



# **GCSE MARKING SCHEME**

**SCIENCE - BIOLOGY (LEGACY)**

**SUMMER 2012**

## **INTRODUCTION**

The marking schemes which follow were those used by WJEC for the Summer 2012 examination in GCSE SCIENCE - BIOLOGY (LEGACY). They were finalised after detailed discussion at examiners' conferences by all the examiners involved in the assessment. The conferences were held shortly after the papers were taken so that reference could be made to the full range of candidates' responses, with photocopied scripts forming the basis of discussion. The aim of the conferences was to ensure that the marking schemes were interpreted and applied in the same way by all examiners.

It is hoped that this information will be of assistance to centres but it is recognised at the same time that, without the benefit of participation in the examiners' conferences, teachers may have different views on certain matters of detail or interpretation.

WJEC regrets that it cannot enter into any discussion or correspondence about these marking schemes.

**UNIT B1 (LEGACY)**  
**FOUNDATION TIER**

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
1. (a)	(Thick) fur Accept hair	1
(b)	Rough (hair) gives good <u>grip</u> / <u>prevents slipping</u>	1
(c) (i)	Any two from Fox / Eagle / Stoat	1
(ii)	<u>High rate</u> of (re)production / <u>many</u> young produced /	1
(d)	Camouflage / cannot be seen (by predators) Accept: blends into background	1
(e) (i)	Eats only plants/ does not eat animals/ it is a herbivore NOT does not eat meat/ kill other animals/ does not hunt	1
(ii)	Eats/ takes/ destroys (farm) <u>crops</u>	1
<b>Question total</b>		<b>[7]</b>

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
2. (a)	17 (consistent with graph)	1
(b)	Two bars correct height Tolerance +/- ½ small square	2
(c)	160 – 164	1
(d) (i)	All males / same age	1
(ii)	Improves reliability/ increases confidence in the results NOT fair test/ accuracy/ precision	1
(e)	Sexual                      Continuous                      Environmental	3
<b>Question total</b>		<b>[9]</b>

Question	Marking details	Marks Available
3.	(a) (i)	3 max
	Light	
	Sound	(-1 per
	Touch	error)
	Chemical	
	Chemical	
	(ii) Eyes, ears	1
	(b) (i)	
	Receptors	1
	(ii)	
	Electrical	
	NOT electric/ electricity	1
<b>Question total</b>		<b>[6]</b>

**FOUNDATION / HIGHER TIER**

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
4. (a)	Fat/ glycogen/ lipids	1
(b) (i)	Any two from <u>heart</u> disease / cancer / knee or joint <u>damage/ harm</u>	1
(ii)	Fish/ sushi	1
(iii)	Running	1
(iv)	1400 / 350 4 hours (2 marks for correct answer)	2
(c)	<u>Increase/ regular/ lots of/ enough</u> exercise (qualified)/ named activity e.g. football/ go to keep fit / OR {Not too much/ decrease} <u>high energy</u> food/ correct comparison from table/ eat less fat or carbohydrate/ eat a balanced diet NOT eat less/ eat healthy/ ref to surgery or medication	1
<b>Question total</b>		<b>[7]</b>

Question	Marking details	Marks Available
5. (a)	A hair	1
	B {carries / transports / conveys} sweat/ sweat travels through	1
	C erector muscle	1
	D produces/ makes sweat	1
	E (blood) capillary/ blood vessel	1
(b)	Releases sweat / allows sweat out (onto skin surface)	1
	NOT: water	
<b>Question total</b>		<b>[6]</b>

Question	Marking details	Marks Available
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6/1	(a) (i) RR	1
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	(ii) rr	1
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	(iii) Rr	1
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(b)	(i) Award 1 mark for all 4 gametes being correct	1
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	Award 1 mark for all 4 offspring being correct	1
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Allow e.c.f from (a) if different letters used

