Examiners' Report
Principal Examiner Feedback

Summer 2025

Pearson Edexcel International GCSE in Biology (4WBI1) Unit 1BR

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Introduction

This was the first regional paper of the examination for the modular Biology specification.

This paper examined content from Unit 1 of the specification. The paper carried 90 marks and consisted of nine questions in various styles similar to those of the questions on the linear paper. Three of the questions were the same as three on the linear paper.

The examining team were pleased with the knowledge and understanding shown by many of the students taking this examination. Many students were able to apply their knowledge and understanding of the relevant biology topics to novel contexts. Many students were also able to apply their knowledge to unfamiliar practical protocols. Most could analyse and evaluate data and information. The responses of many students indicated that centres had worked hard to prepare their students. Most students attempted all questions and finished the paper.

Question 1 was about microorganisms and cell structure. Students were given a photograph of *Pneumococcus* bacteria as seen with an electron microscope. Many could correctly show, in (a) (i) that bacteria are in the group prokaryotes, although a significant few opted for protoctists or fungi. For question (a) (ii) nearly all students stated that an organism that causes a disease is described as a pathogen or pathogenic. In part (b) students were told that *Pneumococcus* bacteria may infect human lungs. Students were then asked to complete a table to show the differences between a human lung cell (which is eukaryotic) a pneumococcus cell and a virus. Many correctly showed that only the pneumococcus cell has a cell wall, only the human lung cell has a nucleus, only the virus has a protein coat and only the pneumococcus cell has plasmids. Some candidates appeared not to know the differences in structure between the cells or organisms. For question (b) (ii) many candidates knew that viruses have either DNA or RNA. Question (b) (iii) was less well answered. Candidates struggled and did not give the meaning stated in the specification. Some gained one mark by referring to parasites having to live and reproduce in a host but very few referred to the parasite harming the host organism. Some failed to gain a mark by giving rather vague answers

such as 'they rely on other organisms', but this really applies to all living things and is not specific to parasites.

Question 2 was about the human respiratory system. This question also appeared on the linear paper. In (a) (i) students were asked to identify a bronchiole which most did. A few opted incorrectly for bronchus. In (a) (ii) most could state that a lung is an organ because it is made of tissues. In (a) (iii) students were asked to explain how the contraction of the diaphragm causes air to move into the lungs. Many correctly stated that the diaphragm became flat, increasing the volume (of the thorax) and decreasing the pressure so air enters down a pressure gradient. However, some students did not properly read the question and instead talked about breathing out.
In part (b) students were given some data about a novel concept - VO_2 max. They were told what VO_2 max refers to and the data were about the values of VO_2 max in 1 minute in cm^3 per kg for smokers and non-smokers. Students were asked to calculate the maximum volume of oxygen used in 30 minutes by a non-smoker with a mass of 70kg. So, the calculation is one of simple proportion and students needed to multiply the value for a non-smoker (35 cm^3 per minute per kg) by 30 and by 70. Many students carried out a correct calculation and arrived at the number 73500 (answers in the range 73000 – 74000 were accepted) but many only got part way and just multiplied by 30 or by 70 which only gave them one of the two marks. For (b) (iii) students were asked to explain the effect of smoking on VO_2 max so the better students showed that the use of oxygen in the body was decreased because of the effects of tar/ cigarette smoke on cilia or alveoli walls or the effects of mucus build up or the effects of carbon monoxide on carriage of oxygen by haemoglobin in red blood cells. There were many things that they could say and hence many students scored three marks.

Question 3 was also in common with the linear paper. The first two parts related to a diagram of a cell and asked students to identify the structures where protein synthesis occurs and which labelled structures in an animal cell are also present in plant cells. Most students scored well on these questions. The second part of the question asked students to analyse some data about the numbers of mitochondria in different types of human cells. Students were told the volume of a villus cell and were asked to calculate the ratio of the volume of a villus cell to the volume of a sperm cell. Students first

had to calculate the volume of a sperm cell, having been told that each sperm cell had 75 mitochondria and 10 μm^3 of a sperm cell contained 12 mitochondria. Some students calculated that the volume of a sperm cell is 62.5 μm^3 and so the ratio is 40:1. Many students were a factor of 10 out, mainly by calculating the volume of a sperm cell incorrectly as 6.25 μm^3 but still gained some marks for process. Students were then asked to comment on the importance of mitochondria to the activities of various cell types. Nearly all students commented that sperm cells need a lot of mitochondria to provide the energy, via (aerobic) respiration to swim to the ovum/egg cell. Many commented on the villus cells having a lot of mitochondria for absorbing the products of digestion but few related that to active transport. Many realised that skin cells are not very active so have few mitochondria.

Question 4 was also on the linear paper. Students were given a table of data about some of the nutrients in a fruit juice drink, in g per 400 cm^3 of fruit juice and as a percentage of the RDA for a 16-year-old. Students were told that vitamins and minerals were not listed and then asked to name one other component of a balanced diet, not listed. Many gave water or protein, but a significant number gave a vitamin or mineral as their answer. Students were also asked to calculate the RDA of fibre for a 16-year-old, but many lost a mark by not giving the answer to the nearest whole number, as requested. Students were then asked to state the function of dietary fibre, and nearly all scored this mark. In part (b) students were asked how starch is digested to glucose in the human alimentary canal. Most gave amylase and many referred to it being produced in salivary glands or the pancreas or acting in the mouth. Not so many students gained the next mark which referred to starch being broken down to maltose and fewer gained the last mark which needed a reference to maltase breaking down maltose to glucose. Some students said that amylase changes starch to glucose but they still gained a mark for amylase. A few students think that amylase acts in the stomach. In part (c) of this question students were given some data about an unfamiliar protocol - finding the vitamin C content of various fruit juices. Nearly all students were able to determine, from the graph, that lime juice contains 38 mg per cm^3 of vitamin C. many students could use the data to correctly rank the fruit juices in descending order of vitamin C concentration, but a significant number got the correct sequence but upside down. The last part of the question was very demanding and asked students to explain how the

protocol could be modified to give more accurate measure of the vitamin C concentration in the juices. Most gave an answer about doing repeats and finding the mean, which is for reliability rather than accuracy. Few referred to stirring but only the very best students referred to using a graduated pipette or measuring cylinder to get an accurate volume because not all drops are the same size.

