limited spelling, punctuation and grammar and have made little use of specialist terms.	[1]–[2]
D	Response not worthy of credit.	[0]

[6]

6

5 (a) Any **four** from:

- antigen on (TB or bacterium) detected as foreign/nonself;
- WBC/lymphocytes;
- produce antibodies;
- to compliment any antigen on bacterium;
- alternative route: memory cells produce antibodies then lock onto bacterium/joins with antigen;
- cause clumping/immobilisation/stops reproduction/stops spreading phagocytosis/phagocytes/engulf **and** digest

[4]

		AVAILABLE MARKS
(b)	<p>1 → 10 → 100 → 1000; 1000 + 100 + 10 = 1110 1110 + 1 (original person) = 1111</p> <p>[1] 10 + 1 = 11 [1] 10 × 10 = (100) and 100 × 10 = (1000) [1] for addition 1111</p>	[3]
(c) (i)	antibiotic	[1]
(ii)	fungus	[1]
(iii)	$\frac{600\,000}{10\,400\,000} \times 100;$ = 5.77 57.69 = [1] or 0.58 = [1]	[2]
(iv)	overuse of antibiotics/mutations/mutated bacteria have reproduced	[1]
		12
6 (a)	<p>1st bar 8; 2nd bar 8; 3rd bar 4</p>	[3]
(b)	doubles/replicates/copied/forms sister chromatids	[1]
(c)	after meiosis	[1]
(d)	any cell apart from testis/ovary/RBC/cancer/hair	[1]
(e)	testis/ovary	[1]
		7
7 (a) (i)	<p>mother $X^H X^H$; father $X^h Y$</p>	[2]
(ii)	<p>get normal X^H from mother dominant allele on X from mother; get X^h from father recessive allele from father</p>	[2]
(iii)	<p>gets his X^H from mother/dominant allele from mother/gets normal X from mother; gets Y chromosome from his father/gets Y that does not carry haemophilia from dad</p>	[2]

(b) (i)

	X^H	Y
X^H	X^HX^H	X^HY
X^h	X^HX^h	X^hY

[1] Punnett stand alone mark;

[1] Mark's gametes;

[1] Anne's gametes;

[1] cross correct; last mark

[4]

(ii) 25%

[1]

11

8 (a) (i) graph line increasing to right for temp/decreasing for humidity

[2]

(ii) **more water uptake**; must have this
more photosynthesis with more light;
more water needed or used for photosynthesis
or

more water uptake; must have this
stomata open more/wider or more stomata open;
more evaporation/diffusion/transpiration
or

more water uptake; must have this
increasing light causes more heat/temperature/warmer/hotter;
more evaporation/diffusion/transpiration

[3]

(b) (i) arrow from any mesophyll cell (must be in cell or on wall);
out of stoma

[2]

(ii) Any **two** from:

- presence of waxy cuticle;
- rolled leaf/smaller surface area/smaller leaves/spines/
smaller needles;
- less stomata/sunken stomata/stomata can open or close/stomata
on underside **only**/stomata close in hot conditions/less (density) of
stomata/less stomata (on upper surface);
- leaf hairs

[2]

9

		AVAILABLE MARKS
9	<p>(a) (i) $9 \div 30 \times 100;$ $= 30\%$ or $100 - 40;$ $60 \div 2 = 30\%$ If $30\% = [2]$</p> <p>(ii) 5</p>	<p>[2]</p> <p>[1]</p>
(b)	<p>(i) restriction (endonuclease)</p> <p>(ii) both cuts shown ([1] each) – must be staggered</p> <p>(iii) 3</p>	<p>[1]</p> <p>[2]</p> <p>[1]</p>
(c)	<p>(i) plasmid cut open</p> <p>(ii) plasmid back into the bacterium/this must be in step 1; bacterium replicates/placed into fermenter or incubator – can be placed step 1 or 2</p> <p>(iii) extraction/purification/packaging (any two) in correct order [2] explanation: needed to produce pure, human protein/ needed to make sure it is safe for human use/to remove bacterial debris/remove contaminants [1]</p>	<p>[1]</p> <p>[2]</p> <p>[3]</p>
Total		<p>13</p> <hr/> <p>80</p>