

MARKING INSTRUCTIONS FOR HIGHER UNIT 2 QUESTION BOOKLET

Topic 2.1a - Metabolic Pathways

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	A	1	
2.	A	1	
3.	B	1	
4.	A	1	

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Topic 2.1b Control of Metabolic Pathways

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	C	1	
2.	A	1	
3.	B	1	
4.	A	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
5. a i	Concentration of copper sulfate (solution)	1	
a ii	<p>Same experimental set up but with (same volume of) water in place of copper sulfate / 0 mol⁻¹ copper sulfate.</p> <p>OR</p> <p>Full description of tube contents (10cm³ hydrogen peroxide, 5cm³ water/0 mol⁻¹ copper sulfate, paper disc soaked in catalase).</p>	1	NOT - 'same experimental set up without copper sulfate' alone.
a iii	Water bath/incubator/oven	1	
a iv	<p>One disc/test tube/experiment used at each concentration/solution.</p> <p>OR</p> <p>Experiment was not repeated at each concentration.</p>	1	NOT- only done once. NOT - experiment was not repeated and average taken alone.
b i	<p>Labels and scales correctly added. (1)</p> <p>Points plotted correctly and line drawn with ruler. (1)</p>	2	If axes are transposed but points are plotted correctly award 1 mark.
b ii	150	1	

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Question	Expected Answer(s)	Max Mark	Additional Guidance
c	<p>As the concentration of copper sulfate increased the activity of catalase decreased/inhibition of catalase increased.</p> <p>OR</p> <p>The activity of catalase decreased/inhibition of catalase increased as the concentration of copper sulfate increased.</p>	1	<p>NOT - as the concentration of copper sulfate increased the time for disc to rise increased.</p>

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2.2 Cellular Respiration

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	C	1	
2.	C	1	
3.	A	1	
4.	D	1	
5.	D	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
6. a	P is Acetyl CoA Q is Oxaloacetate	2	
b	ATP/ Energy is required AND A greater amount of energy/ ATP is produced	2	
c	Carry hydrogen and high energy electrons AND To the electron transport chain	2	
d	<ul style="list-style-type: none"> • Less ATP/ energy is produced (1) • Fewer electrons are passed to electron transport chain OR <ul style="list-style-type: none"> • Fewer hydrogen ions are pumped through the membrane (1) OR <ul style="list-style-type: none"> • ATP synthase is damaged (1) 	2	

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7.	a i	ADP + Pi/phosphate/inorganic phosphate Both required	1	NOT - P
	a ii	NAD	1	NOT - FAD
	a iii	It is a net/overall energy gain (following an energy investment at an earlier stage) OR More ATP/energy is produced/released than is used/invested (earlier/in stage1	1	Quantification acceptable ie 2 ATP used but 4 ATP produced
	b i	Increases the surface area for (action of) bacteria/Lactobacillus OR Bursts cells to release more substrate/cell contents for bacterial action	1	
	b ii	Acidic conditions/low pH/change in pH/decreased pH/anaerobic conditions/low oxygen inhibits/kills/other/most bacteria OR pH/oxygen levels optimum for Lactobacillus but not for other/most bacteria	1	

Question		Expected Answer(s)	Max Mark	Additional Guidance
8.	a i	lactose concentration/percentage	1	
	a ii	Temperature/concentration of yeast/pH	1	

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Question	Expected Answer(s)	Max Mark	Additional Guidance
b	<p>As lactose increases (from 4%) to 16%, ethanol (concentration) increases 1</p> <p>From 16% (to 20%) ethanol remains constant/levels off 1</p> <p>As lactose (concentration) increases, ethanol (concentration) increases then levels off = 1 mark</p>	2	<p>Both variables must be named at least once to gain any marks</p> <p>Must mention 16% as change point (not 2.8g/cm³ ethanol)</p>
c	37.5	1	NOT - 38
b ii	<p>Aerobic respiration does not produce ethanol</p> <p>OR</p> <p>Aerobic respiration produces water not ethanol</p> <p>OR</p> <p>No/less fermentation so less ethanol produced</p>	1	

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2.3 Metabolic rate

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	A	1	
2.	A	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
3. a i	Time of exposure (to oxygen); Temperature; Volume of blood; Surface area of blood exposed; Age of blood; pH.	1	Additional wrong answers negate.
a ii	40	1	
a iii	<p>More haemoglobin is bound to oxygen at lower oxygen level/between 20 and 60 units.</p> <p>OR</p> <p>Haemoglobin is more likely to bind to oxygen at lower oxygen/between 20 and 60 units.</p> <p>OR</p> <p>They have 24% of haemoglobin bound to oxygen at 20 unit compared to 20 units/lowest oxygen.</p> <p>OR</p> <p>They have 70% of haemoglobin bound to oxygen compared to 50% at 40 units.</p> <p>OR</p> <p>They have 90% of haemoglobin bound to oxygen compared to 80% at 60 units.</p>	1	NOT - more haemoglobin is bound to oxygen alone.

