



Pearson  
Edexcel

## Mark Scheme (Results)

January 2022

Pearson Edexcel International GCSE  
In Biology (4BI1) Paper 1BR and Science (Double  
Award) (4SD0) Paper 1BR

Question Number	Answer	Mark
<b>1 (a)(i)</b>	A - 2  <i>B is incorrect as there are not 3 secondary consumers</i> <i>C is incorrect as there are not 4 secondary consumers</i> <i>D is incorrect as there are not 5 secondary consumers</i>	<b>1</b>

Question Number	Answer	Mark
<b>1 (a)(ii)</b>	Acacia / plant → (desert) rat → fennec / fox → monitor / lizard → hawk (1)	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>1 (a)(iii)</b>	An explanation that makes reference to three of the following: <ul style="list-style-type: none"> <li>• (energy is lost due to) indigestible parts / faeces / not absorbed / eq (1)</li> <li>• (energy is lost due to) excretion / metabolic waste / urine / eq (1)</li> <li>• (energy is lost due to) organisms / parts of organisms that are not consumed /eq (1)</li> <li>• (energy is released) in respiration / by heat loss / in active transport / due to metabolism (1)</li> <li>• (energy is lost due to) movement (1)</li> </ul>	<b>Accept</b> some organisms / food not eaten Accept loss to death / decay	<b>3</b>

Question Number	Answer	Mark
<b>1 (b)</b>	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• mutation / genetic variation (1)</li> <li>• (the fox has / ears have) large surface area to lose heat / keep body cool (1)</li> <li>• (which) enables survival (1)</li> <li>• breeding occurs / (fox) produces offspring (1)</li> <li>• passes on alleles / genes (for ear shape) (to next generation) (1)</li> </ul>	<b>4</b>

Total for Question 1 = 9 marks

Question Number	Answer	Mark
<b>2(a)(i)</b>	<p>B – cornea</p> <p><i>A is incorrect as X is not the conjunctive</i>  <i>C is incorrect as X is not the lens</i>  <i>D is incorrect as X is not the retina</i></p>	<b>1</b>

Question Number	Answer	Mark
<b>2(a)(ii)</b>	<p>A – contracted loose</p> <p>B is incorrect as the ligaments would be loose  C in incorrect as the muscles would be contracted  D in incorrect as the muscles would be contracted</p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>2(a)(iii)</b>	An explanation that makes reference to 3 of the following: <ul style="list-style-type: none"> <li>pupil widens / dilates / gets bigger (1)</li> <li>radial muscles contract (1)</li> <li>circular muscles relax (1)</li> </ul>	<b>Ignore</b> it / Y	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)(i)</b>	27 m/s (3)	<p><b>One Mark:</b> <math>2.5 \div 0.005</math> or <math>25 \div 0.005</math> or 0.25 (m) or 5000</p> <p><b>Two marks:</b> 50 (m/s)</p> <p><b>Award full marks for correct answer</b></p>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>2(b)(ii)</b>	An explanation that makes reference to two of the following: <ul style="list-style-type: none"> <li>(more) synapses are present / eq (1)</li> <li>which transmit by (chemical) diffusion (1)</li> <li>of neurotransmitters (1)</li> </ul>	<b>A</b> gaps / clefts present	<b>2</b>

Total for Question 2 = 9 marks

Question Number	Answer	Mark
<b>3(a)(i)</b>	A mitochondrion  <i>B is incorrect because the nucleus does not carry out photosynthesis</i> <i>C is incorrect because ribosomes carry out protein synthesis</i> <i>D is incorrect because the vacuole sores sap</i>	<b>1</b>

Question Number	Answer	Mark
<b>3(a)(ii)</b>	B chitin  A is incorrect because fungal cell walls are not made of cellulose C is incorrect because fungal cell walls are not made of glycogen D is incorrect because fungal cell walls are not made of starch	<b>1</b>

