



# Mark Scheme (Results)

January 2019

Pearson Edexcel International GCSE

In Biology (4BI0) Paper 2B

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## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question number	Answer	Notes	Marks
1 (a)	1. smaller; 2. has protein coat / capsid / envelope; 3. no cell wall / no ribosomes / no flagellum / no plasmids / no circular chromosome / no nucleoid / no cell membrane / no capsule / no pili / non-cellular / no vacuole / no cytoplasm / no organelles / eq; 4. virus contains DNA <u>or</u> RNA / bacteria DNA <u>and</u> RNA / virus contains DNA <u>only</u> virus contains RNA <u>only</u> / only one kind of nucleic acid;	1. Allow converse 1. Ignore shape 3. Allow converse 3. Ignore no tail / no mitochondria / no nucleus 4. Ignore virus contains DNA/RNA	3 max
(b)	increased / high(er) / rising temperature / increased / high(er) / rising humidity / increased / high(er) / rising rainfall / global warming / eq;	Ignore mosquitoes reach biting age sooner / virus multiplies more / climate change / greenhouse effect / greenhouse gases	1
(c)	$(43 \div 1300 \times 100 =) 3.3 / 3.31 / 3.308 / 3.3077 / 3.30769 / 3.307692 / 3.3076923 / 3.30769231$	Correct answer gains full marks Allow one mark for $43 \div 1300 / 3 / 3.3$ recurring / 3.30	2

(d)	<p>1. temperature / heat / warmth / warmer climate;</p> <p>2. humidity;</p> <p>3. rainfall / rain / drought;</p>	<p>2. Ignore moisture / water / standing water / pools of water / swimming pool</p> <p>3. Ignore storm alone</p>	2 max
(e)	<p>1. birds contain virus / birds carry virus / birds have disease / birds are infected (with virus) / eq;</p> <p>2. mosquitoes feed on birds / mosquitoes bite birds (and transfer to humans);</p>		2
(f)	<p>1. place for mosquito to reproduce / lay eggs / breed / hatch eggs / eq;</p> <p>2. standing water / not drained / not cleaned / stagnant / not disturbed / untreated / eq;</p>	<p>2. Ignore abandoned / not monitored</p>	2

(g)	<p>1. modified / weakened / attenuated / non-harmful <u>virus</u> / dead / modified / weakened / attenuated / non-harmful / <u>pathogen</u> / eq;</p> <p>2. <u>memory</u> cells / lymphocytes / white blood cells;</p> <p>3. antigen;</p> <p>4. antibodies produced quicker / sooner / more / eq;</p> <p>5. <u>secondary immune response</u>;</p>	<p>1. Ignore cells / small amount of virus /</p> <p>1. Ignore dead virus eg. weak or dead form of the virus = 1</p> <p>4. Ignore faster response / faster immune system / antitoxins</p>	3 max
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**Total 15 marks**

Question number	Answer	Notes	Marks
2 (a)(i)	A <u>fetus</u> / <u>embryo</u> ; B uterus / uterine lining / uterus wall / womb / placenta / eq; C amniotic fluid / amniotic sac;	C Allow amniotic liquid	3
(ii)	1. oxygen / glucose / amino acids / mineral ions / vitamins / water to (fetus / baby / embryo) / eq; 2. <u>carbon dioxide</u> / <u>urea</u> from (fetus / baby / embryo) / eq; 3. blood from / to placenta;	1. Ignore food / nutrients 2. Ignore waste 3. Reject blood from / to mother	1
(b)	$(16.6 - 2.0 = 14.6$ $14.6 \times 60 \times 24 =)$ 21 024 / 21 000;;	Correct answer gains full marks  Allow one mark for 23 904 / 2 880 / 14.6 in working	2

(c)	1. (more) oxygen / glucose; 2. respiration / energy / ATP; 3. amino acids; 4. growth; 5. named mineral + function; 6. named vitamin + function; 7. remove <u>carbon dioxide</u> / <u>urea</u> ;	Ignore food / nutrients  Ignore exchange of oxygen and carbon dioxide	4
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**Total 10 marks**



Question number	Answer	Notes	Marks														
3 (a)	<table border="1" data-bbox="461 308 1115 598"> <thead> <tr> <th data-bbox="461 308 864 347">Process</th> <th data-bbox="864 308 1115 347">Letter</th> </tr> </thead> <tbody> <tr> <td data-bbox="461 347 864 387">assimilation</td> <td data-bbox="864 347 1115 387">(G)</td> </tr> <tr> <td data-bbox="461 387 864 427">decomposition</td> <td data-bbox="864 387 1115 427">E;</td> </tr> <tr> <td data-bbox="461 427 864 467">denitrification</td> <td data-bbox="864 427 1115 467">I;</td> </tr> <tr> <td data-bbox="461 467 864 507">excretion</td> <td data-bbox="864 467 1115 507">D;</td> </tr> <tr> <td data-bbox="461 507 864 547">nitrification</td> <td data-bbox="864 507 1115 547">F / H;</td> </tr> <tr> <td data-bbox="461 547 864 598">nitrogen fixation</td> <td data-bbox="864 547 1115 598">A / B;</td> </tr> </tbody> </table>	Process	Letter	assimilation	(G)	decomposition	E;	denitrification	I;	excretion	D;	nitrification	F / H;	nitrogen fixation	A / B;		5
Process	Letter																
assimilation	(G)																
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excretion	D;																
nitrification	F / H;																
nitrogen fixation	A / B;																
(b)	<p data-bbox="394 643 1227 675">1. low to high concentration / against concentration gradient;</p> <p data-bbox="394 722 607 754">2. energy / ATP;</p>	<p data-bbox="1424 643 1742 810">low concentration gradient to high concentration gradient = 0</p> <p data-bbox="1424 858 1760 1217">diffusion of molecules from low to high concentration / diffusion against a concentration gradient / diffusion against a gradient / against a diffusion gradient = 0</p>	2														

