



# Mark Scheme (Results)

Summer 2023

Pearson Edexcel International GCSE  
In Biology (4BI1) Paper 2B

Question Number	Answer	Mark
<b>1(a)</b>	<p>The only correct answer is C (respiration)</p> <p><i>A is incorrect as active transport does not produce ATP</i></p> <p><i>B is incorrect as diffusion does not produce ATP</i></p> <p><i>D is incorrect as transpiration does not produce ATP</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>1(b)(i)</b>	<p>An explanation that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>• soil <u>erosion</u> / soil <u>erodes</u> (1)</li> <li>• fertiliser / organic material (1)</li> <li>• run off / leaching / washed in / eq (1)</li> <li>• (increased) magnesium / <u>nitrates</u> / <u>phosphate</u> / minerals (1)</li> <li>• for correct <b>matched</b> function e.g. magnesium for chlorophyll production / nitrates for amino acids / nitrates for proteins (1)</li> <li>• (more) carbon dioxide for photosynthesis (1)</li> </ul>	<p><b>Allow</b> roots do not hold soil together</p> <p><b>Allow</b> other correct minerals <b>Ignore</b> nutrients</p> <p>Functions must be matched to minerals <b>Ignore</b> growth / repair</p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>1(b)(ii)</b>	<p>An explanation that makes reference to two of the following.</p> <ul style="list-style-type: none"> <li>decomposition / decay / respiration / eq (1)</li> <li>(by) bacteria / fungi / microorganisms / microbes (1)</li> <li>less photosynthesis (1)</li> </ul>	<p><b>Ignore</b> rot <b>Ignore</b> breakdown</p> <p><b>Ignore</b> viruses</p>	<b>2</b>

Question Number	Answer	Mark
<b>1(c)</b>	<p><b>The only correct answer is C (nitrifying)</b></p> <p><i>A is incorrect as decomposers do not release nitrates</i></p> <p><i>B is incorrect as denitrifying bacteria do not release nitrates</i></p> <p><i>D is incorrect as nitrogen fixing bacteria do not convert ammonium to nitrates</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>1(d)(i)</b>	70 (2)	<p><b>One mark</b> for <math>\div 15</math> <b>or</b> <math>\div 2</math> <b>or</b> <math>\div 30</math> <b>or</b> 1050 <b>or</b> 140</p> <p><b>Correct answer gains all marks</b></p>	<b>2</b>

Question Number	Answer		Mark
<b>1(d)(ii)</b>	<p>An explanation that makes reference to four of the following.</p> <ul style="list-style-type: none"> <li>• mutation (produced glowing dinoflagellates) (1)</li> <li>• (produces) variation (1)</li> <li>• (glowing dinoflagellates) survive / not eaten / eq (1)</li> <li>• reproduce / make offspring / eq (1)</li> <li>• pass allele / gene (for glowing on to offspring) (1)</li> </ul>	<p><b>Allow</b> converse for non glowing throughout</p> <p>pass allele gene onto offspring = 2 marks</p>	<b>4</b>

Question Number	Answer		Mark
<b>1(e)</b>	<p>An answer that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>• photosynthesis (1)</li> <li>• takes in carbon dioxide / less carbon dioxide in atmosphere / less carbon dioxide released / eq (1)</li> <li>• less / no use of electricity / eq (1)</li> <li>• less fossil fuel use / oil / coal / gas / eq (1)</li> <li>• less (enhanced) greenhouse effect / global warming (1)</li> <li>• less sulfur dioxide / less acid rain (1)</li> </ul>	<p><b>Ignore</b> carbon neutral (in text) <b>Allow</b> will reduce carbon dioxide / less carbon emissions</p> <p><b>Allow</b> less greenhouse gas</p>	<b>3</b>

(Total for Question 1 = 16 marks)

