

GCE

Biology A

Unit **H020/02**: Depth in biology

Advanced Subsidiary GCE

Mark Scheme for June 2017

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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.

















OCR will not enter into any discussion or correspondence in connection with this mark scheme.

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Annotations

Annotation	Meaning
DO NOT ALLOW	Answers that are not worthy of credit
IGNORE	Statements that are irrelevant
ALLOW	Answers that can be accepted
()	Words that 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

Marking Annotations

Annotation	Use
	Benefit of Doubt
	Contradiction
	Cross
	Error Carried Forward
	Given Mark
	Extendable horizontal wavy line (to indicate errors / incorrect science terminology)
	Ignore
	Large dot (various uses as defined in mark scheme)
	Highlight (various uses as defined in mark scheme)
	Benefit of the doubt not given
	Tick
	Omission Mark
	Blank Page
	Level 1 answer in Level of Response question
	Level 2 answer in Level of Response question
	Level 3 answer in Level of Response question

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.

Examples of the Level of Response answers are provided as an Appendix at the end of this mark scheme. Please familiarise yourself with them and use them as your guide when marking.

Question			Answer	Mark	Guidance
1	(a)	(i)	<p><i>you can now see</i></p> <p>Golgi body / mitochondria / (smooth / rough) endoplasmic reticulum / ER / RER / SER / ribosomes</p> <p>OR</p> <p>organelles seen in more detail / grana (in chloroplast) / thylakoids (in chloroplast) / nuclear pore / cristae (in mitochondria) / membranes within organelles / double nuclear membrane / (double) nuclear envelope</p> <p>OR</p> <p>resolution is , higher / better ✓</p>	1	<p>IGNORE clarity</p> <p>IGNORE ref to size of organelles DO NOT ACCEPT chloroplast</p> <p>IGNORE ref to ultrastructure unqualified</p>
1	(a)	(ii)	<p><i>LSCM image</i></p> <p>has lower <u>resolution</u> (than EM)</p> <p>OR</p> <p>can have <u>fluorescent</u> tag</p> <p>OR</p> <p>can see movement (as can be used on living cells)</p> <p>OR</p> <p>can see , different layers / at different depths (of the sample) ✓</p>	1 max	<p>ORA for electron microscope</p> <p>needs to be comparative</p> <p>IGNORE colour</p> <p>IGNORE ref to 2D / 3D / depth of field</p>

Question			Answer	Mark	Guidance
1	(b)	(i)	prophase (1) ✓	1	DO NOT ACCEPT prophase II (as question states meiosis I)
1	(b)	(ii)	<p>1 chromosomes / chromatids , visible / condensed ✓</p> <p>2 chromosomes not , organised / yet aligned / arranged OR chromosomes not at , ends / equator ✓</p> <p>3 nuclear envelope (around chromosomes) / nuclear membrane is present / chromosomes separated from cytoplasm ✓</p> <p>4 no (visible) nucleolus ✓</p>	2 max	<p>Mark the first 2 answers</p> <p>1 Needs to be a clear statement</p> <p>2 ACCEPT chromosomes , in different positions / scattered / spread out</p> <p>3 ACCEPT nuclear membrane starting to disappear DO NOT ACCEPT nuclear membrane has disappeared</p>
1	(b)	(iii)	<p>1 independent / random , <u>assortment</u> ✓</p> <p>2 (homologous chromosomes) line up, across the centre of the cell / on the equator / on the metaphase plate ✓</p> <p>3 maternal or paternal chromosomes / either one of the homologous pair , can end up , facing either pole / in either (daughter) cell ✓</p> <p>4 each chromosome of the homologous pair , is genetically different / contains different alleles / contains different gene variant ✓</p>	3 max	<p>4 ACCEPT if described in terms of chromatids being genetically different</p>

Question	Answer	Mark	Guidance
1 (c)	<p>2 max for sources embryonic / embryo ✓ fetus / fetal ✓ umbilical cord (blood) ✓ (adult) bone marrow (tissue) ✓ convert somatic cell into pluripotent cell ✓</p> <p>ethical issue – must relate to one of their stated sources ethical issue identified – such as 1 from the list below ✓</p> <p><i>embryonic</i> E1 embryo , destroyed / killed / discarded E2 use of excess embryos from assisted fertilisation (IVF) or or E3 debate about when life begins or E4 embryo cannot give consent or</p> <p><i>fetal</i> F1 obtained from , miscarried / aborted , fetuses or <i>umbilical cord</i> U1 detached from infant at birth anyway</p> <p>or B1 harvesting bone marrow is , painful / risky <i>bone marrow</i> B2 donor babies / or babies conceived specifically to provide a bone marrow transplant for a sibling (with a condition requiring the transplant)</p> <p>a statement indicating , judgement / opinion / understanding , of this ethical</p>	<p>2 max</p> <p>2</p>	<p>ACCEPT e.g. breast milk / muscle / liver / placenta / etc. ACCEPT blastocyst</p> <p>Note: list of issues is not exhaustive – credit a well expressed issue</p> <p>F1 IGNORE ref to obtaining fetal stem cells by killing fetus but can still access the judgement mark</p> <p>Can only be awarded once the issue relating to one of their sources has been identified.</p>