(c)	<p>1. (increase) <u>growth</u> / <u>yield</u> of plants / crops;</p> <p>2. fertiliser contains ammonium / nitrates;</p> <p>3. amino acids / protein / DNA;</p> <p>4. magnesium for chlorophyll / chloroplasts;</p> <p>5. crops deplete soil minerals / ions / salts / soil lacks minerals / ions / salts / named mineral / minerals need to be replaced / eq;</p> <p>6. organic fertiliser / manure retains water:</p>	<p>2. Ignore nitrogen</p> <p>4. Allow other named mineral and function eg phosphates for ATP / DNA / calcium for cell walls / sulphates for protein / eq;</p>	max 5
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**Total 12 marks**

Question number	Answer	Notes	Marks
4	<p>(a)(i) energy (content) / temperature (rise);</p> <p>(ii) 1. repeating / calculate mean / calculate average / increase sample size / eq; 2. identify anomalies;</p> <p>(iii) 1. heat / energy transferred to air / surroundings / heat / energy not transferred to water / beaker / eq; 2. less accurate / energy values are lower / smaller / less energy in popcorn / temperature change lower / less / eq;</p>	<p>Allow energy transfer Ignore heat</p> <p>Ignore references to time taken to transfer</p> <p>quicker transfer means more energy = 0</p> <p>heat/energy lost during transfer = 0</p>	<p>1</p> <p>2</p> <p>2</p>

(iv)	1. larger volume of water / use more water; 2. insulate beaker / eq; 3. provide oxygen; 4. cover (top of beaker) with lid / foil; 5. clamp food at same distance; 6. calorimeter / shield flame / ignite with electricity / eq;		max 2
(b)	$\frac{\text{mass of water; in g} \times \text{temperature; rise in } ^\circ\text{C} \times 4.2}{\text{mass of popcorn / food; in g}}$	Ignore mass of substance / burnt popcorn	3

**Total 10 marks**

Question number	Answer	Notes	Marks
5(a)	1. <u>nucleus</u> from body cell into enucleated <u>egg cell</u> / <u>female</u> gamete / eq; 2. electricity / spark; 3. mitosis; 4. embryo; 5. uterus / womb; 6. <u>surrogate</u> mother;	Allow nucleus from diploid cell / skin cell  2. Allow shock	4
(b)	(i) 1. <u>cells</u> are dead / not alive / inactive / no longer respire; 2. genetic material / chromosomes / gene / allele / DNA + destroyed / mutated / damaged / degraded / eq;  (ii) 1. behaviour not just due to genetic material / chromosomes / gene / allele / DNA; 2. behaviour affected by environment / learning / nurture / training;	Allow converse Ignore cells denatured / start to die          2. Ignore personality alone	max 1          max 1

**Total 6 marks**

Question number	Answer	Notes	Marks																
6 (a)	<table border="1" data-bbox="333 359 1319 686"> <thead> <tr> <th data-bbox="333 359 580 440">Type of enzyme</th> <th data-bbox="580 359 828 440">Example</th> <th data-bbox="828 359 1081 440">Site of production</th> <th data-bbox="1081 359 1319 440">Optimum pH</th> </tr> </thead> <tbody> <tr> <td data-bbox="333 440 580 521">amylase</td> <td data-bbox="580 440 828 521">salivary amylase</td> <td data-bbox="828 440 1081 521"><u>salivary glands;</u></td> <td data-bbox="1081 440 1319 521">7.0</td> </tr> <tr> <td data-bbox="333 521 580 603"><b>protease / peptidase</b></td> <td data-bbox="580 521 828 603">pepsin</td> <td data-bbox="828 521 1081 603"><b>stomach;</b></td> <td data-bbox="1081 521 1319 603">1.5</td> </tr> <tr> <td data-bbox="333 603 580 686">lipase</td> <td data-bbox="580 603 828 686">pancreatic lipase</td> <td data-bbox="828 603 1081 686">pancreas</td> <td data-bbox="1081 603 1319 686"><b>7.0 to 9.0;</b></td> </tr> </tbody> </table>	Type of enzyme	Example	Site of production	Optimum pH	amylase	salivary amylase	<u>salivary glands;</u>	7.0	<b>protease / peptidase</b>	pepsin	<b>stomach;</b>	1.5	lipase	pancreatic lipase	pancreas	<b>7.0 to 9.0;</b>		4
Type of enzyme	Example	Site of production	Optimum pH																
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(b)	<p>1. pH of mouth is neutral / 7.0 or pH of stomach is acidic / 1.5 / contains HCl;</p> <p>2. enzymes <u>denature</u> (at different pH);</p> <p>3. affects digestion / breakdown (of food);</p>	<p>1. Allow mouth not acidic or alkaline 1. pH mouth neutral and pH stomach alkaline = 0</p>	3 max																

**Total 7 marks**

