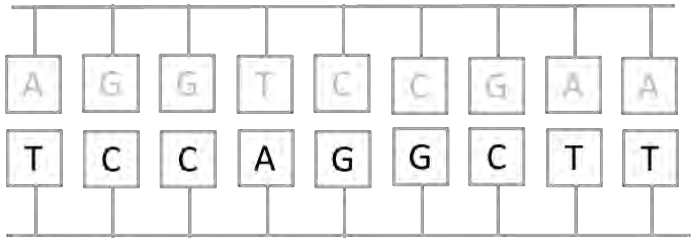
Question Number	Answer	Additional Guidance	Mark
1(a)(i)	D (increases the time taken for a blood clot to form)		**(1)**

Question Number	Answer	Additional Guidance	Mark
1(a)(ii)	C (internal bleeding)		**(1)**

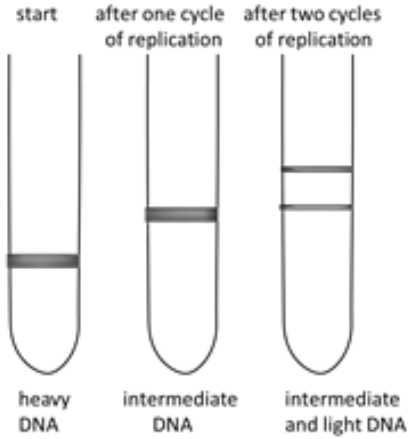
Question Number	Acceptable Answer	Additional guidance	Mark
1(b)	An explanation that makes reference to the following: • blood clots can block the coronary arteries (1) • reducing the {flow of blood / supply of oxygen} to heart tissue (1) • resulting in a heart attack (1)		**(3)**

(Total for Question 1 = 5 marks)

Question Number	Answer	Additional Guidance	Mark
2(a)	B (pentose)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
2(b)(i)			**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
2(b)(ii)	Hydrogen (bond)	Allow H	**(1)**

Question Number	Acceptable Answer		Additional Guidance	Mark
2(c)	A description that makes reference to five of the following: • (bacteria) are initially fed on medium containing { heavy nitrogen / N15 } • (bacteria) are then fed on { light nitrogen / N14 } • DNA is extracted and separated by (centrifugation) after one and two cell cycles • DNA from the start shows up as a single band of heavy DNA • DNA extracted after one cycle of replication shows up as a single band of intermediate DNA • DNA extracted after two cycles of replication shows up as one band of intermediate and one band of light DNA	(1) (1) (1) (1) (1) (1)	Accept a suitable annotated drawing of the results for the last three marking points.  	**(5)**

(Total for Question 2 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
3(a)(i)	C (S – mm and T – Mm)		**(1)**

Question Number	Answer	Additional Guidance	Mark
3(a)(ii)	C (0.5)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(b)	An explanation that makes reference to the following: • a mutation gives rise to a change in the { nucleotide / base } sequence (1) • resulting in a change in the { primary structure / amino acid sequence } (1) • resulting in altered folding or bonding (1) • changing the shape of the protein (1)	Accept an explanation in terms of production of a truncated protein – mutation gives rise to stop codon – a shortened polypeptide chain is produced – that cannot fold in the same way – giving a protein with a different shape	**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
3(c)	An explanation that makes reference to the following: • less { elastic tissue / fibres } in the wall (1) • so reduced ability to { maintain blood pressure / reduced elastic recoil } (1)		**(2)**

(Total for Question 3 = 8 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
4(a)	• values identified as 22 and 13 (1) • correct answer 41 (1)	22 − 13 = 9 (9 ÷ 22) x 100 = 41 Allow full marks for correct answer with no workings	**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(b)	An explanation that makes reference to the following: • blood glucose concentration decreases (as soon as exercise starts) because it is used as energy source (1) • muscle glycogen concentration only decreases one hour after exercise begins (1) • glycogen is { an energy store / hydrolysed } providing glucose (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(c)(i)	A description that makes reference to the following: • starch is a polysaccharide made from alpha glucose units (1) • units in the chains are joined by 1,4 glycosidic links (1) • starch contains { unbranched chains / amylose } and { branched chains / amylopectin } (1) • branches are joined to chains by 1,6 glycosidic links (1)	Glucose alone is insufficient	**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
4(c)(ii)	An explanation that makes reference to the following: • starch can be easily broken down to glucose (1) • glucose can be used to form glycogen (1) • glycogen stored in muscle (1) • as required glycogen can be { broken down / hydrolysed } to glucose (1)		**(4)**

(Total for Question 4 = 13 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
5(a)	An explanation that makes reference to five of the following:			
	• rate of diffusion is proportional to surface area - alveoli have large surface area	(1)		
	• rate of diffusion is proportional to difference in concentration – breathing maintains a difference in gas concentrations	(1)		
	• rate of diffusion is proportional to difference in concentration – blood flow maintains a difference in gas concentrations	(1)		
	• rate of diffusion is inversely proportional to diffusion distance – walls of alveoli and capillaries are one cell thick	(1)		
	• diffusion distance is reduced due to flattened cells forming alveoli and capillary walls	(1)		
	• rate of diffusion is proportional to diffusion constant – cell membranes are relatively permeable to non-polar gas molecules	(1)		**(5)**