			issue ✓		IGNORE 'playing God' as an opinion
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Question		Answer	Mark	Guidance
2	(a)	<p>D1 put , (leaf) stalk(s) / petiole(s) , in , dye / stain / food colouring ✓</p> <p>D2 (then) cut , transversely / cross section ✓</p> <p>OR</p> <p>M1 cut a (thin) , transverse / cross , section ✓</p> <p>M2 (then) add (named) stain / observe with microscope under low power ✓</p>	2	<p>IGNORE any observations</p> <p>D1 ACCEPT 'stick' for 'stalk'</p> <p>D2 ACCEPT cut across , (leaf) stalk / petiole (with a sharp blade) a longitudinal , cut / section cut in half</p> <p>IGNORE IGNORE</p> <p>M1 ACCEPT cut a (thin) slice of (leaf) stalk / petiole (with a sharp blade) a longitudinal , cut / section cut in half</p> <p>IGNORE IGNORE</p>

Question	Answer	Mark	Guidance
2 (b)	<p><i>lignin</i> (Water Starwort) has no / less , <u>lignin</u> (than deciduous woodland plants) ✓</p> <p>(Cholla) more <u>lignified</u> (walls) / (walls) contain more <u>lignin</u> (than deciduous woodland plants) ✓</p> <p>OR</p> <p><i>thickness of walls</i> (Water Starwort) has <u>thinner</u> walls (of xylem vessels) (than deciduous woodland plants) ✓</p> <p>(Cholla) has <u>thicker</u> wall (of xylem vessels) (than deciduous woodland plants) ✓</p>	2	<p><i>The comparison is between each of these plants with a woodland deciduous plant and not a comparison between the 2 species</i></p>

Question			Answer	Mark	Guidance
3	(a)		removal of <u>operculum</u> (of fish) / move <u>operculum</u> out of the way / cut open <u>exoskeleton</u> (of insect) ✓ method to , observe / display , gills / tracheae / tracheoles ✓	2	ACCEPT any suitable detail of display method e.g. observe structures under water placing a rod/pencil into buccal cavity to display lamellae staining tracheoles with methylene blue
3	(b)	(i)	20 indicated as the incorrect value ✓ 19 ✓	2	e.g. number written alongside the 20 20 circled or indicated by arrow or other indication
3	(b)	(ii)	tracheole(s) ✓	1	

Question			Answer	Mark	Guidance
3	(b)	(iii)	<p>1 mammals have just one trachea and insects have multiple tracheae ✓</p> <p>2 mammals (much) larger diameter / insects (much) smaller diameter ✓</p> <p>3 in mammals trachea has , cartilage / no chitin (support) and in insects tracheae have , no cartilage / chitin ✓</p> <p>4 mammals have , C-shaped 'rings' / incomplete circle , and insects have spiral (support) ✓</p> <p>5 mammal trachea is longer / (individual) insect tracheae shorter ✓</p> <p>6 mammal trachea branch into bronchi and insect tracheae branch into tracheoles ✓</p> <p>7 mammal trachea has , smooth muscle / goblet cells / ciliated epithelium and (individual) insect tracheae do not ✓</p>	2	<p>Statements must be comparative Assume 'it' is the mammal</p> <p>2 ACCEPT 'wider / narrower' for 'larger / smaller' diameter IGNORE bigger</p> <p>4 ACCEPT descriptions e.g. gap v no gap in strengthening</p> <p>6 ACCEPT 'leads to' instead of 'branch into'</p>

