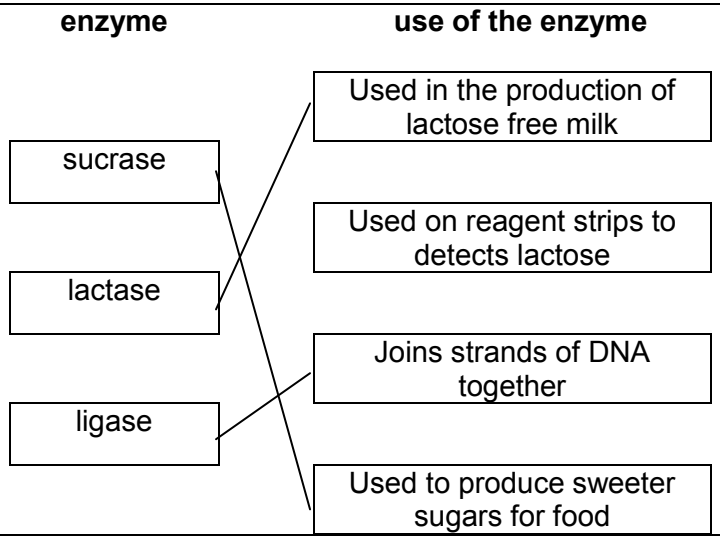
Question	Answer	Marks	Guidance
1 a	<table><tr><td>saliva</td><td></td></tr><tr><td>gastric juice</td><td></td></tr><tr><td>bile from the liver</td><td>✓</td></tr><tr><td>secretions from the pancreas and small intestine</td><td></td></tr></table>	1	More than 1 tick = 0
b	**any two from:** they contain different enzymes (1) enzymes do not get denatured (1) each enzyme has a different optimum pH / works best at a different pH (1)	2	**allow** correct named examples
	Total	**3**	

Question	Answer	Marks	Guidance
2 a		2	three correct =2 marks one or two correct = 1 mark if 2 lines from one enzyme, then do not credit for that enzyme
b i	protein (1)	1	**allow** polypeptides **not** amino acids
ii	idea that claim can not be quantified (1) people's taste differs / it's just an opinion / it's subjective (1)	2	**allow** it is only a claim / not scientific fact / cannot be proved / there is no evidence
iii	plasmid (1)	1	**allow** virus **allow** loop of DNA
	Total	**6**	

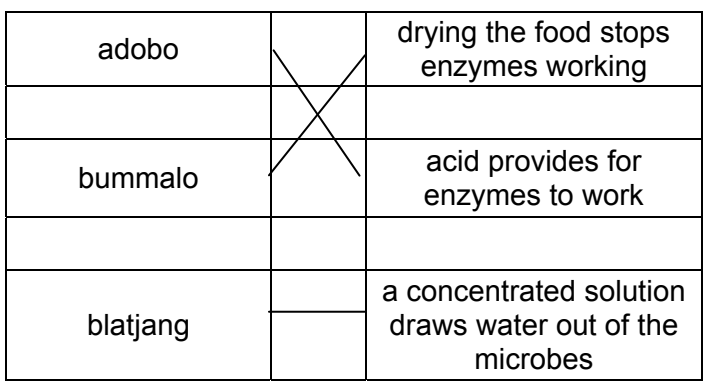
Question	Answer	Marks	Guidance
3 a	T = 27 (%) C = 23 (%) G = 23 (%) all correct = 2 one or two correct = 1	2	
b	idea of base pairing (1) BUT A pairs with T **and** C pairs with G (2)	2	**allow** the bases are complementary **allow** A pairs with T = 1 or C pairs with G = 1 **allow** bases pair - A links with T **and** C links with G = 2
c i	Idea that Watson and Crick / they could not have produced their model without Chargaff's / his discovery / AW (1)	1	**allow** without Chargaff's information they could not advance their work **ignore** he discovered the bases / base pairings **ignore** he helped them with the structure but **allow** he discovered the base pairings that helped them discover the structure
ii	Watson and Crick were the ones who came up with the structure of DNA / Chargaff did not come up with the structure of DNA / AW (1)	1	**allow** he was not in the group that came up with the final discovery
	Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		Answer in range 11-12 (years) (1) idea of greatest difference between 95th and 5th percentile lines (1)	2	**allow** calculation of the difference anywhere in the 11-12 range
	(b)		(yes) because the mean / median values for boys > mean / median values for girls (1) (no) because some girls are taller than some boys (1)	2	**allow** value for boys at 50 percentile is higher than girls at 50 percentile **allow** some of the boys are same height as some of the girls ORA
	(c)	(i)	**max four from:** structural proteins (1) to build new **tissue** / named tissue e.g. skin (1) hormones (1) to **control** growth / control body processes / control named process e.g. puberty (1) carrier molecules / eg haemoglobin (1) to **transport** materials (needed for growth) (1) enzymes / catalysts (1) to control chemical reactions (involved in growth) (1)	4	can only get both marks for each type of protein if points clearly linked 'job' mark is dependent on 'type' mark max 2 for types of proteins given with no link to growth **allow** named enzymes or named reactions eg enzymes (1) that control respiration (1) **allow** specific examples eg insulin (1) to control blood sugar (1) collagen (1) to make skin (1) antibodies (1) to fight disease (1) clotting factor (1) to seal wounds (1) melanin (1) protect skin from UV (1) keratin (1) to make skin/hair (1) haemoglobin (1) carry oxygen (1) two specific examples of the same type can still gain full marks e.g protease to break down protein, carbohydrase to break down carbohydrates = 4 **ignore** hormones that are not proteins: progesterone / oestrogens / testosterone

