

GCSE (9–1)

Combined Science A (Biology) A (Gateway Science)

J250/08: Paper 8 (Higher Tier)

General Certificate of Secondary Education

Mark Scheme for Autumn 2021

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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Annotations available in RM Assessor

Annotation	Meaning
	Correct response
	Incorrect response
	Omission mark
	Benefit of doubt given
	Contradiction
	Rounding error
	Error in number of significant figures
	Error carried forward
	Level 1
	Level 2
	Level 3
	Benefit of doubt not given
	Noted but no credit given
	Ignore

11. Abbreviations, annotations and conventions used in the detailed Mark Scheme (to include abbreviations and subject-specific conventions).

Annotation	Meaning
/	alternative and acceptable answers for the same marking point
✓	Separates marking points
DO NOT ALLOW	Answers which are not worthy of credit
IGNORE	Statements which are irrelevant
ALLOW	Answers that can be accepted
()	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
ECF	Error carried forward
AW	Alternative wording
ORA	Or reverse argument

12. Subject-specific Marking Instructions

INTRODUCTION

Your first task as an Examiner is to become thoroughly familiar with the material on which the examination depends. This material includes:

- the specification, especially the assessment objectives
- the question paper
- the mark scheme.

You should ensure that you have copies of these materials.

You should ensure also that you are familiar with the administrative procedures related to the marking process. These are set out in the OCR booklet **Instructions for Examiners**. If you are examining for the first time, please read carefully **Appendix 5 Introduction to Script Marking: Notes for New Examiners**.

Please ask for help or guidance whenever you need it. Your first point of contact is your Team Leader.

The breakdown of Assessment Objectives for GCSE (9-1) in Biology/ Combined Science A:

	Assessment Objective
AO1	Demonstrate knowledge and understanding of scientific ideas and scientific techniques and procedures.
AO1.1	Demonstrate knowledge and understanding of scientific ideas.
AO1.2	Demonstrate knowledge and understanding of scientific techniques and procedures.
AO2	Apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures.
AO2.1	Apply knowledge and understanding of scientific ideas.
AO2.2	Apply knowledge and understanding of scientific enquiry, techniques and procedures.
AO3	Analyse information and ideas to interpret and evaluate, make judgements and draw conclusions and develop and improve experimental procedures.
AO3.1	Analyse information and ideas to interpret and evaluate.
AO3.1a	Analyse information and ideas to interpret.
AO3.1b	Analyse information and ideas to evaluate.
AO3.2	Analyse information and ideas to make judgements and draw conclusions.
AO3.2a	Analyse information and ideas to make judgements.
AO3.2b	Analyse information and ideas to draw conclusions.
AO3.3	Analyse information and ideas to develop and improve experimental procedures.
AO3.3a	Analyse information and ideas to develop experimental procedures.
AO3.3b	Analyse information and ideas to improve experimental procedures.

For answers to section A if an answer box is blank ALLOW correct indication of answer e.g. circled or underlined.

Question		Answer	Marks	AO element	Guidance
1		C✓	1	1.1	
2		D✓	1	1.2	
3		B✓	1	1.1	
4		B✓	1	2.1	
5		D✓	1	1.1	
6		B✓	1	2.1	
7		A✓	1	2.1	
8		A✓	1	1.1	
9		B✓	1	1.1	
10		C✓	1	1.1	

BLANK PAGES MUST BE ANNOTATED TO SHOW THEY HAVE BEEN SEEN

Question		Answer	Marks	AO element	Guidance
11	(a)	<p>(Acyanogenic are found in colder climates because)</p> <p>Do not release toxin when cells are damaged by the cold ✓</p> <p>(Cyanogenic are found in warmer climates because)</p> <p>They are protected from snails/predation ✓</p> <p>OR</p> <p>Cells are damaged by toxins in the cold / ORA ✓</p>	2	2 x 2.2	<p>ALLOW idea that there may be fewer snails / too cold for snails to live (in cold climate)</p> <p>ALLOW snails will not eat them</p>
	(b)	(i)	1	1.2	<p>ALLOW large numbers to count would lead to errors</p> <p>ALLOW idea that you will not lose track of what has been counted</p> <p>ALLOW it is faster (than counting all of them)</p> <p>IGNORE it would be impractical (unless qualified)</p>
	(b)	(ii)	2	2 x 1.2	<p>ALLOW random sampling uses a quadrat placed randomly (over large area)</p> <p>IGNORE quadrats are placed in a specific area or mapped out area</p>
	(b)	(iii)	2	3.3a 3.3b	<p>ALLOW transects compare different areas on the slope</p> <p>ALLOW transect measures the slope to show how the land changes</p>