Question	Answer	Mark	Guidance
3 (c)	<p>For answers marked by levels of response:</p> <p>Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.</p> <p>Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme.</p> <p>Once the level is located, award the higher or lower mark.</p> <p>The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.</p> <p>The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.</p> <p>In summary:</p> <ul style="list-style-type: none"> • The science content determines the level. • The communication statement determines the mark within a level. <p>Level 3 (5–6 marks) Detail of more than one adaptation of the alveoli</p>	6	<p>For Level 3 need more than one correct adaptations of alveoli AND an explanation of how more than one adaptation of alveoli improves efficient gaseous exchange.</p> <p>IGNORE simply stating that the adaptation increases efficiency</p> <p>IGNORE further ref to capillaries beyond vascularisation</p> <p>Indicative scientific points may include the following:</p> <p>A – area <i>Adaptation -</i></p> <ul style="list-style-type: none"> • large surface (in small volume) - <i>detail</i> large numbers of (spherical) alveoli • surfactant <i>detail -</i> <ul style="list-style-type: none"> • reduces , cohesive action between water molecules / surface tension • prevents alveoli from collapsing • elastic fibres <i>detail -</i> <ul style="list-style-type: none"> • stretch and recoil • stretch increases surface area • recoil helps force air out <p><i>Explanation -</i></p> <ul style="list-style-type: none"> • more space for molecules to pass

	<p>AND scientific explanations of how more than one adaptation improves the efficiency of gas exchange.</p> <p><i>There is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant.</i></p> <p>Level 2 (3–4 marks) Identification of more than one adaptation of the alveoli</p> <p>AND scientific explanation of how one adaptation improves the efficiency of gas exchange.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most-part relevant.</i></p> <p>Level 1 (1–2 marks) Identification of one adaptation of the alveoli</p> <p>OR scientific explanation of how the efficiency of gas exchange is improved.</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 No response or no response worthy of credit.</p>	<ul style="list-style-type: none"> • large volume of gas exchanged per unit time / high rate of diffusion <p>D – distance <i>Adaptation -</i></p> <ul style="list-style-type: none"> • thin walls <i>detail -</i> <ul style="list-style-type: none"> • alveolar wall one cell thick • (alveolar wall) made of squamous epithelium • (which consist of) flattened cells • capillaries close to alveolar wall <p><i>Explanation -</i></p> <ul style="list-style-type: none"> • short diffusion path / short distance for diffusion • high rate of diffusion <p>G – gradient <i>Adaptation -</i></p> <ul style="list-style-type: none"> • ventilated <i>detail -</i> <ul style="list-style-type: none"> • oxygen constantly replenished • carbon dioxide constantly removed • good blood supply / well vascularised <i>detail -</i> <ul style="list-style-type: none"> • capillaries close to alveolar wall • blood supply constantly replenished • elastic fibres (detail) <ul style="list-style-type: none"> • stretch and recoil • stretch increases surface area • recoil helps force air out
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					<p><i>Explanation -</i></p> <ul style="list-style-type: none">• maintains , concentration / diffusion , gradients• (keeps) O₂ higher in alveolar air than blood (from pulmonary artery)• (keeps) CO₂ lower in alveolar air than blood (from pulmonary artery) <p>T – temperature</p> <p><i>Adaptation -</i></p> <ul style="list-style-type: none">• internal gas exchange surface <p><i>Explanation -</i></p> <ul style="list-style-type: none">• warm / higher / constant temperature , so rate of diffusion stays high
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Question	Answer	Mark	Guidance																																																												
4 (a)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;"><i>Statement</i></th> <th style="width: 30%;"><i>B lymphocytes</i></th> <th style="width: 30%;"><i>T lymphocytes</i></th> <th></th> </tr> </thead> <tbody> <tr> <td><i>Matured in bone marrow</i></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✗</td> <td></td> </tr> <tr> <td><i>Form part of immune response</i></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td><i>Differentiate into memory cells</i></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td><i>Produce chemicals that can cause lysis of infected cells</i></td> <td style="text-align: center;">✗</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td><i>Form plasma cell clones</i></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✗</td> <td style="text-align: center;">✓</td> </tr> </tbody> </table>	<i>Statement</i>	<i>B lymphocytes</i>	<i>T lymphocytes</i>		<i>Matured in bone marrow</i>	✓	✗		<i>Form part of immune response</i>	✓	✓	✓	<i>Differentiate into memory cells</i>	✓	✓	✓	<i>Produce chemicals that can cause lysis of infected cells</i>	✗	✓	✓	<i>Form plasma cell clones</i>	✓	✗	✓	4	<p>1 mark for each correct row Ticks and crosses must be clear – do not accept 'hybrids' If ALL CELLS BLANK then = NR If TICKS AND BLANKS ONLY in the table, 1 mark for each correct row as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><i>B lymphocytes</i></th> <th style="width: 50%;"><i>T lymphocytes</i></th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✗</td> <td></td> </tr> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td style="text-align: center;">✓</td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✓</td> <td></td> <td style="text-align: center;">✓</td> </tr> </tbody> </table> <p>If CROSSES AND BLANKS ONLY in the table, 1 mark for each correct row as follows:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;"><i>B lymphocytes</i></th> <th style="width: 50%;"><i>T lymphocytes</i></th> <th></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">✓</td> <td style="text-align: center;">✗</td> <td></td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td style="text-align: center;">✗</td> <td></td> <td style="text-align: center;">✓</td> </tr> <tr> <td></td> <td style="text-align: center;">✗</td> <td style="text-align: center;">✓</td> </tr> </tbody> </table> <p>ACCEPT 'yes' for 'tick' and 'no' for 'cross'</p>	<i>B lymphocytes</i>	<i>T lymphocytes</i>		✓	✗		✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	<i>B lymphocytes</i>	<i>T lymphocytes</i>		✓	✗				✓			✓	✗		✓		✗	✓
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Question		Answer	Mark	Guidance
4	(b)	<p>L primary , (just) after vaccination / when the person is vaccinated</p> <p>and secondary , (just) after infection / when the person is infected ✓</p> <p><i>primary</i></p> <p>P slow(er) / delayed , response because of , clonal selection / clonal expansion / production of antibodies ✓</p> <p><i>secondary</i></p> <p>S quick(er) response / shorter lag time / more antibodies produced , because of , memory cells / immunological memory ✓</p>	3	<p>L Comments should relate to Fig 4 (rather than straight recall) IF THIS MARK NOT STATED, look on the graph from appropriate labels on the graph ACCEPT a description of the shape of the graph in both responses</p> <p>P ACCEPT description</p>