Question			Answer	Marks	Guidance
		(ii)	it codes for the amino acid sequence / order (1) 3 bases / triplet codes for one amino acid (1)	2	**ignore** bases make amino acids **allow** higher level answers referring to role(s) of mRNA / tRNA (up to 2 marks for full explanation)
			Total	**10**	

<table>
<tr><th colspan="3">Question</th><th>Answer</th><th>Marks</th><th>Guidance</th></tr>
<tr><td>5</td><td>(a)</td><td></td><td>any two from:
microbes can respire faster (1)
microbes can reproduce/grow faster (1)
enzymes work faster / enzymes are closer to optimum (1)</td><td>2</td><td>allow non-comparative statements but must have at least one comparative statement to gain full marks

e.g. microbes grow fast = 1
microbes grow fast and enzymes work fast = 1
enzymes work fast so microbes grow faster = 2

ignore microbes work faster
allow alternatives to microbes e.g. bacteria / fungi</td></tr>
<tr><td></td><td>(b)</td><td></td><td> 
</td><td>1</td><td>all correct = 1 mark</td></tr>
<tr><td></td><td></td><td></td><td>Total</td><td>3</td><td></td></tr>
</table>

Question			Answer	Marks	Guidance
6	(a)	(i)	answer in range 9-10 (years) (1)	1	
		(ii)	answer in range 0-1 (years) (1)	1	
		(iii)	13.5 (years) (1) greatest (vertical) distance/height between lines / AW (1)	2	**allow** answer in range 13-14 (years) mark the two points independently
	(b)	(i)	mitosis (1)	1	**allow** phonetically correct spelling
		(ii)	DNA unzips (1) add bases (1) **but** add complementary bases (2)	3	marks may be awarded to a diagram **ignore** DNA unwinds / splits **allow** double helix unzips **ignore** chromosome unzips **ignore** descriptions of cell division **allow** add nucleotides (1) **allow** A pairs with T / C pairs with G (2)
			Total	**8**	

Question			Answer	Marks	Guidance
7	(a)	(i)	mitosis (1)	1	**allow** phonetic spelling but important that "t" is in the middle
		(ii)	idea that there is the same (amount of) DNA / genetic material in each (new) cell after division (as before) (1)	1	**answer must refer to new cells produced after division** **allow** makes a copy of chromosomes so there are two new copies, one for each cell **ignore** just to copy DNA
	(b)		**[Level 3]** Comparison made between the two graphs WITH explanation in terms of collision rates OR in terms explanation of denaturing in terms of the shape of the active sites. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Comparison made between the two graphs with an explanation to include denaturing. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Comparison made between the two graphs: shape of graphs OR optimum temperatures OR when enzyme activity stops. No explanation of mechanisms. Quality of written communication impedes communication of the science at this level. (1 – 2 marks) **[Level 0]** Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)	6	**This question is targeted at grades up to A*** **Indicative scientific points at Level 3 may include:** • more frequent successful collisions with higher temperature due to increased energy for movement • denaturing irreversibly changes the shape of the active site **Indicative scientific points at Level 2 may include:** • high temperatures denature enzymes • active site denatured by heat / "lock and key" no longer fit **Indicative scientific points at Level 1 may include:** • enzyme activity for both graphs activity increases with temperature to an optimum then decreases • optimum temperature is about 37°C for humans and about 55°C for bacteria • enzyme activity stops at about 42°C for human and about 66°C for bacteria **allow** best / peak temperature instead of optimum **must make some comparison between the two graphs to score any marks**
			Total	**8**	