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Question	Expected Answer(s)	Max Mark	Additional Guidance
b	More red blood cells/EPO. OR Increased lung capacity / more capillaries / more alveoli. OR Increased myoglobin (in muscle cells).	1	NOT- produce more blood cells. NOT- more blood vessels.

MARKING INSTRUCTIONS FOR HIGHER UNIT 2 QUESTION BOOKLET**2.4 Metabolism in conformers and regulators**

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	C	1	
2.	D	1	
3.	C	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance	
4.	a	Enzymes have an optimum temperature or only work within a certain temperature range	1	
	b i	Hypothalamus	1	
	b ii	Nerve (impulse)	1	
	c i	Vasoconstriction / vessels get narrower	1	
	c ii	Reduces blood flow to skin so less heat loss	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
5.	a	<p>Mitochondria are the site of aerobic) respiration/electron transport chain/electron transfer chain/citric acid cycle. which produces ATP/releases/gives out energy.(1)</p> <p>Pumps/active transport/transporting salt requires ATP/energy. (1)</p>	2	
	b	<p>So that enzymes are at their optimum activity/temperature.</p> <p>OR</p> <p>High diffusion rates.</p>	1	<p>NOT - enzymes have an optimum temperature</p> <p>NOT - so enzymes don't denature.</p>
	c	<p>Regulators have a wider/larger range of niche(s)/ ecosystems/ environments/ habits.</p> <p>OR</p> <p>Regulators have more niche(s)/ecosystems/ environments/ habitats.</p> <p>OR</p> <p>Conformers have a narrower/smaller range of niche(s)/ ecosystems/environments/ habitats).</p> <p>OR</p> <p>Conformers have fewer niche(s) /ecosystems/ environments/ habitats.</p> <p>OR</p> <p>Conformers have narrow niche(s) and regulators have wide niche(s).</p>	1	

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2.5 Metabolism and Adverse Conditions

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	A	1	
2.	C	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
3. a	112	1	
b	<ul style="list-style-type: none"> • 08:00 - 12:00 (1) • Time of lowest metabolic rate (1) 	2	
c	<ul style="list-style-type: none"> • Energy saved / conserved OR • Uses less energy OR • Energy not wasted 	1	
d	<ul style="list-style-type: none"> • Dormancy OR • Hibernation OR • Aestivation OR • A correct description of one of these terms 	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
4.	a	990	1	
	b	<p>As temperature increases population decreases OR The higher the temperature the lower the population</p> <p>NB: If values included (21 to 72)/ (123 to 0.1) they must be correct, units not necessary</p> <p>NB: Any description extended beyond the first 4 days negates</p>	1	NOT - As the population decreases the temperature increases (Dependent variable controlling the independent is wrong)
	c i	<p>Species: B (1)</p> <p>Justification: high population/ population thrived at... 72 °C/highest temperature OR higher population than A or C at...72°C/highest temperature (1)</p>	2	<p>NOT - As the temperature increased the population increased</p> <p>NOT - its optimum temperature is 72 °C/ highest temperature</p> <p>NOT - can withstand a wider range of temperatures</p>
	c ii	Contain enzymes/proteins which are... tolerant of/don't denature at/are resistant to/optimum at/working at... high temperatures	1	<p>NOT - they are heat tolerant</p> <p>NOT - extreme temperatures</p>
	c iii	hot springs / geysers / volcanoes/ seabed vents	1	

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Topic 2.6 - Environmental Control of Metabolism in Microorganisms

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	B	1	
2.	D	1	
3.	C	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
4. a	20	1	
b	<p>increase - people becoming complacent about hand washing or bacteria becoming resistant</p> <p>OR</p> <p>no change - everyone now using procedure</p> <p>OR</p> <p>decrease - increased uptake of procedure</p>	1	
c	<p>Clostridium increases (1)</p> <p>Staphylococcus remains fairly constant (1)</p>	2	
d	<p>Conclusion - effective (1)</p> <p>Justification - although percentage of cases remains similar number of cases falls (1)</p>	2	
e	<p>Type - Clostridium</p> <p>Reason - percentage of cases due to Clostridium increased</p>	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
5.	a	<p>Name: Lag phase (1)</p> <p>Explanation: (time required for) DNA replication/enzyme induction/enzyme production</p> <p>OR</p> <p>Cells can't divide until DNA replicates /enzymes induced (1)</p> <p>NB: Correct explanation for lag phase with wrong name = 1 mark</p>	2	<p>NOT - log (check handwriting)</p> <p>NOT - lagging</p> <p>NOT - enzymes are starting to work</p> <p>NOT - enzymes are being switched on</p> <p>NOT - cells are getting used to the environment / acclimatising</p> <p>NB: Incorrectly named phase with matching explanation = 0 marks</p>
	b i	Stationary	1	NOT - 'C' alone
	b ii	<p>Kills/inhibits/toxic to/prevents growth of.... other bacteria</p> <p>AND</p> <p>reduces/eliminates competition from other bacteria</p> <p>OR</p> <p>allows it to outcompete other bacteria</p> <p>OR</p> <p>Eliminates interspecific competition</p>	1	NOT - kills other bacteria alone
	c	<p>Cell number decreases/line goes down...</p> <p>during/in</p> <p>death phase/phase D/at the end/ eventually</p>	1	