Question	Answer	Mark	Guidance
4 (c)	<p>For answers marked by levels of response:</p> <p>Read through the whole answer from start to finish, concentrating on features that make it a stronger or weaker answer using the indicative scientific content as guidance. The indicative scientific content indicates the expected parameters for candidates' answers, but be prepared to recognise and credit unexpected approaches where they show relevance.</p> <p>Using a 'best-fit' approach based on the science content of the answer, first decide which set of level descriptors, Level 1, Level 2 or Level 3, best describes the overall quality of the answer using the guidelines described in the level descriptors in the mark scheme.</p> <p>Once the level is located, award the higher or lower mark.</p> <p>The higher mark should be awarded where the level descriptor has been evidenced and all aspects of the communication statement (in italics) have been met.</p> <p>The lower mark should be awarded where the level descriptor has been evidenced but aspects of the communication statement (in italics) are missing.</p> <p>In summary:</p> <ul style="list-style-type: none"> • The science content determines the level. • The communication statement determines the mark within a level. 	6	<p>For Level 3 need discussion of more than one correct factor related to information in rubric of question AND a plausible suggestion of an action that could be taken to address one of these factors.</p> <p>IGNORE climate change (as not mentioned in information given)</p> <p>IGNORE repetition of bullet points and suggestions that are simply reverse action (e.g. don't live close together).</p> <p>Indicative scientific points may include:</p> <p>F1</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i> lack of trained health professionals so lack of , vaccination / treatment lack of understanding of the way in which pathogen is , spread / transmission • <i>Possible action:</i> increase trained health staff by sending trained health professionals into the area better access to , hospitals / clinics train up more health professionals locally educate the population (esp children) so that they can take necessary precautions educate the population about the risk of sexual transmission

	<p>Level 3 (5–6 marks) Scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of more than one correct factor that affect the spread of communicable diseases in humans and a plausible suggestion of an action that could be taken to address one of these factors.</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) Scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of one correct factor that affects the spread of communicable diseases in humans</p> <p>a plausible suggestion of an action that could be taken to address any factor mentioned in the passage.</p> <p>and OR scientific discussion expanding on that given in the bullet point on page 12 of the exam paper of more than one factor that affects the spread of communicable diseases in humans OR plausible suggestions of more than one action that could be put in place to address factor(s) mentioned in the passage.</p> <p><i>There is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</i></p>	<p>F2</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i> the ill cared for by family members so family exposed to the pathogen as lack of safe nursing techniques e.g. use of protective clothing / surgical gloves / hand washing / isolation pathogens can be spread more easily , by droplet (infection) / coughing / sneezing • <i>Possible action:</i> restrict care to trained health professionals better access to , hospitals / clinics training in barrier nursing techniques provide isolation wards / quarantine <p>F3</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i> overcrowded living conditions / living in close proximity so pathogens can be spread more easily , by droplet (infection) / coughing / sneezing / within the community • <i>Possible action:</i> accommodation with , larger / less sharing of , rooms improve ventilation <p>F4</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i>
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		<p>Level 1 (1–2 marks) Limited scientific detail of a factor expanding on that given in the bullet points on page 12 of the exam paper or a plausible suggestion of an action that could be put in place to address a factor mentioned in the passage.</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>Level 0 No response or no response worthy of credit.</p>		<p>poor disposal of waste / poor sanitation so easy to pick up pathogen from , faeces / lack of hand washing</p> <ul style="list-style-type: none"> • <i>Possible action:</i> make people aware by , putting up public warnings / education projects improve / proper , sewage disposal use of (antibacterial) handwashing gels <p>F5</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i> people can , travel from / flee , places with disease so pathogens spread to wider area / spread due to symptomless carriers / epidemic becoming pandemic cannot be reached for , vaccination / treatment • <i>Possible action:</i> travel ban restrict travel , into / out of , infected areas health checks at , airports / bus stations / train stations quarantine involve , army / police , to prevent people travelling <p>F6</p> <ul style="list-style-type: none"> • <i>Factor and discussion:</i> mourning and burial practices difficult to change deep-seated ,
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					<p>traditions / religious practices brings people into close contact with pathogen as spread by touch and bodily fluids</p> <ul style="list-style-type: none"> • <i>Possible action:</i> suitable alternative (e.g. cremation) involve local leaders in promoting change in practice