Question Number	Answer	Additional guidance	Mark
<b>2(a)</b>	<p>An answer that makes reference to the following.</p> <ul style="list-style-type: none"> <li>prevent evaporation (from surface of water) / eq (1)</li> </ul>	<p><b>Allow</b> ensure water loss is from plant / eq  <b>Ignore</b> stops water loss unqualified</p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)(i)</b>	<ul style="list-style-type: none"> <li>4.4 <b>or</b> 4.38 <b>or</b> 4.375 (2)</li> </ul>	<p><b>Allow</b> 4.37  <b>One mark</b> 35 <b>or</b> <math>\div 8</math>  <b>Ignore</b> 4.3 but credit any correct working  <b>Correct answer gains all marks</b></p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)(ii)</b>	<p>An answer that makes reference to four of the following.</p> <ul style="list-style-type: none"> <li>• both / volume <b>and</b> mass, decrease / eq (1)</li> <li>• volume changes more than mass / more water is taken up than lost (up to 4 or 8 days) / eq (1)</li> <li>• water loss and uptake are same between <u>4 and 8 days</u> / <u>after 4 days</u> / eq (1)</li> <li>• correct numerical manipulation (1)</li> <li>• transpiration occurs / water evaporates (from leaves) / water lost through stomata (1)</li> <li>• (some) water is retained / stored in cells / (used for) turgor (1)</li> <li>• used in photosynthesis (1)</li> </ul>	<p>Need not be stated in same sentence</p> <p><b>Allow</b> volume decreases more than mass = 2 marks</p> <p>e.g. 35 (cm<sup>3</sup>) lost / 10 (g) lost after 4 days</p> <p><b>Ignore</b> quoting data</p>	<b>4</b>

Question Number	Answer	Additional guidance	Mark
<b>2(c)</b>	<p>An explanation that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>• more transpiration / more evaporation / higher (water loss) / faster (water loss) / eq (1)</li> <li>• (wind) blows /moves, the water away / removes still air / removes humid air / eq (1)</li> <li>• increases / maintains / steeper diffusion <u>gradient</u> / concentration <u>gradient</u> / eq (1)</li> </ul>	<p><b>Allow</b> converse for all mark points</p> <p><b>Allow</b> more water (moves) into air</p> <p><b>Allow</b> keeps air dry</p> <p><b>Allow</b> water potential <u>gradient</u></p> <p><b>Allow</b> maintains a difference in concentration</p>	<b>3</b>

(Total for Question 2 = 10 marks)

Question Number	Answer	Mark
<b>3(a)</b>	<p><b>The only correct answer is A (proximal convoluted tubule)</b></p> <p><i>B is incorrect as it is the distal convoluted tubule</i></p> <p><i>C is incorrect as it is the collecting duct</i></p> <p><i>D is incorrect as it is the loop of Henle</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>3(b)(i)</b>	0.03 (2)	<p><b>Allow</b> 0.031 <b>or</b> 0.0314 <b>or</b> other correct significant figures</p> <p><b>Allow</b> <math>3.14 \times 10^{-2}</math>, <math>3 \times 10^{-2}</math></p> <p><b>One mark</b> for 0.1 <b>or</b> 100/1000 <b>or</b> 31400</p> <p><b>Correct answer gains all marks</b></p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>3(b)(ii)</b>	<p>An explanation that makes reference to two of the following.</p> <ul style="list-style-type: none"> <li>increases the pressure / creates high pressure / eq (1)</li> <li>(for) ultrafiltration (1)</li> <li>so that plasma / small molecules / fluid / filtrate, leave glomerulus / enter Bowman's capsule / eq (1)</li> </ul>	<p><b>Allow</b> generates pressure</p> <p><b>Allow</b> renal capsule <b>Allow</b> correct named small molecule e.g. urea <b>Allow</b> small particles <b>Ignore</b> blood</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>3(c)</b>	<p>A description that makes reference to the following.</p> <ul style="list-style-type: none"> <li>biuret (reagent) (1)</li> <li>lilac / purple / pink / mauve / eq (1)</li> </ul>	<p><b>Allow</b> ninhydrin <b>Allow</b> uristix / clinistix</p> <p><b>Allow</b> ninhydrin goes pink / red <b>Allow</b> uristix / clinistix go brown / green</p>	<b>2</b>

(Total for Question 3 = 7 marks)

