

**Paper 1 (4BI1/1B and 4SD0/1B)**

Question number	Answer	Mark
<b>1(a)</b>	<p>A description that makes reference to the following three points:</p> <ul style="list-style-type: none"> <li>• <i>Lactobacillus</i> (1)</li> <li>• lactose (1)</li> <li>• lactate/lactic acid (1)</li> </ul>	<b>3</b>

Question number	Answer	Mark
<b>1(b)</b>	<p>An answer that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• fruit provides vitamin C to prevent scurvy (1)</li> <li>• roughage/fibre to help peristalsis (1)</li> </ul>	<b>2</b>

**Total for Question 1 = 5 marks**

Question number	Answer	Mark
2(a)(i)	B	1

Question number	Answer	Mark
2(a)(ii)	C	1

Question number	Answer	Additional guidance	Mark
2(b)	Division • $25\,000 \div 4 = 6250$ days (1)  Division • $6250 \div 365 = 17.1$ years (1)  Addition • $2017 + 17.1$ years = 2034 (1)	award full marks for correct numerical answer without working	3

Question number	Answer	Mark
2(c)(i)	An explanation that makes reference to the following two points:  • heart rate increases (1) • because adrenaline is released (1)	2

Question Number	Answer	Mark
2(c)(ii)	A description that makes reference to the following two points:  • one area where rhino are monitored and one area where they are not/monitored and unmonitored rhinos in same area (1) • count/compare the number of deaths (1)	2

**Total for Question 2 = 9 marks**

Question number	Answer	Mark
<b>3(a)(i)</b>	<p>An explanation that makes reference to the following five points:</p> <ul style="list-style-type: none"> <li>• training improves performance by increasing the number of capillaries (1)</li> <li>• better supply of oxygen/aerobic (1)</li> <li>• better supply of glucose (1)</li> <li>• respiration/energy/ATP (1)</li> <li>• muscle contraction (1)</li> <li>• better removal of lactic acid/carbon dioxide (1)</li> <li>• can run for longer/equivalent (1)</li> </ul>	<b>5</b>

Question number	Answer	Mark
<b>3(a)(ii)</b>	<p>An answer that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• use more people (1)</li> <li>• extend training period (1)</li> <li>• compare different ages/genders (1)</li> </ul>	<b>2</b>

Question number	Answer	Additional guidance	Mark
<b>3(b)(i)</b>	<p>Multiplication</p> <ul style="list-style-type: none"> <li>• 0.008 (1)</li> </ul> <p>Division</p> <ul style="list-style-type: none"> <li>• <math>25 \div 0.008 = 3125 = 3100</math> (1)</li> </ul>	<p>award full marks for correct numerical answer without working accept 3125</p> <p>the final answer should reflect the precision of the least precise data (in this case two sig figs)</p>	<b>2</b>

Question number	Answer	Additional guidance	Mark
<b>3(b)(ii)</b>	An explanation that makes reference to two of the following points: <ul style="list-style-type: none"><li>• wall contains muscle/elastic tissue (1)</li><li>• blood is under high pressure from the left ventricle (1)</li><li>• aorta needs to expand (1)</li><li>• need to transport more blood (1)</li></ul>	allow converse	<b>2</b>

**Total for Question 3 = 11 marks**

Question number	Answer	Mark
4(a)(i)	D	1

Question number	Answer	Mark
4(a)(ii)	A	1

Question number	Answer	Additional guidance	Mark
4(b)	<p>An answer that makes reference to the following four points:</p> <ul style="list-style-type: none"> <li>• beaker containing water/sucrose/thistle funnel containing sucrose/water (1)</li> <li>• selectively permeable membrane separating sucrose from water (1)</li> <li>• ruler by tube of thistle funnel (1)</li> <li>• level of liquid shown in the tube (1)</li> </ul>		4

Question number	Answer	Additional guidance	Mark
4(c)	<p>Identification</p> <ul style="list-style-type: none"> <li>• 42 (1)</li> </ul> <p>Division</p> <ul style="list-style-type: none"> <li>• <math>42 \div 60 = 0.70</math> (1)</li> </ul>	award full marks for correct numerical answer without working	2

**Total for Question 4 = 8 marks**

Question number	Answer	Mark
5(a)(i)	Circle around dendrites/cell body and dendrites	1

Question number	Answer	Additional guidance	Mark
5(a)(ii)	Multiplication • $1.20 \times 10^2 = 120$ (1)  Multiplication • $1.3 \div 120 = 0.0108/1.08 \times 10^{-2}$ (1)	award full marks for correct numerical answer without working	2