Question			Answer	Mark	Guidance
5	(a)	(i)	28 (%) ✓ ✓	2	<p>Correct answer = 2 marks (indicated by 2 ticks) even if no working shown IGNORE minus sign</p> <p>ALLOW 1 mark only for correct but unrounded answer (e.g. 28.18) or for incorrect answer either $(110 - 79) \div 110$ or $31 \div 110$ or $100 - 71.81$ or for 27(%) (as 80 was used instead of 79 but method correct) or for 29(%) (as 78 was used instead of 79 but method correct)</p>

Question			Answer	Mark	Guidance
5	(a)	(ii)	<p>1 number in farmland stays higher than in woodland ✓</p> <p>2 number of butterflies in woodland , has a greater decrease / drops faster / falls more steeply , (than those on farmland)</p> <p>or number of butterflies on farmland , has a smaller decrease / drops slower / falls less steeply , (than those in woodland) ✓</p> <p>3 from 2004 to 2012 they both fall by , similar / same , rate or by 6 (per km²) ✓</p> <p>4 woodland population (decreases) , from 98 to 48 (per km²) / by 50 (per km²) / by 51%</p> <p>farmland population , and from 110 to 79 (per km²) / by 31 (per km²) / by 28%</p> <p>or and difference of 31 (per km²) in 2012 difference of 12 (per km²) in 1992</p> <p>or 23% more decrease in woodland / woodland decreased by 19 (per km²) more than farmland ✓</p>	2 max	<p>Must be comparative statements</p> <p>2 must be stated and not implied from figs</p> <p>4 ecf for 27% / 29% (if that is candidate's answer to (a)(i))</p>

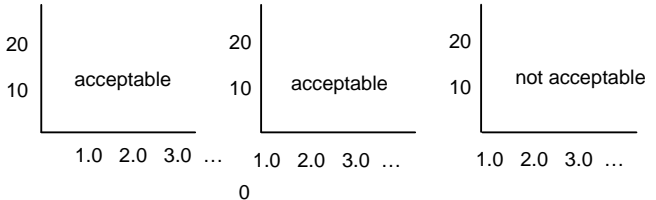
Question			Answer	Mark	Guidance
5	(a)	(iii)	<p><i>woodland population dropped more because of new / more , predator(s) / parasite(s) / disease(s) (of butterflies)</i> or more interspecific competition / new species competing for food or (lack of management / woodland became over grown / reduction in open spaces , leading to) loss of , habitat / food supply / breeding sites ✓</p> <p><i>farmland decreased less because</i> leave , wildlife refuges / area to grow wild or conserve hedgerows or fewer , predators / parasite(s) / disease(s) (of butterflies) or (more open spaces) for breeding sites ✓</p>	1 max	<p>Must specify which population is being discussed.</p> <p>DO NOT ACCEPT in the context of deforestation</p>
5	(a)	(iv)	<p><i>lacks validity because</i></p> <p>1 weather conditions only apply to 2012 ✓</p> <p>2 numbers were falling before 2012 ✓</p> <p>3 weather conditions and butterfly decline may not be linked / other factors may be responsible ✓</p> <p>4 not enough / no / need more , data / evidence (to know that it is the cause of decline) ✓</p>	2	<p>IGNORE statements relating to being valid</p> <p>1 ACCEPT we only know that it was cold and wet in 2012</p> <p>4 ACCEPT we need more information about weather</p>