Question Number	Answer	Mark
<b>4(a)(i)</b>	<p><b>The only correct answer is B (guard)</b></p> <p><i>A is incorrect as it is the cuticle</i></p> <p><i>C is incorrect as it is a palisade cell</i></p> <p><i>D is incorrect as it is a stoma</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>4(a)(ii)</b>	<p>An explanation that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>• <u>spongy mesophyll</u> / <u>spongy cells</u> / <u>spongy tissue</u> / <u>spongy layer</u> (1)</li> <li>• has air spaces / gaps between cells / spaces / eq (1)</li> <li>• (for) diffusion / gas exchange (1)</li> <li>• carbon dioxide moves in (to palisade cells) / oxygen out (from palisade cells) / eq (1)</li> <li>• xylem to transport water (1)</li> </ul>	<p><b>Ignore</b> chloroplasts / chlorophyll</p> <p><b>Reject</b> palisade</p> <p><b>Allow</b> pockets (of air)</p> <p><b>Ignore</b> phloem</p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(i)</b>	<p>An answer that makes reference to the following.</p> <ul style="list-style-type: none"> <li>• temperature (of water bath) (1)</li> </ul>	<b>Ignore</b> heat	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(ii)</b>	<p>An answer that makes reference to two of the following.</p> <ul style="list-style-type: none"> <li>• light (1)</li> <li>• changes stomatal opening / (affects) photosynthesis / eq (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• volume / concentration of (hydrogen carbonate) indicator (1)</li> <li>• different volumes / concentrations would release / absorb different amounts of carbon dioxide /eq (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• size of tube (1)</li> <li>• would affect concentration of carbon dioxide / eq (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• pH (1)</li> <li>• affects enzymes / photosynthesis / eq (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• age of leaf (1)</li> <li>• may affect chloroplast number / amount of photosynthesis / eq (1)</li> </ul> <p style="text-align: center;"><b>OR</b></p> <ul style="list-style-type: none"> <li>• <b>starting</b> concentration of carbon dioxide (1)</li> <li>• (carbon dioxide) is needed for photosynthesis/ is a limiting factor (1)</li> </ul>	<p><b>max one for factors</b></p> <p><b>Mark in pairs reason can only be awarded if factor is correct except for carbon dioxide</b></p> <p><b>Allow</b> to prevent light being a limiting factor</p> <p><b>Ignore</b> amount of indicator <b>Allow</b> different volumes would affect time to change colour / different volumes would result in different colour change / eq</p> <p><b>Allow for this one case only</b> correct reason if just says carbon dioxide as factor</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>4(b)(iii)</b>	<p>An answer that makes reference to the following.</p> <ul style="list-style-type: none"> <li>control (experiment) / to compare / show effect of temperature on indicator / show that leaf is required to affect the colour / eq (1)</li> </ul>	<p><b>Ignore</b> control <b>variable</b></p> <p><b>Allow</b> shows changes are due to leaf / photosynthesis</p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>4(c)(i)</b>	<ul style="list-style-type: none"> <li>27 (2)</li> </ul>	<p><b>One mark</b> for 26.7 <b>or</b> 26.67 <b>or</b> 26.667 <b>or</b> 26.6667 <b>or</b> 26.66667 <b>or</b> other correct decimal places <b>or</b> 26.6 recurring <b>or</b> 27.0</p> <p><b>Ignore</b> 26.6</p> <p><b>Answer on answer line takes precedence over answer in table</b></p> <p><b>Correct answer gains all marks</b></p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>4(c)(ii)</b>	<p>An explanation that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>faster photosynthesis / eq (1)</li> <li>(more) carbon dioxide is removed / taken in / absorbed / eq (1)</li> <li>increased collisions / more (kinetic) energy / faster movement of molecules / eq (1)</li> <li>(levels off as) another factor limits / light intensity limits the rate / temp no longer limiting / eq (1)</li> </ul>	<p><b>Ignore</b> references to respiration</p> <p><b>Allow</b> less carbon dioxide (in solution / tube)</p> <p><b>Allow</b> more E/S complexes / optimum temperature for <u>enzymes</u></p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>4(d)</b>	<p>An explanation that makes reference to two of the following.</p> <ul style="list-style-type: none"> <li>respiration is faster than photosynthesis / more respiration than photosynthesis / eq (1)</li> <li>so carbon dioxide is released / increases (in indicator / tube) / eq (1)</li> </ul>	<p><b>Allow</b> respiration but no photosynthesis</p> <p><b>Reject</b> if candidate suggests that respiration <b>ONLY</b> starts after photosynthesis stops e.g. respire <b>instead of</b> photosynthesising</p>	<b>2</b>

(Total for Question 4 = 15 marks)

Question Number	Answer	Additional guidance	Mark
<b>5(a)(i)</b>	pituitary (gland) (1)	<b>Ignore</b> anterior or posterior	<b>1</b>

