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**GCE**

**Biology B**

**H022/01: Foundations of biology**

Advanced Subsidiary GCE

**Mark Scheme for June 2019**

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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

Annotation	Meaning
✓	correct response
✗	incorrect response
BOD	benefit of the doubt
NBOD	benefit of the doubt <u>not</u> given
ECF	error carried forward
^	information omitted
I	ignore
BP	Blank page
●	Marking point partially met
~	Underline (for ambiguous / contradictory wording)
CON	contradiction

## Annotations

Annotation	Meaning
<b>DO NOT ALLOW</b>	Answers which are not worthy of credit
<b>IGNORE</b>	Statements which are irrelevant
<b>ALLOW</b>	Answers that can be accepted
( )	Words which are not essential to gain credit
—	Underlined words must be present in answer to score a mark
<b>ECF</b>	Error carried forward
<b>AW</b>	Alternative wording
<b>ORA</b>	Or reverse argument

## 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.

## SECTION A

Question	Answer	Marks	Guidance
1	A	1	
2	A	1	
3	C	1	
4	C	1	
5	D	1	
6	B	1	
7	C	1	
8	A	1	
9	D	1	
10	C	1	
11	B	1	
12	D	1	
13	C	1	
14	B	1	
15	C	1	
16	B	1	
17	D	1	
18	C	1	
19	D	1	
20	B	1	
	Total	20	

## SECTION B

Question		Answer	Marks	Guidance
21	(a)	<p>(lenticels) to allow diffusion of gases between atmosphere and intercellular spaces (of stem) ✓</p> <p>(because) stems , become woody / develop bark ✓</p> <p>not enough leaves therefore insufficient stomata ✓</p>	2 max	
	(b) (i)	<p><i>idea that</i> changes in water table levels would affect the validity of the results ✓</p> <p>changes in the water table level can be accounted for when analysing results ✓</p>	1 max	<p><b>When crediting examples below wording about the three zones on the question paper can be used</b></p> <p>e.g. (if water table rises) seedlings in Zone , A / B , could also be waterlogged so results would not be valid</p> <p>e.g. (if water table drops) seedlings in Zone , B / C , could also be in dry soil so results would not be valid</p> <p><b>IGNORE</b> results won't be , reliable / repeatable / fair</p> <p><b>IGNORE</b> reference to controlling water levels</p>

	(b)	(ii)	<p><i>in situ</i></p> <p><i>Advantage</i> roots would not become 'pot bound' ✓ seedlings exposed to natural environment / AW ✓</p> <p><i>Disadvantage</i> changes in conditions cannot be controlled ✓ data-logger / recording equipment , may get damaged ✓</p>	2 max	<p><b>IGNORE</b> prompt lines and credit ORA if response is about laboratory conditions as appropriate</p> <p><b>1 max for advantage</b></p> <p><b>ALLOW</b> e.g. seedlings in same , day length / natural light</p> <p><b>1 max for disadvantage</b></p> <p><b>ALLOW</b> named condition e.g. rainfall or temperature</p>
	(c)	(i)	<u>mean</u> number of lenticels ✓	1	

Question		Answer	Marks	Guidance
	(c) (ii)	<p>no , data (for zones <b>B</b> and <b>C</b>) / conclusions can be drawn , at start of investigation / at week 0 ✓</p> <p>(mean) number of lenticels for zone <b>B</b> increases (over period of the investigation) ✓</p> <p>(mean) number of lenticels is greater in zone <b>C</b> at 3 <b>and</b> 7 weeks ✓</p> <p>(mean) number of lenticels for zone <b>C</b> increases up to 7 weeks and then levels out ✓</p> <p>range bars show there is no difference , in (mean) number of lenticels at 13 weeks ✓</p> <p>comparative figures used ✓</p>	2 max	<p><b>IGNORE</b> reference to zone <b>A</b></p> <p><b>ALLOW</b> descriptions for zones <b>B</b> and <b>C</b> e.g. wet or saturated and waterlogged or wetland</p> <p><b>ALLOW</b> ORA e.g. there is only data available from week 3</p> <p><b>ALLOW</b> error bars</p> <p><b>ALLOW</b> correct reference to overlap of range bars</p> <p>For zone <b>B</b>: week 3 is 1.5 week 7 is 11 and week 13 is 14.5</p> <p>For zone <b>C</b>: week 3 is 6.5 week 7 is 14.25 and week 13 is 14</p>
	(d) (i)	mitosis / cell division / tissue development ✓ response to infection by plant pathogen ✓	1 max	<b>ALLOW</b> e.g. increase in the number of cells e.g. bark formation
	(d) (ii)	active transport cannot take place ✓ lack of oxygen (due to waterlogging) ✓ (means) less , aerobic respiration / ATP production ✓ leaching of nutrients ✓	2 max	<p><b>ALLOW</b> nutrients are taken up by active transport</p> <p><b>IGNORE</b> air</p> <p><b>ALLOW</b> named nutrient e.g. nitrates</p>
			Total	11