Gametes	r	r
R	Rr	Rr
r	rr	rr

(ii)	I The <u>appearance / features/ looks/ characteristic</u> of an organism that results from the <u>genotype / genes</u> .	1
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	II 1 <u>rose</u> (comb) : 1 <u>single</u> (comb). (ecf from punnett square) NOT 2:2/ 50:50	1
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Question	Marking details	Marks Available
7/2	(a) DNA NOT saliva  (b) (i) Suspect 1;  Has the <u>same {genetic/ DNA} {fingerprint/ profile} as found at the scene of the crime;</u>  Accept DNA matches the scene of the crime	1
	(ii) Reference to <u>ownership of DNA</u> of innocent suspect/ because it is an {invasion/ breach} of privacy/ it is against human rights	1
	(c) Disputed paternity / parentage cases / classification/ correct reference to use by insurance companies/ identification of dead bodies.	1
<b>Question total</b>		<b>[5]</b>

Question	Marking details	Marks Available
8/3	(a) Number of prey has fallen and so numbers of spotted owls fall ; Something wrong with environment; OR More prey species leading to more owls; Showing environment is healthy; To check if there is anything wrong with the environment = 1 mark	1 1
(b)	Common names are different in different {parts of USA / areas}/ scientific names are the same all over the world (OWTTE)/ scientific names are always the same	1
<b>Question total</b>		<b>[3]</b>
<b>TOTAL FOUNDATION TIER</b>		<b>50</b>

## HIGHER TIER

Question	Marking details	Marks Available
4. (a)	{ <u>Jellyfish /fluorescent protein</u> } gene/allele is cut out of <u>DNA</u>	1
	OR gene is cut out of jellyfish <u>DNA</u> ;	
	<u>Zebrafish DNA</u> (in egg) cut open;	1
	{ <u>Jellyfish /fluorescent protein</u> } gene {inserted / spliced} into <u>zebrafish DNA</u> ;	1
(b)	Concerns of escape of gene into <u>wild/ native</u> population/ transfer gene to other fish;	1
	<b>Question total</b>	<b>[4]</b>

Question	Marking details	Marks Available
5. (a)	Alcohol slows reaction time / the time taken to react is longer with alcohol/ reaction time is increased with alcohol/ reactions are slower with alcohol/ ORA  Must be clear whether answer refers to alcohol  NOT reaction time decreased/ reduced/ lowered	1
(b)	Improves reliability / confidence in the results.  NOT accuracy/ validity/ fair test	1
(c)	50%	1
(d)	Alcohol slows reaction times/ increases thinking time/  Alcohol affects sight / impairs vision;  Increases the time taken to brake/ increase likelihood of accident;	1
(e)	liver damage or cirrhosis / mouth cancer/ heart disease/ stomach damage/ kidney damage/ damage to foetus;  NOT heart attack.	1
<b>Question total</b>		<b>[6]</b>

Question	Marking details	Marks Available
6. (a)	<u>Increased</u> {number/ rate} of mutations or cancers;	1
(b) (i)	2.5 <u>mSv</u> Accept any figure 0 – 2.5 mSv (unit must be written correctly)	1
(ii)	{Time / distance} for radioactivity to {be blown to/ travel to / be carried to/ reach} (Wales) / time for radioactivity to enter food chain.	1
(c) (i)	{Meat/ sheep} could not be sold / sheep could not be moved to other areas; NOT less meat sold	1
(ii)	so loss of income/ lose jobs;	1
<b>Question total</b>		<b>[5]</b>

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
7. (a) (i)	Pancreas	1
	(ii) DNA	1
	(iii) Hormones	1
(b) (i)	Mitosis (correct spelling)	1
	(ii) Chromosome	1
(c)	Any 2 from (Objections) to use of embryos; (Objections) to use of monkeys / animals; genetically modified; animals may respond differently to humans; NOT unethical/ cruel ( unqualified)	2
<b>Question total</b>		<b>[7]</b>

Question	Marking details	Marks Available
8. (a)	D.C.B.E.A. 4/5 correct = 3 marks 3 correct = 2 marks 2 correct = 1 mark 0/1 correct = 0 marks.	3
(b)	Any 2 = 1 mark. Protective or stops body being harmed / fast or rapid or quick / automatic or involuntary or does not involve brain/thought;	1
(c) (i)	Muscle /any named voluntary muscle	1
(i)	Spinal cord	1
<b>Question total</b>		<b>[6]</b>