Question Number	Answer	Mark
<b>5(a)(ii)</b>	<p><b>The only correct answer is D</b></p> <p><i>A is incorrect as it is oestrogen</i></p> <p><i>B is incorrect as it is LH</i></p> <p><i>C is incorrect as it is FSH</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>5(a)(iii)</b>	<p>A description that makes reference to the following.</p> <ul style="list-style-type: none"> <li>(FSH) matures eggs / follicles / eq (1)</li> <li>(FSH) stimulates oestrogen (release) / eq (1)</li> <li>(LH) induces ovulation / egg release / eq (1)</li> <li>(LH) stimulates progesterone / oestrogen (release) / stimulates corpus luteum (development) / eq (1)</li> </ul>	<p><b>Allow</b> grows / develops</p> <p><b>Allow</b> oocytes</p> <p><b>Allow</b> FSH makes (ovary / follicle) release oestrogen</p> <p><b>Allow</b> estrogen / estradiol</p> <p><b>Allow</b> oocyte</p> <p><b>Allow</b> (LH) makes (ovary / corpus luteum) release progesterone / oestrogen</p> <p><b>Allow</b> yellow body</p>	<b>4</b>

Question Number	Answer	Additional guidance	Mark
<b>5(b)</b>	<p>An answer that makes reference to five of the following.</p> <p><b>Overall comments</b></p> <ol style="list-style-type: none"> <li>tablets are less effective / tablets have a wider range of effectiveness / implants or injections are more effective / eq (1)</li> <li>no protection against HIV / (any method) may cause side effects / eq (1)</li> </ol> <p><b>Tablets</b></p> <ol style="list-style-type: none"> <li><b><u>max one advantage from:</u></b> <ul style="list-style-type: none"> <li>tablets are easy to use / no need for medical treatment / no need for doctor / surgery / good if people scared of needles / not painful / eq (1)</li> <li>easy to stop if, change mind / want to have children / quick to restart cycle (1)</li> </ul> </li> <li><b><u>max one disadvantage from:</u></b> <ul style="list-style-type: none"> <li>tablets easy to forget / need to take every day / eq (1)</li> <li>tablets may not be effective if vomiting / may be affected by food / eq (1)</li> </ul> </li> </ol> <p><b>Injection</b></p> <ol style="list-style-type: none"> <li><b><u>max one advantage from:</u></b> <ul style="list-style-type: none"> <li>injections last long time / don't need to keep going to doctor / eq (1)</li> <li>can't forget to take / don't need to take every day / no need to keep remembering (1)</li> </ul> </li> <li><b><u>max one disadvantage from:</u></b> <ul style="list-style-type: none"> <li>need to be given by doctor / health professional / eq (1)</li> <li>can be painful / some people are scared of needles / eq (1)</li> <li>longer for cycle to return / difficult to change mind / eq (1)</li> </ul> </li> </ol> <p><b>Implant</b></p> <ol style="list-style-type: none"> <li><b><u>max one advantage from:</u></b> <ul style="list-style-type: none"> <li>implant last long(est) time / don't need to keep going to doctor / eq (1)</li> <li>can't be forgotten / no need to keep remembering / don't need to take every day (1)</li> <li>good for people who have less access to doctors (as it lasts for 3 years) / eq (1)</li> </ul> </li> <li><b><u>max one disadvantage from:</u></b> <ul style="list-style-type: none"> <li>need to be given by doctor / health professional / eq (1)</li> <li>could cause infection / damage tissues / leave scars / painful / eq (1)</li> <li>implant could produce very high hormone levels / eq (1)</li> <li>not easy to change mind / will take longer to return to normal with implant / eq (1)</li> </ul> </li> </ol>	<p><b>Allow</b> mp2 for any method <b>Allow</b> STI / other STIs/ named side effects</p> <p><b>Allow</b> tablets easy to obtain / may be obtained from pharmacist</p> <p><b>Ignore</b> injection lasts 12 weeks <b>unqualified</b></p> <p><b>Ignore</b> implant last 3 years <b>unqualified</b> Injection and implant are long lasting = two marks</p>	<b>5</b>

(Total for Question 5 = 11 marks)