			5 weather conditions in North of England not representative of the whole country ✓		5 ACCEPT we only know about the weather in Northern England
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Question			Answer	Mark	Guidance
5	(a)	(v)	(same) time of year / time of day / time between sampling or (same) size of sample area / length of transect / number of transects or (same) capture / counting / sampling , technique or (exactly the same) place in each habitat ✓	1	Mark the first variable. IGNORE 'time' unqualified

Question	Answer	Mark	Guidance
5 (b)	<p><i>woodlands have a greater species richness because</i> greater number of butterfly species are in decline (than on farmland) ✓ (so probably) greater number of species were present (originally) ✓ more , niches / types of food available / variety of (food) plants ✓ less (or no) pesticide use in woodland / pesticide use in farmland ✓ farmland likely to , be a monoculture / grow limited number of plant species ✓ monoculture results in fewer , niches / variety of food plants ✓</p> <p>OR</p> <p><i>farmland have a greater species richness because</i> lost fewer butterfly species ✓ (so) probably larger number of species remain ✓ have conservation areas / conserve hedgerows / leave wildlife refuges / leave areas to grow wild ✓ (so) more , niches / variety of (food) plants ✓</p> <p><i>general point</i> butterflies are an , indicator species / indicator of what is happening (to other species in the habitat) ✓</p>	2 max	

Question			Answer	Mark	Guidance
5	(c)	(i)	genetic (biodiversity) ✓	1	
5	(c)	(ii)	allows for adaptation to changing environment ✓ provides variation for natural selection ✓ can offer , camouflage / protection from predators ✓	1 max	ACCEPT in the context of an example e.g. species survival when , a / new , disease introduced

Question	Answer	Mark	Guidance														
6 (a) (i)	<p>1 appropriate scale chosen</p> <p>and x axis labelled <u>glucose concentration (mmol dm⁻³)</u></p> <p>and y axis labelled <u>mean % absorbance</u> ✓</p> <p>2 points plotted correctly ✓</p> <p>3 straight line of best fit drawn on graph (not extending beyond the plot points) ✓</p>	3	<p>1 IGNORE presence or absence of 0 at origin(s) unless either axis is deemed to have started above 0</p>  <p>2</p> <table border="1" data-bbox="1333 673 2005 820"> <tr> <td>x axis glucose concentration (mmol dm⁻³)</td> <td>1.0</td> <td>2.0</td> <td>3.0</td> <td>4.0</td> <td>5.0</td> <td>6.0</td> </tr> <tr> <td>y axis mean % absorbance</td> <td>67</td> <td>54</td> <td>47</td> <td>41</td> <td>26</td> <td>16</td> </tr> </table> <p>Centre of cross or dot within + or – half a small square one error in the plotted points</p> <p>ALLOW for glucose concs 1, 3, 5 & 6 mmol dm⁻³ should be in a straight line.</p> <p>Points for glucose concs 2, 3 & 4 mmol dm⁻³ should be in a straight line with a shallower gradient</p> <p>Note: A bar chart will only be able to access mp 2</p>	x axis glucose concentration (mmol dm ⁻³)	1.0	2.0	3.0	4.0	5.0	6.0	y axis mean % absorbance	67	54	47	41	26	16
x axis glucose concentration (mmol dm ⁻³)	1.0	2.0	3.0	4.0	5.0	6.0											
y axis mean % absorbance	67	54	47	41	26	16											

Question			Answer	Mark	Guidance
6	(a)	(ii)	find the absorbance (of the juice using the colorimeter) ✓ (from the graph) find the concentration that corresponds to this absorbance ✓ follow the , absorbance value / value on y axis , across to , line of best fit / (calibration) curve , and then down to the , concentration / x axis ✓	2 max	ACCEPT vertical and horizontal for x and y

Question			Answer	Mark	Guidance
6	(b)	(i)	<p>1 taste the fruit juices to see how sweet they are ✓</p> <p>2 place a sample of each fruit juice in a biosensor and take the reading or test each fruit juice with , Benedict's / diastix / clinistix / (diagnostic) test strip and observe colour(s) ✓</p> <p>3 obtain rank order for , sweetness / fruit juice glucose concentration ✓</p> <p>4 compare rank orders (of fruit juices) for sweetness and glucose concentration ✓</p> <p>5 how a variable was controlled during , taste / glucose concentration , test ✓</p>	4 max	<p>1 could be in the context of different juices or a series of dilutions of the same juice (to give different glucose concentrations) or a series of glucose concentrations</p> <p>2 ACCEPT semi-quantitative test for reducing sugar Benedict's tests on each fruit juice and weigh mass of precipitate formed for each juice ACCEPT plausible way of determining glucose concentration e.g. relative density / specific gravity / mass change as a result of osmosis Benedict's – blue to red with increasing concentration diastix – green/blue to red clinistix – green/blue to red or pink to (dark) purple</p> <p>4 ACCEPT the use of a statistical test if rank orders for both are numerical</p> <p>5 e.g. use same , number of drops / volumes , of fruit juice cleanse palate between juices blind taste test / stated way to avoid bias tasted by a number of subjects (and results pooled) keep test strip in sample for same length of time add excess Benedict's heat for same length of time / at the same temperature (Benedict's only) filter precipitate in same way (semi-quantitative Benedict's only)</p>