Question		Answer	Marks	Guidance
22	(a)	<p><i>Adaptation</i> increased brain size ✓</p> <p><i>Advantage</i> enabled problem solving ✓</p> <p><b>OR</b></p> <p><i>Adaptation</i> change / increase , in leg length ✓</p> <p><i>Advantage</i> (allowed) bipedalism / walking on two legs ✓</p> <p><b>OR</b></p> <p><i>Adaptation</i> bipedalism / walking on two legs ✓</p> <p><i>Advantage</i> more efficient way of walking / use of hands e.g. tools or hunting ✓</p> <p><b>OR</b></p> <p><i>Adaptation</i> body became (more) upright / AW ✓</p> <p><i>Advantage</i> (allowed) use of hands e.g. tool use or hunting ✓</p>	2 max	<p><b>IGNORE</b> prompt lines</p> <p><b>ALLOW</b> other <u>anatomical</u> adaptations e.g. enlarged heels for , weight-bearing / energy conservation during movement</p> <p>Advantage <b>must</b> be linked to adaptation</p> <p><b>ALLOW</b> bipedalism only ONCE as an adaptation OR advantage</p> <p><b>ALLOW</b> e.g. sign language communication</p> <p><b>ALLOW</b> e.g. exposed smaller surface area of body to sun so enabled hominids to live on plains.</p>
	(b)	named theory e.g. 'gossip' / 'mother tongue' ✓	3 max	

Question		Answer	Marks	Guidance
		<p>(methods)</p> <p>example of using fossil , evidence / records ✓</p> <p>example of archeological evidence ✓</p> <p>example of genetics linked to language development ✓</p> <p>comparisons with other , species / hominids ✓</p> <p>use of computer simulation ✓</p>		<p>e.g. hyoid bone</p> <p>e.g. artefacts</p> <p>e.g. FOXP2 gene / genes linked to autism</p> <p>e.g. descended larynx in humans / observing primates</p>
	(c)	<p>polynucleotide / antiparallel ✓</p> <p>phosphodiester ✓</p> <p>condensation ✓</p> <p>pyrimidine ✓</p> <p>guanine ✓</p>	5	<b>ALLOW</b> phonetic spelling e.g. piramidine
		<b>Total</b> 10		

Question		Answer	Marks	Guidance
23	(a) (i)	<p>thrombin / enzyme , converts fibrinogen to fibrin ✓ (variegin) has a similar shape to fibrinogen ✓</p> <p>(so) can occupy the <u>active site</u> of , thrombin / enzyme ✓</p> <p>(variegin) prevents , fibrinogen binding to <u>active site</u> / enzyme-substrate complex formation ✓</p> <p>slower rate of conversion of fibrinogen to fibrin ✓</p> <p>(action of variegin) not permanent / temporary ✓</p>	3 max	<p><b>DO NOT ALLOW</b> incorrect enzyme <b>ALLOW</b> substrate for fibrinogen where it has already been mentioned in <b>MP1</b> <b>DO NOT ALLOW</b> same shape</p> <p><b>ALLOW</b> 'fit into' or 'binds to' for occupy For <b>MPs 3 and 4</b> active site only needs to be mentioned once <b>ALLOW</b> ESC</p> <p>If <b>MP1</b> has been awarded accept slower rate of reaction or slower rate of product formation for <b>MP5</b></p>
	(a) (ii)	<p>(curve) Y <b>AND</b> (at high substrate concentrations) reaches same maximum rate of reaction as (curve) X / AW <b>OR</b> (curve) Z shows non-competitive inhibition ✓</p>	1	<p>e.g. the rate of enzyme activity reaches that of enzyme without inhibitor</p> <p>Y must have been given as the response but then this ORA can be awarded for a reason</p>
	(a) (iii)	51 (%) ✓ ✓	2	<p><b>IGNORE</b> ±</p> <p><b>ALLOW</b> one mark for correct response but incorrect sig. figs. e.g. 51.4% <b>OR</b>  <math display="block">\frac{87.5 - 42.5}{87.5} \times 100</math></p>