Question	Marking details	Marks Available
9. (a)	(Gregor) Mendel (Spelling of Mendel must be correct).	1
(b)	Medium	1
(c)	Any 2 from Variation; Medium stem length better adapted; (survival advantage) increased chance of pollination/ reproduction; genes/ DNA/ alleles passed on;	2
(d)	Any 3 Wind; Soil / pH; minerals / nutrients / water/ rain; Light / shade; Temperature; NOT heat Grazing/ grazers; Salt spray; NOT disease/ habitat destruction/ space/ pollution/ predators/ weather/ climate	3
<b>TOTAL HIGHER TIER</b>		<b>50</b>

**UNIT B2 (LEGACY)**  
**FOUNDATION TIER**

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
1. (a) (i)	A <u>Cell</u> membrane;	1
	B Nucleus;	1
	C Cytoplasm;	1
(ii)	Any <b>two</b> from cell wall; chloroplast; vacuole;	2
(b) (i)	Stem;	1
(ii)	Plants grow throughout life but animals grow to a definite size;	1
	<b>Question total</b>	<b>[7]</b>

Question	Marking details	Marks Available
2. (a) (i)	Takes <u>{land/area/ ground}</u> needed <u>{for breeding/ nesting/ laying eggs}</u> NOT prevent breeding	1
(ii)	There will be <u>{less/ fewer}</u> <u>{eggs/ young/ baby birds}</u> / fewer eggs will hatch;	1
(iii)	Kills/ reduces/ less/ <u>fish</u> needed for <u>food</u> ; Accept No fish available for food Accept <u>poisons</u> birds.	1
(b)	Decrease fishing / stop over-fishing/ limit fishing/ stop fishing;	1
(c) (i)	{Pollution / tourism / fishing} <u>increasing</u> ; To prevent extinction/ being endangered; <u>Help</u> numbers increase or to <u>prevent</u> numbers declining; The numbers are decreasing;	1
(ii)	Reference to an economic factor (More jobs / more money);	1
<b>Question total</b>		<b>[6]</b>

Question	Marking details	Marks Available
3. (a) (i)	Snake / frog;	1
	(ii) Lettuce;	1
	Sun(light); NOT light alone	1
(b) (i)	12000 – 1600 <b>and</b> 10400;	1
	(ii) Lettuce to slug; ( allow e.c.f)	1
(c)	Heat (qualified) e.g. from respiration / maintenance and repair of cells / waste materials or named waste material (as specification) NOT death/ decomposition	1
<b>Question total</b>		<b>[6]</b>

**FOUNDATION / HIGHER TIER**

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
4. (a)	(i) Correctly Placed  Accept Words or correct formulae  Water;  Glucose;	1    1
	(ii) Absorbs light;	1
(b)	(i) Oxygen/ O <sub>2</sub> ;	1
	(ii) I Increase <u>then</u> no change / steady/ level; NOT increase and stops  II Correct from <u>graph</u> – 38 (a.u);  Not incorrect units  III Calculation consistent with II 38 (allow ECF) and graph (26/ 25.5)  38-26=12  Or 38-25.5=12.5;	1         1
	(iii) Reduced / lower / decreased;	1
<b>Question total</b>		<b>[8]</b>

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
5. (a)	Protein;	1
	Chemical;	1
	pH (value); correct cases	1
(b)	All plots correct. +/- ½ small square ;; Deduct one mark for extrapolation	2
	Line through centre of plots;	1
(c)	Sketch line consistent with clear decrease in activity and must reach/ cross 70°C vertical;	1
(d)	Denatures / destroys; NOT kills/ loses shape/ stops it working	1
<b>Question total</b>		<b>[8]</b>

Question	Marking details	Marks Available
6/1 (a)	A – Oesophagus / gullet;	1
	B – Stomach;	1
	C – Small intestine/ ileum;	1
	D – Large intestine/ colon;	1
	Allow phonetic spelling	
(b) (i)	(pH) 1.5;	1
	(ii) Stomach;	1
	(iii) Temperature / mass of protein <u>at start</u> / same protein / same volume / same mass or concentration of enzyme; NOT amount	1
<b>Question total</b>		<b>[7]</b>