Question		Answer	Marks	AO element	Guidance
	(c) (i)	Increase of altitude decreases the number of cyanogenic (clover) / ora ✓	1	3.1b	ALLOW they prefer to grow at lower altitudes ALLOW negative correlation IGNORE inversely proportional
	(c) (ii)	Any altitude above 150m AND Higher altitudes are colder (giving them advantage) ✓	1	3.2a	ALLOW less competition from cyanogenic plants ALLOW there would be less at lower altitudes as they get eaten by snails ALLOW no snails at higher altitude
	(d)	Any three from: (cyanogenic plants) developed as a mutation ✓ Plants/clover that produce toxin are less likely to be eaten (by snails) ✓ Cyanogenic plants are more likely reproduce ✓ Cyanogenic plants are likely to pass on <u>genes/alleles</u> for producing toxin ✓	3	3 x 2.1	ALLOW converse argument for acyanogenic in cold climate / high altitude ALLOW plants/clover that produce toxin are more likely to survive (being eaten)

Question		Answer	Marks	AO element	Guidance
12	(a)	respiration ✓ evaporates ✓	2	2 x 1.1	ALLOW combustion IGNORE decomposition
	(b) (i)	denitrifying bacteria ✓	1	2.1	
	(b) (ii)	they remove nitrogen/nitrates from soil ✓	1	2.1	ALLOW convert nitrates (in soil) into nitrogen (in air) ALLOW return nitrates/nitrogen to the atmosphere/air ALLOW they convert nitrogen/nitrates into a gas DO NOT ALLOW they breakdown nitrogen
	(b) (iii)	dead animals + plants ✓	1	2.1	more than one box ticked = 0 mark
	(c)	Z levels out first because rate becomes limited by both carbon dioxide concentration and temperature ✓ Y levels out second because higher levels carbon dioxide enable higher rate until it becomes limited by temperature ✓ X levels out last due to carbon dioxide and temperature not limiting the rate ✓	3	3 x 3.2b	ALLOW Z levels out first or rate is lower because it has low(est) carbon dioxide concentration and temperature ALLOW comparison between concentration levels between Z and Y e.g. levels off second as carbon dioxide concentration is higher than Z ALLOW X levels out last or rate is higher because it has high(est) carbon dioxide concentration and temperature

Question		Answer	Marks	AO element	Guidance	
13	(a)	<p>Any two from: disease is a disorder that affects health ✓</p> <p>(disease affects health) by affecting an organism's organs/ tissues/cells ✓</p> <p>health is state of physical and mental wellbeing ✓</p>	2	2 x 1.1	<p>ALLOW diseases cause poor health ALLOW poor health increases risk of (some) diseases</p>	
	(b)	(i)	3	2 x 2.2	<p>FIRST CHECK THE ANSWER ON ANSWER LINE If answer = (x) 910000 award 3 marks</p> <p>50(mm) = 50 000 000 (nm) ✓</p> <p>50 000 000 / 55 ✓</p> <p>= (x) 910000 ✓</p>	<p>ALLOW Magnification = Image size ÷ Actual size</p> <p>ALLOW ECF from incorrect unit conversion e.g. $M = 50000 \div 55 = 1$ mark</p> <p>ALLOW answer in SF 9.1×10^5 ALLOW evidence of rounding to 2SF for one mark</p> <p>ALLOW 909090.9 = 2 marks</p>
	(b)	(ii)	2	2 x 1.1	<p>vaccine is dead/weakened pathogen (so does not create warts) ✓</p> <p>but still stimulates antibody production (to antigen) ✓</p>	<p>ALLOW contains antigen</p> <p>ALLOW antibody-antigen reaction still happens ALLOW memory cells are formed</p>

Question		Answer	Marks	AO element	Guidance
	(b) (iii)	<p>abnormal screening rate went down after vaccinations introduced ✓</p> <p>and any two from: vaccination reduces the number of people getting HPV ✓</p> <p>there is an interaction between HPV and cervical cancer / idea that HPV may trigger cervical cancer ✓</p> <p>as fewer people get HPV, fewer will get cancer ✓</p>	3	<p>1 x 2.2</p> <p>2 x 2.1</p>	<p>ALLOW increase in vaccines results in decrease in (cervical) cancer</p> <p>ALLOW HPV is passed between people but cancer is not</p>
	(c)	<p>Any two from: preclinical drug trials / testing on living cells ✓</p> <p>animal testing / animal monitored for any side-effects ✓</p> <p>human clinical trials / tested on healthy volunteers to check that they are safe ✓</p>	2	2 x 1.1	<p>ALLOW idea of computer modelling</p>

