Pearson Edexcel

# Mark Scheme (Results)

## Summer 2025

Pearson Edexcel AS Level GCE
In Biology A Salters Nuffield (8BN0)
Paper 01: Lifestyle, Transport, Genes and Health

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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 | Mark |
|---|---|---|
| **1(a)(i)** | D- uracil<br><br>*A is incorrect because adenine is present in DNA*<br><br>*B is incorrect because guanine is present in DNA*<br><br>*C is incorrect because thymine is present in DNA* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(a)(ii)** | B- DNA is double-stranded and messenger RNA is single stranded<br><br>*A is incorrect because messenger RNA is single-stranded*<br><br>*C is incorrect because messenger RNA is single-stranded*<br><br>*D is incorrect because DNA is double-stranded* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **1(b)(i)** | D- phosphodiester<br><br>*A is incorrect because mononucleotides are joined by phosphodiester bonds*<br><br>*B is incorrect because mononucleotides are joined by phosphodiester bonds*<br><br>*C is incorrect because mononucleotides are joined by phosphodiester bonds* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **1(b)(ii)** | An answer that makes reference to three of the following:<br><br>• DNA replication uses DNA nucleotides whereas transcription uses RNA nucleotides (1)<br><br>• DNA replication uses DNA polymerase whereas transcription uses RNA polymerase (1)<br><br>• DNA replication copies both strands whereas transcription copies {one / template} strand (1)<br><br>• DNA replication forms {a DNA double helix / double stranded DNA} whereas transcription forms single stranded (m)**RNA** (1) | ALLOW DNA replication is semi-conservative whereas transcription is not<br><br>IGNORE replication making 2 {strands / molecules} and transcription making 1 {strand / molecule} | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(a)(i)** | An answer that makes reference to the following:<br><br>• ATP provides {**energy** / is **energy source**} for {active transport of molecules / movement of molecules against concentration gradient / carrier protein (T) to change shape} (1) | ALLOW ATP provides **energy** to {pump /move} molecules (through component T) | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(a)(ii)** | A description that makes reference to the following:<br>• by facilitated diffusion (1)<br>• (diffusing) from a higher concentration to a lower concentration / down a concentration gradient (1) | ALLOW diffusion through a hydrophilic channel | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(b)(i)** | osmosis (1) | IGNORE (simple) diffusion | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(b)(ii)** | An explanation that makes reference to the following:<br>• Q has two saturated **fatty acids** whereas R has one saturated **fatty acid** and one unsaturated **fatty acid** (1)<br>• (unsaturated fatty acids) contain (carbon to carbon) double bond(s) which cause a kink (1) | ALLOW Q has saturated **fatty acids** whereas R has unsaturated **fatty acid**(s) / R has an unsaturated **fatty acid** and Q does not<br>IGNORE fat | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **2(b)(iii)** | An answer that makes reference to the following:<br><br>• (increasing proportion of S would) increase {the fluidity / permeability} (of the cell membrane) | | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(a)(i)** | An answer that makes reference to the following:<br><br>• (genotype is) the {genetic makeup / combination of alleles} (of the organism) (1)<br><br>• (phenotype is) the {observable / physical} characteristics resulting from the expression of {genes / alleles} (1) | ALLOW the alleles of {an organism / a gene}<br><br>ALLOW (phenotype) results from the expression of {genes / genotype} interacting with the environment | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **3(a)(ii)** | An explanation that makes reference to the following:<br><br>• incomplete dominance / co-dominance (1)<br><br>• (because) both the **allele** for black feathers and the **allele** for white feathers are expressed (in the phenotype) (1) | ALLOW both **alleles** are expressed<br>DO NOT ALLOW genes for alleles | **(2)** |

<table>
<tr><th>Question Number</th><th>Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>3(b)(i)</td><td>• correct gametes in genetic diagram (1)<br>• correct offspring genotypes (1)<br>• correct ratio for named phenotypes (1)</td><td>E.g.
<table>
<tr><td></td><td>B</td><td>W</td></tr>
<tr><td>B</td><td>BB</td><td>BW</td></tr>
<tr><td>W</td><td>BW</td><td>WW</td></tr>
</table>
allow WB<br><br>1 black : 2 white with black flecks : 1 white<br><br>ALLOW 1:2:1 without qualification<br>DO NOT ALLOW a different ratio order without named phenotype<br><br>no ECF</td><td>(3)</td></tr>
</table>