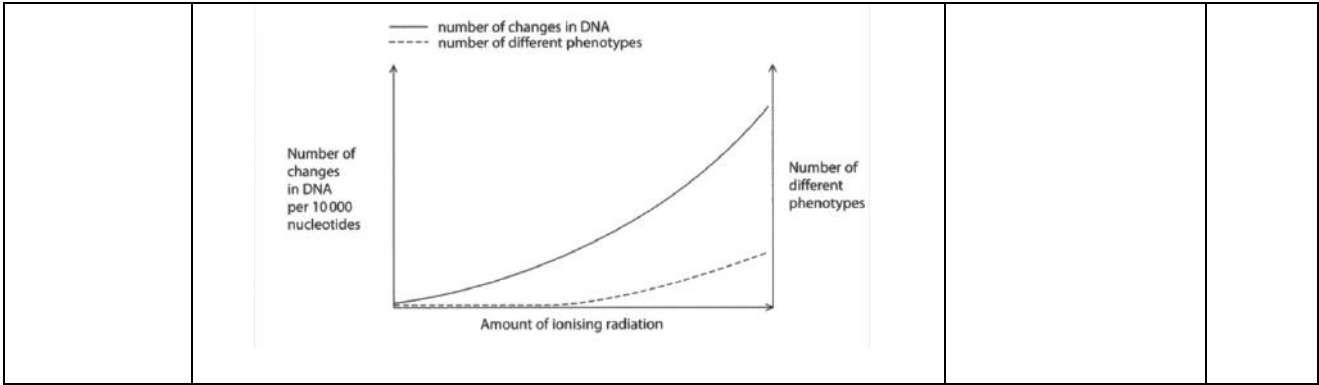
Question Number	Answer	Additional guidance	Mark
<b>6(a)(i)</b>	<p>A description that makes reference to the following.</p> <ul style="list-style-type: none"> <li>• select plants with bright flowers <u>and</u> pollinate / breed / cross / eq (1)</li> <li>• select offspring (with bright flowers) and pollinate / breed / cross / repeat with offspring / eq (1)</li> </ul>	<p><b>Allow</b> desired characteristics  <b>Allow</b> breed two plants with bright flowers</p> <p><b>Allow</b> repeat over several generations if mp1 has been awarded  <b>Ignore</b> repeat if not about offspring / next generations</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>6(a)(ii)</b>	<p>A description that makes reference to three of the following.</p> <ul style="list-style-type: none"> <li>• take small samples / small tissue / few cells / scrape cells off / remove growth tips / eq (1)</li> <li>• sterilise / wash with ethanol / alcohol / disinfectant / antiseptic / eq (1)</li> <li>• (place into) agar (1)</li> <li>• provide minerals / glucose / carbohydrates / amino acids / eq (1)</li> <li>• plant growth substances / auxin / rooting powder (1)</li> </ul>	<p><b>Allow</b> any idea of small pieces of plant e.g. fragment  <b>Allow</b> meristems</p> <p>Sterile agar = 2 marks  <b>Allow</b> bleach</p> <p><b>Allow</b> agarose</p> <p><b>Ignore</b> nutrient  <b>Allow</b> named minerals  <b>Allow</b> sugar</p> <p><b>Allow</b> hormones</p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>6(b)(i)</b>	<p>An answer that makes reference to the following.</p> <ul style="list-style-type: none"> <li>all plants will be <u>genetically</u> identical / have same DNA / same <u>genetic</u> material / same genes / same alleles / eq (1)</li> </ul>	<b>Allow</b> so they will be clones	<b>1</b>

Question Number	Answer	Mark
<b>6(b)(ii)</b>	<p><b>The only correct answer is B (genome)</b></p> <p><i>A is incorrect as all the DNA is not a gene</i></p> <p><i>C is incorrect as all the DNA is not a genotype</i></p> <p><i>D is incorrect as all the DNA is not a nucleoid</i></p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>6(b)(iii)</b>	<p>An answer that makes reference to four of the following.</p> <ul style="list-style-type: none"> <li>• more radiation increases the number of changes in DNA / genotypes <b>and</b> number of different phenotypes / eq (1)</li> <li>• mutations (have occurred in the DNA) (1)</li> <li>• (mutations) change amino acid sequences / different protein / different enzyme / eq (1)</li> <li>• changes in DNA increases more / steeper (than number of different phenotypes) / changes in DNA occur with lower amount (of radiation) / eq (1)</li> <li>• (some) DNA changes / mutations, have no effect / are silent / code for same amino acid / have similar amino acid / enzymes still work / proteins still work / eq (1)</li> <li>• DNA changes / mutations, may be recessive (so do not affect phenotype) / eq (1)</li> </ul>	<p><b>Allow</b> increase number of mutations <b>and</b> number of phenotypes  <b>Allow</b> positive correlation between DNA changes <b>and</b> phenotypes</p> <p><b>Ignore</b> more rapid increase</p> <p><b>Allow</b> converse</p> <p><b>Allow</b> some mutations do not affect phenotype  <b>Allow</b> mutations occur in non-coding DNA</p>	<b>4</b>



(Total for Question 6 = 11 marks)