Question	Marking details	Marks Available
7/2 (a)	A species { <u>introduced/ brought in/ imported</u> } from another <u>country</u> / the <u>introduction</u> of a species not native to the <u>country</u> .	1
(b)	Biological control/ biocontrol	1
(c)	{Research/ tests / trials/ experiments} have to be carried out; To make sure that the species (biological control agent) {does not become a pest itself /doesn't harm non target species or humans} (OWTTE)/ to check species does not introduce disease.	1
<b>Question total</b>		<b>[4]</b>

Question	Marking details	Marks Available
8/3 (a)	Insecticide is on the {food/ plants/ crops} (that it eats).	1
(b) (i)	Sparrowhawk eats { <u>many/ lots of</u> } {pigeons / blue tits/ prey}; insecticide is {persistent / bioaccumulates / builds up in the body / not excreted/ not broken down}; NOT concentration increases/ more concentrated/ becomes concentrated	2
(ii)	It reaches { <u>toxic/poisonous</u> } level in sparrowhawk (ORA)	1
<b>Question total</b>		<b>[4]</b>
<b>TOTAL FOUNDATION TIER</b>		<b>50</b>

## HIGHER TIER

Question	Marking details	Marks Available
4. (a)	A Respiration; NOT anaerobic respiration	1
	B Photosynthesis;	1
	C Feeding/ eating;	1
(b)	<u>{Decomposers/ bacteria/ fungi}</u> {feeding on / break down/ decompose/ putrefy/ decay/ rot} the bodies;	1
	Release <u>{it/ carbon dioxide}</u> during <u>respiration</u> ;	1
	Decomposers respire producing carbon dioxide = 2	
	OR	
	Dead plants and/ or animals become <u>fossilised</u> ;	
	<u>{Combustion/ burning}</u> of fossil fuels releases <u>{carbon dioxide/ it}</u> ;	
	<b>Question total</b>	<b>[5]</b>

(b)	(i)	Not enough light available/ low light intensity; Any reference to carbon dioxide being in low concentration negates a correct answer.	1
	(ii)	Photosynthesis is taking place at the maximum rate for the (concentration of) Carbon dioxide available/ CO <sub>2</sub> is {a/the} limiting factor/ not enough carbon dioxide available to increase the rate of photosynthesis; (amount= neutral) Any reference to light being the limiting factor negates a correct answer.	1
(c)		Any <b>one</b> of: Measure the volume /concentration/ number of bubbles of O <sub>2</sub> ; Measure volume of CO <sub>2</sub> taken up; Measure the mass of starch / glucose produced (NOT volume of water used/ any record of light used). (NOT amount).	1
(d)		Any <b>one</b> from: Respired to provide energy/ respiration; Converted/ changed to starch; Used to make cellulose / proteins / lipids; NOT cell walls/ growth and repair	1
<b>Question total</b>			<b>[5]</b>
<b>6.</b>	(a)	Oystercatcher;	1
	(b)	Spire shell / clam / sandhopper;  crab / fish;  sandpiper / turnstone;	3
	(c)	(i) Sandpiper and turnstone;	1
		(ii) Industry / factories/ relevant named industry e.g. paper mill;	1
<b>Question total</b>			<b>[6]</b>

Question	Marking details	Marks Available
7.	(a) (i) 67/68 <u>mg/100cm<sup>3</sup></u> ;	1
	(ii) Anaerobic respiration;	1
	(iii) Glucose;	1
	(b) Oxygen debt has to be repaid/ paid back/ removed; to remove/ break down lactic acid;	2
<b>Question total</b>		<b>[5]</b>

Question	Marking details	Marks Available
8. (a)	Light / temperature / pH; (amount = neutral)	1
(b)	Useful up to a maximum concentration / can increase growth up to stated concentration (0.6); then does not increase growth / decrease growth/ kills plants above 0.6M/ kills plants at 0.8M;	2
(c)	To show NITRATE causes growth; not SODIUM;	2
(d)	Any 3 <u>Overgrowth/ excess growth</u> of plants or algal bloom <u>and</u> they die; Decayed/ decomposed by bacteria/ decomposers; Take in oxygen by respiration and the fish die;	3
<b>Question total</b>		<b>[8]</b>