Question			Answer	Mark	Guidance
6	(b)	(ii)	tasting is , subjective / (only) qualitative / not quantitative or hard to quantify sweetness or people may have different , judgement / opinion / taste buds ✓ colour judgement (in Benedict's) is subjective ✓ (juice) may contain , sucrose / fructose / other (named) sugar / (artificial) sweetener ✓	1 max	IGNORE accuracy / reliability ACCEPT ref to biased opinion ACCEPT sensible ref to acidity in juice masking sweetness IGNORE ref to 'other ingredients' unqualified
6	(c)	(i)	<i>both</i> contain , C / carbon (atoms) and H / hydrogen (atoms) ✓ contain , O / oxygen (atoms) ✓ have , OH / hydroxyl / hydroxide (groups) ✓	2	Mark the first 2 answers IGNORE properties e.g. solubility IGNORE ref to hexagons / rings IGNORE hydrocarbon DO NOT ACCEPT hexose DO NOT ACCEPT ions DO NOT ACCEPT molecules / groups DO NOT ACCEPT molecules / groups ACCEPT alcohol group DO NOT ACCEPT molecules
6	(c)	(ii)	(glucose is) soluble (in water) ✓	1	ACCEPT polar / dissolves (in water)
Total				70	

Appendix

Level of Response Exemplars

Question 3(c) Explain how alveoli are adapted for efficient gas exchange.

e.g. 1
Level 2

(c)* Alveoli are located in the lungs of mammals.

Explain how alveoli are adapted for efficient gas exchange.

One way ~~our~~ alveoli are adapted for efficient gaseous exchange is that they have thin walls which means that there is a short diffusion distance for oxygen to diffuse out and CO₂ to diffuse in. Furthermore, Alveoli are also well ventilated ~~with oxygen~~ allowing for more effective ~~diffusion~~ gaseous exchange. In addition to that, Alveoli ~~are~~ ~~are~~ good blood supply as well which makes gas exchange ~~take part~~ quicker as there is enough blood for all of the oxygen to diffuse to. There are also lots of alveoli which increases exchange rate.

9
Lots of alveoli so more efficient ~~exchanging~~
well ventilated
short ~~diffusion~~ distance to diffuse
good blood supply

with mark for communication = 4 marks

brief notes seen – to be considered if points not made in main answer

D – adaptation and explanation

G – adaptation but no explanation

G – adaptation but no explanation

A – detail of adaptation

More than one category of adaptation identified
One adaptation has with additional detail.
One explanation given and we know which adaptation it refers to.
So only accesses L2 as we need more than one explanation L3.

L2

e.g. 2

Level 1 with mark for communication = 2 marks

Explain how alveoli are adapted for efficient gas exchange.

The alveoli have a moist surface and constant blood supply for gas exchange. They have a short diffusion pathway to ~~travel into~~ allow gases to diffuse into the blood stream. There is a constant diffusion gradient as O_2 and CO_2 diffuse in and out. They also have a constant oxygen supply for ~~diffuse~~ gas exchange to take place. Have a large surface area for maximum gas uptake.

A - adaptation

[6]

L1

Explanations not clearly in the context of an adaptation. Adaptation stated but no extra detail. So only accesses L1.

e.g. 3
Level 2 with mark for

communication = 4 marks

D – detail of adaptation & explanation

A – adaptation

G – adaptation & explanation

Explain how **alveoli** are adapted for efficient gas exchange.

The walls of the alveoli are only one layer of flattened epithelial cells, so a short diffusion distance for oxygen and carbon dioxide to get to the blood is created. They also have a large surface area to volume ratio so there is a large area on which diffusion can occur, and a short diffusion distance is also created. The alveoli are highly vascularised so they have access to a ~~good~~ constant blood supply. This maintains the concentration gradient for diffusion and creates a short diffusion distance as the blood vessels are next to the alveoli. Due to these factors, the rate of diffusion of oxygen and carbon dioxide into and out of the alveoli is very fast, so gas exchange is efficient.