| Question Number | Answer | Mark |
|---|---|---|
| **3(b)(ii)** | A – chi-squared test<br><br>*B is incorrect because the chi-squared test is used to compare observed and expected numbers*<br><br>*C is incorrect because the chi-squared test is used to compare observed and expected numbers*<br><br>*D is incorrect because the chi-squared test is used to compare observed and expected numbers* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(a)** | An answer that makes reference to the following:<br>• correct conversion of units of mass for vitamin C (1)<br>• correct calculation of volume of extract (1)<br>• correct calculation of volume of extract in dm3 (1) | <u>Example of calculation</u><br>85mg = 85 000 µg<br>or 25 µg = 0.025mg<br>85000÷25 OR 85÷ 0.025 = 3400 $cm^3$<br>3400÷1000 = 3.4 $dm^3$<br>Correct answer without working gains full marks | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(b)** | An answer that makes reference to the following:<br><br>• control of a biotic variable (1)<br><br>• control of an appropriate abiotic variable (1)<br><br>• valid method of measuring vitamin C content of {broccoli / water} (1)<br><br>• performing repeats and calculating mean (1)<br><br>• compare with vitamin C content of {broccoli / water} before cooking (1) | **ignore amount**<br><br>e.g. same age, same type, same mass, same surface area, same broccoli plant<br><br>e.g. same volume of water, same cooking time, concentration of DCPIP, buffer<br><br>e.g. use of DCPIP<br>ALLOW correct use of calibration curve to compare with result<br><br>ALLOW compare with {control / uncooked sample} from **same** plant<br>ignore compare steamed with boiled | **(5)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **4(c)** | An answer that makes reference to the following<br><br>• higher vitamin C intake lowers risk of coronary heart disease / risk of coronary heart disease increases as intake of vitamin C decreases | ALLOW CHD for coronary heart disease | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(a)(i)** | An answer that makes reference to the following:<br><br>• line below that of left ventricle, but same shape, starting at 0.16 and ending at 0.44 (1) | | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(a)(ii)** | An answer that makes reference to the following:<br><br>• 75 | <u>Example of calculation</u><br><br>60 ÷ 0.8 = 75<br><br>Correct answer with no working gains full marks | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **5(a)(iii)** | The only correct answer is C – oxygenated pumped into the aorta<br><br>*A is incorrect because the blood is oxygenated*<br><br>*B is incorrect because the blood is oxygenated*<br><br>*D is incorrect because the blood is pumped into the aorta* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(a)(iv)** | An explanation that makes reference to the following:<br><br>0.0 to 0.08 seconds:<br>• blood is entering the ventricle (from the atrium) (1)<br><br>• due to {contraction of (atrial cardiac) muscle wall / atrial systole} (1)<br><br>0.16 to 0.3 seconds:<br>• volume of the (left) ventricle is decreasing (1)<br><br>• (due to) contraction of (cardiac) muscle wall / ventricular systole (1) | IGNORE opening of AV valve<br><br>ALLOW {blood is leaving ventricle / entering aorta}<br>ignore blood is leaving the heart | **(4)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(b)(i)** | An explanation that makes reference to the following:<br><br>• {lumen narrowed / oxygen supply reduced / blood flow reduced} due to {atherosclerosis / atheroma / plaque} / (1)<br><br>• to allow {heart / cardiac} muscle to contract (normally) / more aerobic respiration by {heart / cardiac} {muscle / cells} (1) | ALLOW artery for lumen<br><br>ALLOW {wider lumen / treatment} allows (more) {oxygen delivery / blood flow}<br><br>ALLOW to prevent {a heart attack / MI}<br>IGNORE respiration unqualified / CHD | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **5(b)(ii)** | An explanation that makes reference to four of the following:<br><br>• antithrombin has a complementary shape (to thrombin) (1)<br><br>• {heparin-antithrombin / complex} binds to (active) thrombin (1)<br><br>• which inactivates thrombin (1)<br><br>• so thrombin cannot convert fibrinogen (to fibrin) (1)<br><br>• (therefore) mesh will not be made / blood cells will not be trapped (in mesh / by fibrin) / fewer blood cells trapped (1) | ALLOW deactivates thrombin / no active thrombin<br><br>ALLOW reduced fibrin production | **(4)** |