Question	Marking details	Marks Available
9. (a)	<p>Osmosis (correct context);</p> <p>water passes out of {cells / eggs / animals};</p> <p>from where <u>it</u> is in high concentration to low concentration/ down a gradient / from high to low water potential (must be clear that high concentration of water is inside newt);</p> <p>through {selectively / partially / semi} permeable membrane.</p>	4
(b)	<p>{Make / provide/ choose} {new ponds / habitat/ safe area};</p> <p>relocate newts;</p>	2
<b>Question total</b>		<b>[6]</b>
<b>TOTAL HIGHER TIER</b>		<b>50</b>

**UNIT B3 (LEGACY)**  
**FOUNDATION TIER**

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
1. (a)	Red (blood) cell;  White (blood) cell;  Platelet;  Plasma;	4
(b) (i)	Capillary;	1
(ii)	{Named substances/ substances} {diffuse/ pass} {through/ in/ out}  OR less distance for diffusion;  Allow reference to white blood cells passing through  Allow exchange of materials  NOT diffusion unqualified or Blood passing through  If use named substance must be in correct direction	1
(c)	Artery/ arteries;	1
<b>Question total</b>		<b>[7]</b>

Question	Marking details	Marks Available
2. (a)	Ureter; Bladder; Urethra; SPELLING correct	3
(b) (i)	I Eat normally/ not a strict diet / <u>only</u> one hospital visit/ fewer hospital visits; NOT you can have a operation	1
	II No drugs;	1
(ii)	I Low blood pressure / vomiting;	1
	II Rejection;	1
(c)	(Measures to encourage) <u>more</u> donors/ make donation compulsory;	1
(d)	Urea/ <u>excess</u> water/ <u>excess</u> salt;	1
	<b>Question total</b>	<b>[9]</b>

Question	Marking details	Marks Available
3. (a)	Day 2 = 37/38/39 Day 3 = 52 (both correct for 1 mark);	1
(b)	Three correct bars (height and position and labelled 1,2,3);; 3 bars correct = 2 marks 2 bars correct = 1 marks 0/1 bars correct = 0 marks	2
(c) (i)	Consistent with bar chart (allow e.c.f.) (should be B);	1
(ii)	C; <u>Largest/ Highest</u> at day 1; OR first bar is the highest	1
(d)	Prevents entry of {unwanted/ other} {micro-organisms/ bacteria/ microbes/ fungi/ viruses} (from the air)/ prevent exit of bacteria; NOT to prevent contamination unqualified NOT reference to germs/ pathogens	1
(e) (i)	Cannot kill viruses;	1
(ii)	Resistance/ Bacteria become immune (accept MRSA); NOT disease or patient becomes {immune/ resistant}/ the bacteria start to fight it/ germs becoming resistant	1
<b>Question total</b>		<b>[9]</b>

FOUNDATION / HIGHER TIER

Question	Marking details	Marks Available
4. (a)	Bacteria;	1
	27-33(°C);	1
	Protein;	1
(b)	{Prevents / slows} {bacterial growth/ reproduction}. NOT kills bacteria	1
(c)	Any one from Bread and yeast; {Mycoprotein/ Quorn} and fungus; {Single Cell Protein/ Pruteen} and bacteria; Cheese and fungus; Cheese and bacteria;	1
<b>Question total</b>		<b>[5]</b>

Question	Marking details	Marks Available
5. (a)	3/ 4 correct = 3 marks;;; 2 correct = 2 marks 1 correct = 1 mark	3 max
(b) (i)	Nitrate / potassium / phosphate/ calcium/ magnesium; NOT nitrogen/ phosphorus	1
(ii)	Support / prevent wilting/ keeps cells turgid/ photosynthesis NOT carries minerals	1
<b>Question total</b>		<b>[5]</b>