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6.	a i	Protein synthesis / translation / gene expression	1	
	a ii	1650	1	
	a iii	<p>Microbes bacteria/other yeast/other cells may compete with yeast/use up nutrients /compete for resources.</p> <p>OR</p> <p>Microbes/bacteria/other yeast/ other cells may reduce productivity / growth/yield of the culture/yeast.</p> <p>OR</p> <p>Microbes/bacteria/other yeast/other cells may cause disease/health risks/harm humans.</p>	1	<p>NOT - to ensure only yeast grows</p> <p>NOT - affect growth of the culture / yeast.</p> <p>NOT - prevent health risks without mention of microbes.</p>
	a iv	Add buffer / acid / alkali	1	
	b	<p>A Phase - Lag</p> <p>Description -Enzymes induced.</p> <p>B Phase - Stationary</p> <p>Description - Culture becomes depleted of nutrients/substrates/ resources/oxygen</p> <p>OR</p> <p>Secondary metabolites produced/build up</p> <p>OR</p> <p>Toxic metabolites/waste accumulate</p>	2	<p>NOT- enzymes are starting to work.</p> <p>NOT- enzymes are being switched on.</p> <p>NOT- cells are getting used to the environment.</p> <p>NOT- no cell division alone.</p> <p>NOT- birth rate = death rate alone.</p>
	c	Introduce genes/sequences that prevent survival (in external environment)/allow them to only survive in lab.	1	

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Topic 2.7 - Genetic Control of Metabolism in Microorganisms

Question	Expected Answer(s)	Max Mark	Additional Guidance
1.	B	1	

Question	Expected Answer(s)	Max Mark	Additional Guidance
2 a	Same/complementary sticky ends OR Complementary/matching base sequence/bases	1	NOT - enzyme cuts in same place in plasmid and chromosome NOT - same bases/ base sequence
b	(DNA) ligase	1	
c	In the presence of antibiotic only these/modified bacteria grow/survive OR Converse	1	NOT - modified plasmids survive in presence of antibiotic
d	Origin of replication	1	
e i	Lack of post-translational modifications OR It/protein/polypeptide is folded incorrectly	1	NOT - bacteria is a prokaryote and this is a eukaryote gene
e ii	Use yeast/put modified plasmid into yeast OR chemically modify protein	1	

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Question		Expected Answer(s)	Max Mark	Additional Guidance
3.	a	<p>Name: restriction endonuclease (1)</p> <p>Function: Cuts DNA/ genes out OR Cuts plasmid (1)</p> <p>OR</p> <p>Name: Ligase (1)</p> <p>Function: Joins/seals/inserts gene into plasmid OR Joins/seals/ sticky ends of plasmid and gene (1)</p>	2	<p>NOT - cuts gene from plasmid</p> <p>NOT - <u>to</u> plasmid</p> <p>NOT - joins sticky ends alone</p> <p>NOT - joins together gene and plasmid</p>
	b i	<p>Grow/culture with ampicillin/ antibiotic (1)</p> <p>Only cells containing the plasmid/that gene/transformed cells/modified cells can grow/survive (1)</p>	2	<p>NOT - only plasmids with gene survive</p> <p>NOT - only resistant cells survive</p>
	b ii	<p>DNA/gene/plasmid/genetic info. passed from/between/to ... cell/bacterium/bacteria ... in same generation/without reproduction/in same population/ neighbouring bacteria</p> <p>OR</p> <p>DNA/gene/plasmid/genetic information/vector passed by... conjugation/transduction/ transformation (or description)</p> <p>OR</p> <p>DNA/gene/plasmid/genetic info. passed from prokaryote to eukaryote</p>	1	<p>NOT - DNA /gene /plasmid / genetic info. passed from one bacterium to another alone</p> <p>NOT - term <i>conjugation</i> alone</p>

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Question	Expected Answer(s)	Max Mark	Additional Guidance
c	<p>Eliminates/kills... other/contaminating/unwanted... microorganisms/bacteria OR Eliminates competition from... other/unwanted... microorganisms/bacteria OR So only insulin-producing bacteria can grow</p>		<p>NOT - contamination alone NOT - answers relating to idea of patient safety</p> <p>NB: germs \neq microorganisms</p> <p>NOT - Reduces contamination by other microorganisms</p>