| Question Number | Answer | Mark |
|---|---|---|
| **6(a)(i)** | B – aorta and vena cava only<br><br>*A is incorrect because the vena cava also has collagen*<br><br>*C is incorrect because both aorta and vena cava have collagen*<br><br>*D is incorrect because the aorta has collagen* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(a)(ii)** | A description that makes reference to two of the following:<br><br>• fibrous protein (1)<br><br>• three polypeptide chains in a helix (1)<br><br>• {polypeptide chains / helix} held together by hydrogen bonds (1)<br><br>• every third amino acid is glycine (1) | ALLOW polypeptide chains form a triple helix<br><br>ALLOW repeating triplets of amino acids (proline, glycine, hydroxyproline) in each chain | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(b)(i)** | An answer that makes reference to the following:<br><br>• high (tensile) strength | DO NOT ALLOW elastic<br>ALLOW flexible / strong<br>IGNORE non-polar / durable | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(b)(ii)** | An explanation that makes reference to two of the following:<br><br>• (collagen) is {a large molecule / non-polar} (1)<br><br>• hydrogen bonds cannot form (between water and collagen) (1)<br><br>• because it {contains non-polar amino acids / has hydrophobic R groups on the outside} (1) | | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(c)** | An answer that makes reference to the following:<br><br>• (similarity) catalyse chemical reactions / form enzyme-substrate complexes / lower activation energy (1)<br><br>• (difference) intracellular enzymes work inside cells whereas extracellular enzymes {work / are secreted} outside cells (1) | ALLOW both increase rate of reaction | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(d)(i)** | An answer that makes reference to the following:<br><br>• increasing chemical concentration increases the percentage of inhibition of collagenase (1)<br><br>• chemical C {inhibits the most / most effective} / chemical A {inhibits the least / least effective} (1) | ALLOW increasing concentration of all chemicals increase inhibition (of collagenase)<br>ALLOW positive correlation between chemical concentration and inhibition (of collagenase)<br>ALLOW all chemicals have highest inhibition (of collagenase) at 500 (μg $cm^{-3}$) | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **6(d)(ii)** | A description that makes reference to two of the following:<br><br>• add a set volume of collagenase to an excess of collagen (1)<br><br>• measure {concentration of collagen/ products of collagen breakdown} at regular time intervals (1)<br><br>• {determine gradient of slope / draw a tangent} at time zero (1) | ALLOW calculate mass of collagen broken down in (first) {30 seconds / 1 minute} and divide by the time<br>ALLOW calculate g/s at start of the line | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(a)** | An explanation that makes reference to the following:<br><br>• {surface area to volume ratio is (too) small / diffusion distance (too) large} (to rely on diffusion alone) (1)<br><br>• to transport {(sufficient) oxygen / substances} (to cells) (1)<br><br>• for (aerobic) respiration / metabolic {reactions / demands of cells) (1) | ALLOW diffusion alone would be insufficient | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)(i)** | An explanation that makes reference to the following:<br><br>• relevant feature of Daphnia described (1)<br><br>• appropriate explanation for feature described (1) | E.g. {transparent / translucent} (body / surface) / aquatic animal / simple nervous system / invertebrate / large surface area: volume<br><br>E.g. heart is visible / monitoring of heart rate is non-invasive / alcohol can diffuse (from solution into *Daphnia*) / alcohol absorbed through skin / less likely to feel pain<br><br>IGNORE cannot feel pain / easier to count heart rate | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)(ii)** | An answer that makes reference to one of the following:<br>• distilled water (1)<br>• solution used to make alcohol solution (without alcohol added) (1) | ALLOW water / pondwater / 0% alcohol solution | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)(iii)** | A description that makes reference to three of the following:<br>• time for acclimatisation (1)<br>• correct reference of use of microscope to view heart rate (1)<br>• how another (suitable stated) variable could be controlled (1)<br>• suitable method to measure heart rate accurately (1) | e.g. same temperature, same volume of solution, same oxygen concentration, same pH, immobilisation of *Daphnia,* same age of *Daphnia*<br>e.g. filming on phone and watching back at slow speed, dots on paper, clicker | **(3)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **7(b)(iv)** | An answer that makes reference to the following:<br><br>• alcohol decreases heart rate compared to {resting / control / 290bpm} heart rate (1)<br><br>• heart rate decreases during the first two minutes and then increases / heart rate decreases and then increases {after 2 minutes / at 3 minutes / between 3-4 minutes} (1)<br><br>• all heart rates are significantly {lower / different} than the control as the {SD / error} bars don't overlap (1) | ALLOW heart rate does not return to {resting / control} heart rate<br><br>ALLOW heart rate is lowest at two minutes<br><br>ALLOW no significant difference between heart rate at 1 and 3 minutes {SD / error} bars overlap | **(3)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8(a)(i)** | B – oxygen concentration difference between alveoli and red blood cells<br><br>*A is incorrect because it is the oxygen concentration difference*<br><br>*C is incorrect because it is the oxygen concentration difference*<br><br>*D is incorrect because it is the oxygen concentration difference* | **(1)** |