Question number	Answer	Mark
5(a)(iii)	Mitochondria	1

Question number	Answer	Additional guidance	Mark
5(b)(i)	An answer that makes reference to the following points:  • chromosome (1) • plasmid (1)	allow nucleoid	2

Question number	Answer	Mark
5(b)(ii)	Stage Q	1

Question number	Answer	Mark
5(b)(iii)	Stage R	1

**Total for Question 5 = 8 marks**

Question number	Answer	Mark
<b>6(a)</b>	An explanation that makes reference to the following two points: <ul style="list-style-type: none"> <li>• attaches to haemoglobin (1)</li> <li>• therefore less oxygen transport (1)</li> </ul>	<b>2</b>

Question number	Answer	Mark
<b>6(b)</b>	A	<b>1</b>

Question number	Answer	Mark
<b>6(c)</b>	An answer that makes reference to the following six points: <ul style="list-style-type: none"> <li>• plus and minus sulphur dioxide (1)</li> <li>• same species of seed/equivalent (1)</li> <li>• more than one seed per treatment/equivalent (1)</li> <li>• number of seeds germinated/calculate percentage germination (1)</li> <li>• air tight container used (1)</li> <li>• same time period (1)</li> <li>• same water/same temperature/equivalent (1)</li> </ul>	<b>6</b>

**Total for Question 6 = 9 marks**

Question number	Answer	Mark
<b>7(a)</b>	A description that makes reference to two of the following points: <ul style="list-style-type: none"> <li>softened by saliva/bolus (1)</li> <li>muscle contraction in oesophagus (1)</li> <li>peristalsis (1)</li> </ul>	<b>2</b>

Question number	Answer	Mark
<b>7(b)</b>	An explanation that makes reference to four of the following points: <ul style="list-style-type: none"> <li>churning/equivalent (1)</li> <li>digested/broken down (1)</li> <li>protease/pepsin (1)</li> <li>amino acids (1)</li> <li>hydrochloric acid/low pH/optimum pH (1)</li> </ul>	<b>4</b>

Question number	Answer	Mark
<b>7(c)</b>	An explanation that makes reference to four of the following points: <ul style="list-style-type: none"> <li>growth reduced (1)</li> <li>lack of villi (1)</li> <li>fewer capillaries/fewer lacteals/less surface area (1)</li> <li>less absorption of named food molecule (1)</li> <li>function of named food molecule linked to growth (1)</li> </ul>	<b>4</b>

**Total for Question 7 = 10 marks**

Question number	Answer	Additional guidance	Mark
<b>8</b>	<p>An evaluation that makes reference to the following points:</p> <ul style="list-style-type: none"> <li>• letrozole does improve male fertility (1)</li> <li>• sperm concentration increases/sperm motility increases (1)</li> <li>• letrozole increases testosterone levels/ decreases oestrogen levels (1)</li> <li>• letrozole causes side effects/equivalent (1)</li> <li>• need to know group size (1)</li> <li>• matched groups (1)</li> <li>• need to know other factors controlled (1)</li> </ul>	<p>e.g. age, diet, smoking, drugs</p>	<b>6</b>

**Total for Question 8 = 6 marks**

Question number	Answer	Additional guidance	Mark
<b>9(a)</b>	An explanation that makes reference to two of the following points: <ul style="list-style-type: none"> <li>• dominant allele always expressed (1)</li> <li>• dominant expressed in heterozygote (and homozygote)/recessive allele not expressed in heterozygote (1)</li> <li>• recessive allele only expressed in phenotype of homozygote/equivalent (1)</li> </ul>	allow seen/visible	<b>2</b>

Question number	Answer	Mark
<b>9(b)</b>	An explanation that makes reference to three of the following points: <ul style="list-style-type: none"> <li>• Karen and Brian unaffected (1)</li> <li>• they both are heterozygous/carriers/have a recessive allele (1)</li> <li>• Sam is albino (1)</li> <li>• Sam is aa/homozygous recessive (1)</li> </ul>	<b>3</b>

Question number	Answer	Additional guidance	Mark
<b>9(c)</b>	A genetic diagram including: <ul style="list-style-type: none"> <li>• parents Nn and Nn (1)</li> <li>• gametes N or n (1)</li> <li>• genotypes of offspring NN Nn Nn nn and phenotypes correctly assigned (1)</li> </ul>	allow max 3 for transfer error  allow all marks from Punnett square	<b>3</b>