Question Number	Answer	Mark
<b>3 (a)(iii)</b>	A cell membrane  B is incorrect because prokaryotes do not contain mitochondria C is incorrect because prokaryotes do not contain nuclei D is incorrect because prokaryotes do not have vacuoles	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>3 (b)(i)</b>	80 % (2)	one mark for 20  <b>Award full marks for correct answer</b>	<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>• (yeast) respire / fermentation / respiration (1)</li> <li>• producing / carbon dioxide (1)</li> <li>• (carbon dioxide) bubbles become trapped / stuck / inflate in dough (1)</li> </ul>	<b>Reject</b> oxygen produced	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>3 (b)(iii)</b>	<p>An explanation that makes reference to two of the following:</p> <p>at 25 °C:</p> <ul style="list-style-type: none"> <li>• (kinetic) energy lower / molecules move slower / eq (1)</li> <li>• fewer collisions / fewer enzyme substrate complexes / further away from <b>enzyme</b> optimum / eq (1)</li> <li>• less carbon dioxide / gas released / eq (1)</li> </ul>	<b>Accept</b> converse for 35 °C for all MPs	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>3 (b)(iv)</b>	<p>An explanation that makes reference to two of the following:</p> <p>at 35 °C</p> <ul style="list-style-type: none"> <li>• <u>enzymes</u> not denatured (1)</li> <li>• substrate fits into active site / active site shape not changed / eq (1)</li> <li>• so respiration continues / more carbon dioxide produced / yeast cells are alive / eq (1)</li> </ul>	<b>Accept</b> converse for 65 °C for all MPs	<b>2</b>

Total for Question 3 = 11 marks

Question Number	Answer	Mark
<b>4(a)(i)</b>	An explanation that makes reference to the following: <ul style="list-style-type: none"> <li>• peristalsis (1)</li> <li>• (waves of) muscular <u>contractions</u> (1)</li> </ul>	<b>2</b>

Question Number	Answer	Mark
<b>4 (a)(ii)</b>	C liver  A is incorrect because bile is not made in the stomach B is incorrect because bile is not made in the pancreas D is incorrect because bile is not made in the gall bladder	<b>1</b>

Question Number	Answer	Mark
<b>4 (a)(iii)</b>	An explanation that makes reference to three of the following: <ul style="list-style-type: none"> <li>• bile neutralises stomach acid / food / chyme / eq (1)</li> <li>• to set the optimum pH for <u>enzymes</u> (1)</li> <li>• bile emulsifies fats / breaks up fats into smaller droplets / eq (1)</li> <li>• to increase the surface area (for digestion) (1)</li> </ul>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>4 (b)(i)</b>	0.11 (2)	One mark for 2.2 or 8 - 5.8  One mark for dividing by 20  <b>Award full marks for correct answer</b>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>4 (b)(ii)</b>	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"><li>• (without inhibitor) pH falls faster / falls more / becomes more acidic (without inhibitor) / bigger change in pH / eq (1)</li><li>• because fats are broken down into fatty acids (and glycerol) (1)</li><li>• inhibitor causes less acid to be produced (1)</li></ul>	<p><b>Accept</b> converse</p> <p><b>Accept</b> converse</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>4 (b) (iii)</b>	<p>A discussion that makes reference to five of the following:</p> <ol style="list-style-type: none"> <li>1. lower blood lipid / fat when taking inhibitor / eq (1)</li> <li>2. (because) less fat is absorbed (when taking inhibitor) (1)</li> <li>3. fat needs to be broken down into fatty acids (to be absorbed) (1)</li> <li>4. less fat would be stored / deposited around the body (1)</li> <li>5. one person who did not take inhibitor did not have increase in lipid / fat in blood / eq (1)</li> <li>6. two / more / some suffered side effects when taking the drug / eq (1)</li> <li>7. side effects may be due to the olive oil / may not be caused by the drug (1)</li> <li>8. sample size is only very small / eq (1)</li> <li>9. there is no information about diet / other food / activity / eq (1)</li> <li>10.no information on age / sex / health / diabetes / eq (1)</li> <li>11.no information on change of mass of people / experiment does not actually assess obesity / / eq (1)</li> <li>12.starting levels of blood lipid were equal (so were controlled) (1)</li> </ol>	<p><b>Accept</b> drug causes side effects / abdominal pains  <b>Accept</b> one person had side effects without drug</p> <p><b>Accept</b> other factors may affect obesity</p>	<b>5</b>