Question			Answer	Marks	Guidance
24	(a)	(i)	<p><i>A. fumigatus</i> does not normally cause disease but remains in soil / AW ✓</p> <p><i>A. fumigatus</i> causes disease only when host immune system is weakened / AW ✓</p>	1 max	
	(a)	(ii)	<p>(fungus) releases , enzymes / toxins ✓</p> <p>enzymes break down , tissues / cells ✓</p> <p>(fungus) produces , spores / hyphae, that invade tissues ✓</p>	2	<p><b>ALLOW</b> secretes enzymes / excretes toxins</p> <p><b>ALLOW</b> named enzymes e.g. proteases</p>
	(b)	(i)	<p>sputum is spread <del>thinly</del> on a microscope slide ✓</p> <p>use of fixative ✓</p> <p>use of (differential) stain to distinguish fungal cells ✓</p>	2 max	<p><b>ALLOW</b> e.g. use another slide to scrape across to produce , smear / thin layer</p> <p><b>ALLOW</b> named fixative e.g. methanol</p> <p><b>ALLOW</b> e.g. fungal cells being visible in the sputum by staining technique / AW</p>

Question		Answer			Marks	Guidance															
24	(b)	(ii) x 200 ✓✓			2	If answer incorrect accept the following for 1 mark: 1cm OR 10mm OR 10000 50µm 50µm 50															
	(c)	<table border="1"> <thead> <tr> <th>Feature</th> <th>Scanning electron microscope</th> <th>Transmission electron microscope</th> </tr> </thead> <tbody> <tr> <td>The electron beam reflects off the surface of the specimen</td> <td>✓</td> <td></td> </tr> <tr> <td>A 3-D image is produced</td> <td>✓</td> <td></td> </tr> <tr> <td>Heavy metals are used to stain or coat the specimen</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Specimens must be extremely thin</td> <td></td> <td>✓</td> </tr> </tbody> </table>			Feature	Scanning electron microscope	Transmission electron microscope	The electron beam reflects off the surface of the specimen	✓		A 3-D image is produced	✓		Heavy metals are used to stain or coat the specimen	✓	✓	Specimens must be extremely thin		✓	4	1 mark for each correct row
Feature	Scanning electron microscope	Transmission electron microscope																			
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Specimens must be extremely thin		✓																			
		✓✓✓✓																			
		Total			11																

Question			Answer	Marks	Guidance
25	(a)	(i)	need to know how many women and men have non-gender related cancers ✓	1	<b>ALLOW</b> number of women and men who have the other cancers <b>ALLOW</b> anus, mouth and throat cancers for non-gender related cancers
	(a)	(ii)	(young men) do not suffer from cervical cancer ✓ (young men) may not be sexually active ✓ financial implications / AW ✓  lack of awareness of benefits of vaccinating (young men) ✓	2 max	<b>IGNORE</b> effect on health / risks of vaccine /  <b>ALLOW</b> don't have a cervix  e.g. could be unnecessary cost as they don't need to be vaccinated
	(b)	(i)	active (immunity) <b>and</b> passive (immunity) ✓  active (immunity) e.g. antibody production following , infection /exposure to antigen <b>OR</b> active (immunity) e.g. protected by memory cells produced following infection ✓  passive (immunity) e.g. where antibodies passed from mother to fetus through placenta <b>OR</b> passive (immunity) e.g. where antibodies passed from mother to baby through , breast milk / colostrum ✓	3	Only credit responses involving <i>natural</i> immunity <b>ALLOW</b> mp1 within examples even if examples are incorrect

	<b>(b)</b>	<b>(ii)</b>	(B memory cells) can survive for long periods in blood stream ✓  <i>idea of quicker antigen presentation ✓</i> more rapid clonal , selection / expansion ✓ (so) increased antibody , production / concentration ✓  secondary response is quicker ✓	<b>3 max</b>	
	<b>(c)</b>		may be issues with , false / incorrect , test results ✓  HPV screening test may not be as reliable (as normal cervical screening) ✓ positive result for HPV does not necessarily mean cancer ✓	<b>1 max</b>	<b>ALLOW</b> answers that refer to false-positive or false-negative
			<b>Total</b>	<b>10</b>	

**OCR (Oxford Cambridge and RSA Examinations)**  
**The Triangle Building**  
**Shaftesbury Road**  
**Cambridge**  
**CB2 8EA**

**OCR Customer Contact Centre**

**Education and Learning**

Telephone: 01223 553998  
Facsimile: 01223 552627  
Email: [general.qualifications@ocr.org.uk](mailto:general.qualifications@ocr.org.uk)

[www.ocr.org.uk](http://www.ocr.org.uk)

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**OCR (Oxford Cambridge and RSA Examinations)**  
Head office  
Telephone: 01223 552552  
Facsimile: 01223 552553

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