Question number	Answer	Additional guidance	Mark
<b>9(d)</b>	An answer that makes reference to the following points: <ul style="list-style-type: none"> <li>• Nn not affected/killed by malaria/survive (1)</li> <li>• reproduce (1)</li> <li>• so number of Nn individuals increase (1)</li> <li>• so number of nn individuals increases/frequency of (n) allele increases (1)</li> </ul>	allow converse for NN	<b>4</b>

**Total for Question 9 = 12 marks**

Question number	Answer	Mark
10(a)(i)	C	1

Question number	Answer	Mark
10(a)(ii)	B	1

Question number	Answer	Mark
10(b)(i)	<p>A description that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>• place leaf in boiling water (1)</li> <li>• place leaf in boiling ethanol (1)</li> <li>• use water bath/safe heating/no naked flame (1)</li> <li>• place leaf in water (1)</li> <li>• place leaf in iodine solution (1)</li> <li>• blue/black indicates starch; orange/yellow indicates no starch (1)</li> </ul>	4

Question number	Answer	Additional guidance	Mark
10(b)(ii)	<p>A drawing showing the following:</p> <ul style="list-style-type: none"> <li>• white part labelled orange/yellow/no starch (1)</li> <li>• green part labelled blue/black/starch (1)</li> </ul>	allow approximate shape	2

Question number	Answer	Mark
10(c)	<p>A method that includes two of the following points:</p> <ul style="list-style-type: none"> <li>• trace around the leaf/use transparent paper/equivalent (1)</li> <li>• trace around the green part (1)</li> <li>• put onto squared paper (1)</li> <li>• count the number of squares (1)</li> <li>• reference to both sides of leaf being measured (1)</li> </ul>	2

**Total for Question 10 = 10 marks**

Question number	Answer	Mark
11(a)(i)	<p>A graph showing:</p> <ul style="list-style-type: none"> <li>• <math>y</math>-axis scale half grid and linear (1)</li> <li>• bars drawn with lines (1)</li> <li>• <math>x</math>-axis labelled age and <math>y</math>-axis labelled mean maximum, and <math>x</math>-axis units as years and <math>y</math>-axis units as <math>\text{dm}^3</math> (1)</li> <li>• bars plotted correctly (1)</li> <li>• key males/females (1)</li> </ul>	5

Question number	Answer	Mark
11(a)(ii)	<p>Subtraction</p> $5.2 - 2.1 = 3.1$ (1)	1

Question number	Answer	Mark
11(a)(iii)	<p>An explanation that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• mean maximum lung volume for males is greater than females for 16 and 25 (1)</li> <li>• males grow more than females (1)</li> <li>• greater difference from puberty/equivalent (1)</li> <li>• males continue to grow from 16 to 25 (1)</li> </ul>	3

Question number	Answer	Mark
11(b)(i)	B	1

Question number	Answer	Mark
11(b)(ii)	<p>An explanation that makes reference to two of the following points:</p> <ul style="list-style-type: none"> <li>• different body mass/size (1)</li> <li>• taking more exercise/equivalent (1)</li> <li>• smoking (1)</li> <li>• asthma/lung disease/equivalent (1)</li> <li>• genetics/inheritance (1)</li> </ul>	2

**Total for Question 11 = 12 marks**

Question number	Answer	Mark
<b>12(a)(i)</b>	<p>A description that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• use information about milk yield of daughters/mothers (1)</li> <li>• to select bulls as male parents (1)</li> <li>• mate with cows with high milk yield (1)</li> <li>• repeat over generations (1)</li> </ul>	<b>3</b>

Question number	Answer	Mark
<b>12(a)(ii)</b>	<p>An answer that makes reference to three of the following points:</p> <ul style="list-style-type: none"> <li>• cheaper/quicker to transport sperm than live bulls (1)</li> <li>• can use semen to mate with many cows (1)</li> <li>• can store semen after bull has died (1)</li> <li>• safer (for cows) (1)</li> </ul>	<b>3</b>

Question number	Answer	Additional guidance	Mark
<b>12(b)</b>	<p>A description that makes reference to four of the following points:</p> <ul style="list-style-type: none"> <li>• control light intensity/use artificial lighting (1)</li> <li>• use heaters to increase temperature (1)</li> <li>• provide additional carbon dioxide (1)</li> <li>• provide additional minerals (1)</li> <li>• control water supply (1)</li> <li>• reduce damage by pests/use biological control (1)</li> </ul>	ignore nutrients	<b>4</b>

**Total for Question 12 = 10 marks**

**TOTAL FOR PAPER = 110 MARKS**