Total for Question 4 = 15 marks

Question Number	Answer	Mark
<b>5 (a)(i)</b>	An explanation that makes reference to two of the following: <ul style="list-style-type: none"> <li>• <u>oxygen</u> is required (1)</li> <li>• for respiration (1)</li> </ul>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>5 (a)(ii)</b>	An explanation that makes reference to two of the following: <ul style="list-style-type: none"> <li>• to kill pathogens / other microorganisms / sterilises the fermenter / eq (1)</li> <li>• to prevent contamination (of the product) / competition (1)</li> <li>• steam condenses to water so does not affect product / taste/ flavour / eq (1)</li> </ul>	<p><b>Accept</b> remove bacteria / eq</p> <p>Prevent bacterial contamination = 2 marks</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>5(b)(i)</b>	A graph that includes: <ul style="list-style-type: none"> <li>• S scales linear and at least half page and axes the correct way around (1)</li> <li>• A both axes labelled with units (1)</li> <li>• L straight lines joining points (1)</li> <li>• P points correctly plotted (1)</li> <li>• K key / labelled GM and non-GM (1)</li> </ul>	<p>Lose line mark for bar chart</p> <p>Units: time in days and mass in kg</p> <p><b>Ignore</b> extrapolation to zero</p> <p>Plots +/- half square</p>	<b>5</b>

Question Number	Answer	Additional guidance	Mark
<b>5 (b)(ii)</b>	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• GM fungus grows faster up to 20 days / before day 30 / eq (1)</li>   <li>• (but) over 30 days, the non-GM fungus produces a higher final yield / GM fungus starts to level off after 20 days / non-GM fungus produces more over longer time (1)</li>   <li>• GM fungus is better if product is required in a shorter time / non-GM fungus is better if product is required after longer time period (1)</li> </ul>	<p><b>Accept</b> converse for all MPs</p> <p><b>Accept</b> GM produces more mass over first 20 days / produces more product in short time</p> <p><b>Accept</b> at 30 days GM fungus produces less yield than non-GM / grows slower / non-GM has higher yield over last new days</p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>5 (b)(iii)</b>	<p>An answer that makes reference to five of the following:</p> <p><i>Yes because:</i></p> <ol style="list-style-type: none"> <li>1. there is less fat in mycoprotein (1)</li> <li>2. there is less cholesterol in mycoprotein (1)</li> <li>3. less risk of heart disease / obesity / eq (1)</li> <li>4. there is more fibre in mycoprotein so less risk of constipation / moves through gut / gut / eq (1)</li> <li>5. mycoprotein has more calcium for bones / teeth / eq (1)</li> </ol> <p><i>No because:</i></p> <ol style="list-style-type: none"> <li>6. mycoprotein has less protein (1)</li> <li>7. for growth / muscle growth / eq (1)</li> <li>8. mycoprotein has less iron so may be a risk of anaemia / less haemoglobin / fewer red blood cells / eq (1)</li> </ol>	<p><b>Accept</b> other protein functions</p>	<b>5</b>

Total for Question 5 = 16 marks

Question Number	Answer	Mark
<b>6 (a)(i)</b>	<p>B is the only correct answer</p> <p>A is incorrect as ovulation does not occur in the oviduct</p> <p>C is incorrect as ovulation does not occur in the uterus</p> <p>D is incorrect as ovulation does not occur in the vagina</p>	<b>1</b>