Question Number	Acceptable Answer		Additional Guidance	Mark
5(b)	An explanation that makes reference to the following:			
	• { thick / sticky } mucus accumulates in airways	(1)		
	• { blocking / reducing } air flow into the alveoli	(1)		
	• concentration gradient of gases reduced	(1)		**(3)**

(Total for Question 5 = 8 marks)

Question Number	Answer	Additional Guidance	Mark
6(a)(i)	A (aorta)		**(1)**

Question Number	Answer	Additional Guidance	Mark
6(a)(ii)	B (P → R → Q → S)		**(1)**

Question Number	Answer	Additional Guidance	Mark
6(a)(iii)	D (R and S)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
6(b)(i)	(1) • two correctly identified times (1) • correct answer 85.6 / 86	<u>Example of calculation</u> 1.14 − 0.44 = 0.70 s 60 ÷ 0.70 = 85.6 = 86 beats min^{-1} Allow +/- 0.02 for cycle length Allow correct numerical value with no units Allow full marks for correct answer with no workings	**(2)**

Question Number	Acceptable Answer	Additional Guidance	Mark
6(b)(ii)	• correct calculation of volume of blood per contraction (1) • correct multiplication of volume by heart rate (1) • correct answer 6.54 (1)	<u>Example of calculation</u> 124 − 48 = 76 cm^3 86 x 76 = 6536 cm^3 = 6.54 Allow +/-4 for volume of blood expelled Allow ECF Allow full marks for correct answer with no workings	**(3)**

(Total for Question 6 = 8 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
7(a)	An explanation that makes reference to the following: • between 0 and 4% permeability of the membrane increases slightly (1) • between 4% and 6% there is a large increase in permeability due to { damage to membrane / disruption of the lipids } (1) • from 8% to 10% there is no change in absorbance as the concentration of betalain is the same inside the cell and outside the cell (1) • lipids in the cell membrane are soluble in detergents (1)	Do not accept 'all the betalain has left the cell'	**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(b)	An explanation that makes reference to four of the following: • temperature to be controlled because an increase in temperature causes an increase in { permeability of membranes / rate of diffusion } (1) • beetroot sample to be of same { source / age } to ensure constant concentration of betalain inside cells (1) • beetroot cubes to be the same size as surface area to volume ratio affects rate of diffusion (1) • volume of solution to be kept constant as it will affect the dilution of the betalain (1) • repeats at each concentration of detergent to { ensure reliability of results / allow calculation of average } (1)		**(4)**

Question Number	Acceptable Answer	Additional Guidance	Mark
7(c)	• correct absorbance reading (1) • correct concentration of betalain (1)	0.36 – 0.38 0.20 – 0.21 Allow full marks for correct answer with no workings	**(2)**

(Total for Question 7 = 10 marks)

Question Number	Answer	Additional Guidance	Mark
8(a)	A (ester bonds to produce fatty acids)		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(i)	Correct reading and subtraction	95 − 60 = 35	**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(ii)	An explanation that makes reference to the following: • from 0 to 5 μg cm^{-3} of lipase rate of hydrolysis of the triglyceride shows linear increase (1) • after 5 μg cm^{-3} of lipase the increase in rate of hydrolysis is no longer proportional to the increase in concentration of enzyme (1) • substrate concentration is limiting (1)	Accept 'is directly proportional' Accept another factor is limiting	**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(iii)	An explanation that makes reference to the following: • (carry out the same procedure) using a concentration of lipase between 3 and 5 μg cm^{-3} (1) • use a range of concentrations of orlistat (1) • measure mass of triglyceride hydrolysed (1)		**(3)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(b)(iv)	(change in) pH		**(1)**

Question Number	Acceptable Answer	Additional Guidance	Mark
8(c)	A description that makes reference to the following: • mRNA is produced by transcription in the nucleus (1) • mRNA (leaves the nucleus and) associates with the ribosome (1) • tRNA brings specific amino acid to the ribosome (1) • anticodons on the tRNA bind to (complementary) codons on the mRNA (1) • order of amino acids in the lipase molecule is determined by the codons on the mRNA (1)		**(5)**

(Total for Question 8 = 14 marks)

Question Number	Indicative Content	
***9**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. 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. • use of statins increases risk of diabetes in those with a major risk factor • diabetes not immediately life threatening • use of statins reduces the risk of death from CVD in both groups • reduction in risk of CVD outweighs the risk of diabetes • statins should be taken by those over 50 • those with a risk factor for diabetes might be monitored more closely	
Level 0	Marks	No awardable content
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. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.
Level 2	3-4	An explanation will be given with occasional evidence of analysis, interpretation and/or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.
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. The explanation shows a well-developed and sustained line of scientific reasoning which is clear and logically structured.

(Total for Question 9 = 6 marks)