| Question Number | Answer | Mark |
|---|---|---|
| **8(a)(ii)** | B – 1, 2 and 3<br><br>*A is incorrect because all three would be included*<br><br>*C is incorrect because all three would be included*<br><br>*D is incorrect because all three would be included* | **(1)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(a)(iii)** | An explanation that makes reference to the following:<br><br>• emphysema results in a reduced (alveolar) surface area (1)<br><br>• rate of **oxygen** diffusion is proportional to surface area (1) | ALLOW reduced area for diffusion<br><br>ALLOW decreased {rate of diffusion of **oxygen** / diffusion of **oxygen** into the blood}<br>ALLOW {reduced / slower} **gas** exchange | **(2)** |

| Question Number | Answer | Additional Guidance | Mark |
|---|---|---|---|
| **8(b)** | An answer that makes reference to the following:<br><br>• correct calculation of total mass of haemoglobin before training (1)<br><br>• correct calculation of increase in haemoglobin after 500 hours (1)<br><br>• correct calculation of total mass of haemoglobin after training in kg to two significant figures (1) | <u>Example of calculation:</u><br><br>13.1 × 70.8 = 927.48<br><br>6.8% of 927.48 = 63.07<br>ALLOW 6.9% of 927.48 = 63.996<br>(927.48 + 63.07 = 990.55 g)<br><br>990.55 ÷ 1000 = 0.99 / 1.0 (2 sf)<br><br>Correct answer with no working gains full marks | **(3)** |

| Question Number | Answer |
|---|---|
| ***8(c)** | Answers will be credited according to candidate's knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.<br>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.<br><br>Reasons why additional oxygen supply needed:<br>• reduced availability of oxygen at high altitudes<br>• partial pressure (ALLOW concentration) of oxygen in {alveoli / arterial blood} decreases with increased altitude – 62.5% less in the blood<br>• the percentage of (aortic) haemoglobin combined with oxygen decreases with increased altitude<br><br>Advantages of carrying oxygen supply<br>• use of portable oxygen will increase {partial pressure / concentration} of oxygen<br>• this will {increase / maintain} the (steep) concentration gradient between air and blood oxygen content<br>• resulting in an increased rate of diffusion of oxygen into the blood<br>• correct reference to Fick's Law<br>• {raising / maintaining} the partial pressure of oxygen in the arterial blood<br>• increased percentage of haemoglobin combined with oxygen / more {oxygen binds to haemoglobin / oxyhaemoglobin}<br>• allows (more) aerobic respiration / preventing anaerobic respiration / reduces build-up of {lactate / lactic acid / reduces oxygen debt} (or in reverse context without supply)<br>• reduces side effects e.g. nausea, dizziness, muscle cramps (or in reverse context without supply)<br>• reduces risk of {hypoxia / death / altitude sickness} (no reverse context)<br><br>Disadvantages of carrying oxygen supply<br>• portable oxygen supply {is heavy / weighs 3.5 – 7 kg / slow the climbers / cause fatigue / restricts movements / may run out}<br>• more energy needed (for carrying tank of oxygen) / increasing oxygen requirement for {respiration / muscles / climbing} / increased force of muscle (contraction)<br>• increased {ATP requirements / respiration rate / force} of (skeletal) muscle<br>• meaning more oxygen is required by the body for movement<br><br>**(6)** |

| | | | **Additional Guidance** |
|---|---|---|---|
| Level 1 | 1-2 | An explanation may be attempted but with limited interpretation or analysis of the scientific information with a focus on mainly just one piece of scientific information.<br><br>The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context. | basic analysis of effect of altitude on partial pressures of oxygen or percentage concentration of oxyhaemoglobin<br><br>with a basic consideration of either an advantage or disadvantage |
| Level 2 | 3-4 | An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information.<br><br>The explanation shows some linkages and lines of scientific reasoning with some structure. | level 1<br>Plus:<br>basic consideration of both advantages and disadvantages<br>or<br>basic consideration of advantages supported by some relevant scientific knowledge<br>or<br>detailed explanation of disadvantages supported by relevant scientific knowledge |
| Level 3 | 5-6 | An explanation is made which is supported throughout by sustained application of relevant evidence of analysis, interpretation and/or evaluation of both pieces of scientific information.<br><br>The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured. | ALL from Level 2<br><br>Plus:<br><br>detailed explanation of both advantages and disadvantages with sustained application of relevant scientific knowledge |

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