Question Number	Answer	Mark
<b>6 (a)(ii)</b>	<p>A is the only correct answer</p> <p>B is incorrect as fertilisation does not normally occur in the ovary</p> <p>C is incorrect as fertilisation does not usually occur in the uterus</p> <p>D is incorrect as fertilisation does not usually occur in the vagina</p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>6 (b)(i)</b>	<p>X: oestrogen / estrogen (1)</p> <p>Y: progesterone (1)</p>	<b>Accept</b> other correct names	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>6(b)(ii)</b>	<p>An description that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>• repairs / thickens the uterus lining / endometrium / eq (1)</li> <li>• for implantation / eq (1)</li> </ul>	<p><b>Accept</b> reduces FSH levels / eq (1)</p> <p><b>Accept</b> stimulates release of LH / eq (1)</p>	<b>2</b>

Question Number	Answer	Mark
<b>6 (c)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>villi providing a large surface area (1)</li> <li>for diffusion / active transport (1)</li> <li>capillaries bring / blood supply brings nutrients / remove(s) waste products / eq (1)</li> <li>blood supply / capillaries / blood vessel to maintain a diffusion gradient (1)</li> <li>close distance between mother's and fetal blood for short diffusion pathway (1)</li> </ul>	<b>3</b>

Total for Question 6 = 9 marks

Question Number	Answer	Additional guidance	Mark
<b>7(a)(i)</b>	<p>An explanation that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>less pressure / reduced heart volume / less blood pumped (each beat) (1)</li> <li>less oxygen pumped to <u>muscles</u> (1)</li> <li>less respiration (1)</li> </ul>	<p><b>Accept</b> lower stroke volume</p> <p>Less oxygenated blood to muscles = 2 marks</p>	<b>2</b>

Question Number	Answer	Mark
<b>7(a)(ii)</b>	<p>only one copy of an allele is needed to affect the phenotype / an allele that is always expressed (1)</p>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>7(a)(iii)</b>	<p>A genetic diagram that shows:</p> <ul style="list-style-type: none"> <li>parent genotypes of Hh and hh (1)</li> <li>gametes as H or h and h (or h) (1)</li> <li>offspring as Hh, hh (1)</li> <li>offspring in correct ratios (of 1:1) and phenotypes correctly identified (1)</li> </ul>	<p><b>Accept</b> other letters</p> <p>Ecf maybe for mp2 and 3</p>	<b>4</b>

Question Number	Answer	Mark
<b>7(a)(iv)</b>	0.25 / ¼ / 25%	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>7 (b)</b>	<p>An answer that makes reference to two of the following:</p> <ul style="list-style-type: none"> <li>recessive alleles are not always expressed (in the phenotype) / recessive alleles are not expressed in heterozygous individuals / only expressed when homozygous / eq (1)</li> <li>dominant alleles are always expressed (in the phenotype) / are expressed when one is present / eq (1)</li> <li>cats with a dominant allele can be prevented from breeding / cats with a recessive allele cannot always be stopped from breeding / eq (1)</li> </ul>	<p><b>Accept</b> recessive alleles are hidden when a dominant allele is present / recessive alleles are only expressed when homozygous</p> <p><b>Accept</b> possession of one dominant allele means that the phenotype is identified / dominant alleles are always identified in phenotype</p>	<b>2</b>

Total for Question 7 = 10 marks

Question Number	Answer	Additional guidance	Mark
<b>8(a)</b>	$6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (2)	one mark for incorrectly balanced equation	<b>2</b>

Question Number	Answer	Mark
<b>8 (b)(i)</b>	<ul style="list-style-type: none"> <li>repeats / find means / eq (1)</li> </ul>	<b>1</b>

Question Number	Answer	Mark
<b>8 (b)(ii)</b>	<ul style="list-style-type: none"> <li>time taken (for leaf to rise) (1)</li> </ul>	<b>1</b>

Question Number	Answer	Additional guidance	Mark
<b>8 (c)</b>	<p>An explanation that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>as distance increases, light intensity / energy decreases (1)</li> <li>(as distance increases / as light intensity decreases) rate of photosynthesis decreases / is slower / eq (1)</li> <li>so less oxygen is produced / eq (1)</li> <li>oxygen is trapped in leaf and causes leaf discs to rise / eq (1)</li> <li>when close to lamp another factor is limiting / light intensity is not limiting / eq (1)</li> <li>limiting factor could be temperature / carbon dioxide concentration (1)</li> </ul>	<b>Accept</b> converse for decreasing distance	<b>4</b>