Question		Answer	Marks	AO element	Guidance									
14	(a)	meiosis ✓ produces gametes/sex cells ✓	2	1 x 1.1 1 x 2.1	ALLOW idea of restoring diploid number at fertilisation									
	(b) (i)	idea that there is nothing in between just those that need blood and those that don't ✓	1	1.1										
	(b) (ii)	<p style="text-align: center;">Male</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;">X</td> <td style="text-align: center;">Y</td> </tr> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">XX</td> <td style="text-align: center;">XY</td> </tr> <tr> <td style="text-align: center;">X</td> <td style="text-align: center;">XX</td> <td style="text-align: center;">XY</td> </tr> </table> <p style="text-align: right; margin-right: 20px;">✓</p> <p>probability = 0.5 / 50% / ½ ✓</p>		X	Y	X	XX	XY	X	XX	XY	2	2 x 1.2	ALLOW 1 in 2 / 1:1
	X	Y												
X	XX	XY												
X	XX	XY												

Question		Answer	Marks	AO element	Guidance
15	(a)	impulses not passed onto the relay neurone ✓ (impulses) do not reach CNS/brain ✓	2	2 x 2.1	
	(b)	(i) FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 43.75 (%) award 2 marks 64 - $36/64 \times 100$ ✓ = 43.75 (%) ✓	2	2 x 2.2	ALLOW $28/64 \times 100$ ALLOW 44(%) = 2 marks
	(b)	(ii) idea that it allows for estimations of uncertainty / AW ✓	1	3.3b	ALLOW smaller range bars mean you can be surer of the result
	(c)	embryo stem cells can differentiate into any type of cell ✓ bone marrow cells would not differentiate into corneal cells ✓	2	2 x 1.1	ALLOW bone marrow cells can only form blood cells

Question	Answer	Marks	AO element	Guidance
<p>(d)</p>	<p>Please refer to the marking instructions on page 4 of this mark scheme for guidance on how to mark this question.</p> <p>Level 3 (5–6 marks) Detailed description of the use of genetic engineering for corneal transplants. AND Identifies improvements from treatment. AND Identifies risks of using of genetic engineering for corneal transplants.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</i></p> <p>Level 2 (3–4 marks) Detailed description of the use of genetic engineering for corneal transplants. OR Outline description of the use of genetic engineering for corneal transplants. AND Identifies improvements from treatment or Identifies risks of using of genetic engineering for corneal transplants. OR Identifies improvements from treatment. AND Identifies risks of using of genetic engineering for corneal transplants.</p> <p><i>There is a line of reasoning presented with some structure.</i></p>	6	2 x 2.1 2 x 3.1a 2 x 3.3b	<p>AO2.1 Apply knowledge and understanding of genetically engineering to donor cornea</p> <ul style="list-style-type: none"> cutting out the desired protein gene - restriction enzymes used to do this making many copies of the protein gene/allele putting copies of the protein gene into donor cornea - ligase enzymes used to join with DNA in cells of donor cornea <p>AO3.1a Analyse information and ideas to identify risks of genetically engineered cornea</p> <ul style="list-style-type: none"> the modified protein gene may not go into every target cell the modified protein gene may join with the chromosomes in random places, so they do not work properly treated cells may be replaced naturally by the patient's own untreated cells <p>AO3.3b Analyse information and ideas to identify improvements</p> <ul style="list-style-type: none"> rejection of corneal tissues by host is reduced improved transparency of cornea as no blood vessels will develop

Question	Answer	Marks	AO element	Guidance
	<p><i>The information presented is relevant and supported by some evidence.</i></p> <p>Level 1 (1–2 marks) Outline description of the use of genetic engineering for corneal transplants. OR Identifies improvements from treatment. OR Identifies risks of using of genetic engineering for corneal transplants.</p> <p><i>There is an attempt at a logical structure with a line of reasoning. The information is in the most part relevant.</i></p> <p>0 marks <i>No response or no response worthy of credit.</i></p>			

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