Question	Marking details	Marks Available
7/2 (a)	<p>Any <b>two</b> from:</p> <p>(Same) {amount/ size/ volume/ area} of {egg stain/ egg/ stain};</p> <p>(Same) {size/ material / brand/ type} of T-shirts/ use 4 identical t shirts;</p> <p>(Same) {volume/ concentration} of washing powder used/ same pairs of washing powder; NOT amount</p> <p>(Same) washing machine used/ same program/ same time.</p> <p>NOT pH</p>	2
(b)	<p>Biological washing powders work {better/ best / are more effective} {at 35°C / lower temperatures} (ORA);</p> <p>Biological washing powders work better than non-biological powders at 35°C or lower temperature/ ORA;</p> <p>Credit can be given for any other correct conclusion/ must imply comparison.</p>	1
(c)	<p>reference to: less {energy / electricity} used /financial {cost / savings/ more economical/ more cost effective};</p>	1
(d)	Lipase;	1
<b>Question total</b>		<b>[5]</b>

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
<b>8/3</b> (a)	{Destroy or kill} {bacteria / micro-organisms}/ to sterilise it; NOT denature/ get rid of bacteria/ sanitise	1
(b)	Lid must be {sealed/ secured (with tape)};	1
	To prevent entry of other micro-organisms / prevent exit of {micro-organisms/ pathogens};	1
<b>Question total</b>		<b>[3]</b>
<b>Foundation tier total</b>		<b>50</b>

## HIGHER TIER

Question	Marking details	Marks Available
4. (a)	To prevent the entry of {micro-organisms or named micro-organisms}{which could kill the yeast / contaminate Penicillin / culture.);	1
(b)	Temperature monitor { <u>measures/ takes temperature</u> }; And {controls / adjusts} the { <u>rate of movement/ flow of / temperature of</u> }cooling water;	2
(c) (i)	84 hours;	1
(ii)	Penicillium; Correct spelling, (allow lower case p)	1
<b>Question total</b>		<b>[5]</b>
5. (a)	Single arrow (or many small arrows) starting at the soil, through root hair and passing out the stomatal pore.	1
(b)	Any <b>four</b> of the following points. Water enters root <u>hair</u> by osmosis; Water vapour lost through transpiration/ through stomata; Creates a pull/ draws water up; moves water up the xylem.	Max 4
<b>Question total</b>		<b>[5]</b>

Question	Marking details	Marks Available
6. (a) (i)	<p><b>A</b> <u>Bowman's</u> capsule; Allow Bowmens</p> <p><b>D</b> Collecting duct; NOT collection duct</p>	2
(ii)	<p>The pressure of blood is increased/ builds up pressure/ causes high pressure; NOT for pressure for ultrafiltration/ to increase filtration/ forces out small molecules or named molecules;</p>	2
(iii)	Urine;	1
(iv)	{Molecules/ particles} too big {to pass through filter or capillary knot/ to be filtered/ to pass into Bowman's capsule};	1
(b)	<p>B;</p> <p>C;</p>	2
<b>Question total</b>		<b>[8]</b>

<b>Question</b>	<b>Marking details</b>	<b>Marks Available</b>
7. (a)	Correct labels ;;	2
(b)	Both arrows leaving heart;;	2
(c) (i)	I;	2
(ii)	III;	
<b>Question total</b>		<b>[6]</b>

Question	Marking details	Marks Available
8. (a)	Presence of antibodies; NOT memory cells (not neutral)	1
(b)	(i) Antigen;	1
	(ii) White <u>blood</u> cells / lymphocytes; NOT phagocytes	1
(c)	Memory Cells;	1
<b>Question total</b>		<b>[4]</b>

Question	Marking details	Marks Available
9. (a) (i)	Carbon dioxide is produced by respiration; Forms carbonic acid; Lowers pH/ makes it more acid; NOT becomes 5	3
(ii)	(At 40%) yeast is killed (Not denatured)/ enzymes are denatured by alcohol; <u>No</u> {carbon dioxide/ carbonic acid} produced / <u>no</u> respiration; NOT less respiration pH does not change; ref to lactic acid - negates any marks	3
(b)	As concentration increases {more yeast is killed/ less respiration/ less carbon dioxide produced/ less carbonic acid produced};	1
<b>Question total</b>		<b>[7]</b>
<b>PAPER TOTAL</b>		<b>50</b>



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