Question Number	Answer	Mark
<b>8 (d)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• place leaf disc in boiling water (1)</li> <li>• heat / boil leaf in ethanol (1)</li> <li>• stain with iodine (1)</li> <li>• iodine stain will turn blue black with starch (1)</li> </ul>	<b>3</b>

Total for Question 8 = 11 marks

Question Number	Answer	Additional guidance	Mark
<b>9 (a)</b>	4.6 (2)	<p>one mark for 4.625 / 4.63</p> <p><b>Award full marks for correct answer</b></p>	<b>2</b>

Question Number	Answer	Additional guidance	Mark
<b>9(b)</b>	<p>A discussion that makes reference to five of the following:</p> <p><i>Agreement:</i></p> <ol style="list-style-type: none"> <li>(anaerobic digesters) release less CO<sub>2</sub> / methane (1)</li> <li>release less CO (1)</li> <li>(because less CO<sub>2</sub> / less methane) there is less greenhouse effect / global warming / eq (1)</li> <li>so less ice caps melting / habitat loss / climate change / other effects / flooding / coral reef damage / eq (1)</li> <li>(because less carbon monoxide) less damage to haemoglobin / carboxyhaemoglobin / eq (1)</li> <li>so less effect on oxygen transport / eq (1)</li> </ol> <p><i>Disagreement:</i></p> <ol style="list-style-type: none"> <li>(however) anaerobic digesters release more sulfur dioxide (1)</li> <li>(causing) acid rain (1)</li> <li>which causes deforestation / kills fish in lakes / eq (1)</li> </ol>	<p><b>Accept</b> less ocean acidification / extreme weather / desertification</p> <p><b>Accept</b> other correct biological consequences of acid rain</p>	<b>5</b>

Total for Question 9 = 7 marks

Question Number	Answer	Mark
<b>10 (a)(i)</b>	<p>The correct answer is: D trachea      bronchus</p> <p>A is incorrect as Q is not a bronchiole  B is incorrect as Q is not a bronchus  C is incorrect as R is not a bronchiole</p>	<b>1</b>

Question Number	Answer	Mark
<b>10 (a)(ii)</b>	<p>An explanation that makes reference to three of the following:</p> <ul style="list-style-type: none"> <li>• S / diaphragm / it / muscle relaxes (1)</li> <li>• S / diaphragm moves up / becomes dome shaped (1)</li> <li>• volume decreases (1)</li> <li>• pressure increases (1)</li> </ul>	<b>3</b>

Question Number	Answer	Additional guidance	Mark
<b>10 (b)</b>	<p>An answer that makes reference to four of the following:</p> <ul style="list-style-type: none"> <li>• the (maximum) lung volume of people with lung disease is lower / less volume can be exhaled / less air exhaled (1)</li> <li>• people with lung disease cannot exhale as rapidly / eq (1)</li> <li>• less carbon dioxide removed / less oxygen taken in (1)</li> <li>• diffusion gradient (into blood) is less steep / eq (1)</li> <li>• less respiration (in cells) / more anaerobic respiration / more lactic acid accumulation / eq (1)</li> </ul>	<b>Accept</b> converse for healthy lungs	<b>3</b>

Total for Question 10 = 7 marks

Question Number	Answer	Additional guidance	Mark
<b>11</b>	<p>An answer that makes reference to six of the following:</p> <p>C: range of different light intensities / dark and light (1)</p> <p>O: same species / age of wood lice / eq (1)</p> <p>R: repeats / groups of woodlice (1)</p> <p>M1: measure distance moved (1)</p> <p>M2: over a set / stated time (1)</p> <p>S1 and S2: same humidity / temperature / oxygen / carbon dioxide / food / size of container / wood types / eq (2)</p>	<p><b>Accept</b> for M1 and M2, time how long takes to move set distance</p>	<b>6</b>

Total for Question 11 = 6 marks