- ① thin walls ∴ short diff. dist.
- ② large SA:V ∴ large area for diff. and
- ③ highly vascularised ∴ maintains conc. gradient (good blood supply) +

Three adaptations identified, one with extra detail. Explanation supplied for only one adaptation so science only gives it a L2.

e.g. 4

Level 3 with communication statement = 6 marks

(c)* Alveoli are located in the lungs of mammals.

Explain how **alveoli** are adapted for efficient gas exchange.

Alveoli are made up of squamous epithelium tissue. This tissue is very thin and means that the walls of ~~the~~ alveoli are only 1 cell thick. This greatly reduces the diffusion distance that oxygen and carbon dioxide have to pass through during gas exchange. Therefore, gas exchange can happen quickly. There are also ~~thousands~~ thousands of alveoli in our lungs, resulting in a large SA:V ratio. This also makes ^{the} diffusion ~~easy~~ of gases occur faster due to the space available for gas exchange to take place. Alveoli are surrounded by capillaries that are constantly bringing deoxygenated blood to the lungs to be oxygenated. This creates a constant ~~oxygen~~ ^{oxygen} concentration gradient between the blood and the alveoli, causing the diffusion of oxygen to occur very quickly during gas exchange.

D – detail of adaptation & explanation

A – detail of adaptation

G – detail of adaptation & explanation

Three adaptations identified, two with extra detail. Explanation supplied for two adaptations. So can access L3.

L2

Question 4(c) A number of common factors affect the spread of communicable diseases in humans and some of them are relevant to the spread of Ebola.

From the information above, discuss these factors and suggest what actions could have been put in place to address them.

e.g. 1
Level 2 with

One factor is that there is sometimes poor understanding of the cause of the disease. This can be seen in the Ebola outbreak as initially there were not many trained professionals, so the illness was allowed to spread. This could have been prevented if health workers were sent out immediately. Another issue is that the illness is not contained. For example, Ebola victims would travel to stay with relatives, spreading the illness as they travelled and then to their relatives. Also, the residents who fled may have already caught the disease, so they took the disease to wherever they fled to. This could have been prevented by placing people in quarantine. [6]

Also, improper disposal of the victim's bodies was an issue. Burying the deceased straight away would have reduced the spread of Ebola

F1 – action

F5 – action

F6 – action

L2

communication mark = 4 marks

Three plausible actions identified.
No discussion expanding any of the factors in the bullet points.
So can access L2 only.

e.g. 2

Level 0 = 0 marks

A lack of hygiene (poor hygiene) increases ~~that~~ the likely hood of a spread of disease. Appropriate training ~~should~~ should be taken to deal with viral diseases and the training should be offered ~~so that~~ in many countries ~~prone~~ prone to disease. ~~the~~ living in close proximity makes ~~of~~ the disease spread from person to person a lot quicker, ~~so~~ houses should be build with enough proximity. Also untrained ^[6] individuals should not deal with the deceased body of person who had a disease as they can still catch the disease.

No plausible actions identified.
No discussion expanding any of the factors in the bullet points.
So cannot access L1.

X

e.g. 3

Level 3 with communication mark = 6 marks

A number of common factors affect the spread of communicable diseases in humans and some of them are relevant to the spread of Ebola. From the information above, discuss these factors and suggest what actions could have been put in place to address them.

F1 - discussion and action

- a severe lack of trained health workers, means that ill people cannot get the medicine & care they need to get better, and others at risk of catching it cannot be warned or vaccinated against it, so ~~the case~~ ~~is~~ ~~transmitted~~ ~~with~~ ~~more~~ ~~workers~~ ~~should~~ ~~have~~ ~~been~~ ~~sent~~ ~~to~~ ~~the~~ ~~area~~, as well as medicine & warning on the news & radio.
- the fact it is infected with bodily fluids means it can be transmitted through sex & ~~person~~ ^{urine} ~~urine~~ ~~or~~ ~~urine~~, so people should be given condoms & advised to keep toilets as clean as possible.

F5 - discussion and action

4 - many residents lived in close proximity to (C) one another & people gathered ~~for~~ ^{to} pay respects to the deceased. This means transmissions of Ebola can occur more rapidly & affect more people as it is large gatherings of people close to one another. Therefore a ring vaccination should have been put in place, to ~~oh~~ give immunity to those at greater risk.

- People left their villages & ^{also} travelled to nearby places. This will spread the pathogen to other places & even nationally or internationally if planes are ~~border~~ ^{bordered}. Therefore quarantine the people, ~~or~~ ^{or} vaccinate, & if they don't show vaccination documentation they cannot leave the village or travel abroad.

L3

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