Question 5 presented students with another unfamiliar protocol, that of olive oil and lipase inside a bag made of partially permeable material, immersed in a beaker of water with an indicator solution that changed colour over 30 minutes. Students were asked to explain why the indicator changes colour. Nearly all realised that the water in the beaker was becoming more acidic and most realised that the lipase digested the oil to fatty acids which caused the drop in pH. However, fewer students explained that fatty acid molecules were small enough to diffuse through the Visking tubing. Instead, quite a lot of students lost the idea of what was happening and wrote about water entering the Visking bag by osmosis – confusing this with another experiment. Students were then asked to name an element present in lipase but not in olive oil. Many realised that lipase is a protein so nitrogen is the element (we also accepted sulfur) but some lost the mark by referring to nitrate, which is not an element. In part (c) of this question students were given a diagram of the human alimentary canal with various structures labelled with letters. Most correctly identified R (the liver) as where bile is made but some gave Q – the bile duct, confusing where it is stored with where it is made. Nearly all students knew the role of bile in the digestion of lipids but a few think that bile contains enzymes and some lost the mark for emulsification by describing fat molecules being broken down to smaller molecules, which is a description of digestion rather than emulsification.

Question 6 was about photosynthesis. Most students could give a correct balanced chemical symbol equation for the process but a few confused it with the equation for respiration. Students were given a diagram of leaf structure as a prompt and were asked to explain how a leaf is adapted for photosynthesis. Most scored well here and referred to transparency of the cuticle, stomata, air spaces in the spongy mesophyll and the large numbers of chloroplasts. The last part of the question was a CORMS question and students were asked to design an investigation to find how temperature

affects the rate of photosynthesis in a plant. Most are well practised in such a question and referred to same type of plants, changing the temperature, how to measure rate of photosynthesis, a suitable time, and two control variables, one of which is light intensity. Most students scored at least 4 marks here and many scored 5 or 6.

Question 7 gave students some information about the tobacco mosaic virus, TMV. Students were told that TMV infects leaves and cause leaves to become yellow and were then asked to explain why TMV infection leads to a reduction in crop yield. Most made the link between damage to chloroplasts or chlorophyll leading to less light energy trapped so less photosynthesis and less glucose for respiration and less energy for growth of the crop/fruits/seeds. Some failed to gain full marks because they referred to less growth but did not link it to the damage to chloroplasts or leaves and reduction in photosynthesis. Nearly all students gained full marks for part (b) – two differences between plant cells and animal cells. The most frequent answers referred to chloroplasts and cell walls. Most scored well on the last part of the question by referring to a lack of magnesium ions but some students had not read the question carefully enough and repeated what was in the question by talking about leaves turning yellow in winter/autumn.

Question 8 was about the energy content of foods. Students were told about a familiar protocol to determine the energy content of some foods. When asked why it is important to use dried foods some did not read the instruction that said not to refer to ease of burning but some students realised that different non-dried foods would contain differing amounts of water that would give inaccurate data. Surprisingly very few students scored any marks for the next question which asked why for each food the energy content per gram was calculated. Very few referred to being able to give a valid comparison or for standardization. In the last part of this question students were asked to explain two changes to the method that would improve accuracy. Many students scored two marks for referring to insulation to prevent heat loss to the surroundings but many then reiterated the same idea, thus not gaining any more marks. Better students referred to stirring to distribute heat or to using a more accurate thermometer or holding the thermometer upright to avoid parallax errors. Most students scored two marks for part (c) two factors that determine the energy requirements of

humans. However, some did not gain marks due to vague responses such as 'lifestyle' with no qualification.

Question 9 was about gas exchange in leaves. Students were told that a leaf is an organ and were asked why the epidermis layer is a tissue. Most said correctly that it contained cells performing a function. Students were then given a photograph of stomata as seen under a light microscope at magnification x 200 and were told the diameter of the field of view at that magnification. They were asked to calculate the area of the field of view at this magnification and given a formula to use. Many correctly calculated the area but very few were able to use it to calculate the number of stomata in 1 mm^2 of lower surface of this leaf. For the last part of the question some students were a little vague in their answers and did little more than repeat the question – 'stomata are for gas exchange'. We expected a description of named gases, their direction of movement and the reason for their entry or exit. We also credited reference to many stomata, and more on the underside of leaves to reduce water loss.

Summary

Based on their performance on this paper, students are offered the following advice:

- read each question carefully and note any special instructions such as giving a numerical answer to a whole number or to a certain number of decimal places
- always show your working for calculations as you may then score some marks for process even if you get an incorrect answer
- identify the command word and when asked for an explanation of the results of an investigation do not just describe the results
- study the meanings of the command words that may be used in an exam; these are given in the specification
- write in detail and use biological terminology such as 'diffuses through' rather than 'passes through'
- avoid referring to 'producing energy'. Respiration produces ATP is fine and respiration releases energy is fine
- read through your answers and check that they make sense and that you have covered everything you have been asked to do

- look at the number of marks allocated to the question part and think about whether you have given enough information to gain that amount of marks
- for experimental design questions make sure you write about how to carry out an investigation
- make sure you are familiar with the content of the specification and with the mathematical skills you may be expected to demonstrate.

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