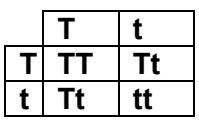
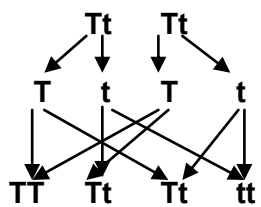
Question	Answer	Marks	Guidance
1 a i	37.5 (^{o}C) (1)	1	**allow** answer in range 35-40 (^{o}C) **allow** single number, e.g. 37 (^{o}C) or range, e.g. 37-38 (^{o}C)
ii	(as temperature increases) time gets longer / rate gets slower (1) reaction stops / protein no longer broken down / AW (1) enzyme / pepsin denatures (at high temperatures) (1)	3	**allow** time increases **allow** any specific time greater than 6 **allow** time would be infinite / tube would not go colourless/ no reaction / the reaction won't work **ignore** it would not work if referring to enzyme only and not reaction **allow** description of denaturing in terms of changing shape of active site **ignore** protein is denatured
b i	The volume of carbon dioxide is less than the volume of oxygen / 2nd box (1)	1	more than one answer = 0 **allow** other unambiguous answers, e.g. X in box, underlining, circle
ii	**max three from** structural (1) e.g. collagen / keratin (1) hormones (1) e.g. insulin (1) carrier molecules (1) e.g. haemoglobin (1) enzymes / biological catalyst (1) e.g. amylase (1)	3	only award marks for examples if have already gained the function mark **ignore** pepsin **allow** antibodies (1) receptors (1) muscles / growth / repair (1)
	Total	**8**	

Question			Answer	Marks	Guidance
2	(a)		supports claim (that found in stomach) because it works best/optimum around pH 2 (1) does not support claim that it is a protease since there is no evidence (to support or reject claim) (1)	2	**allow** optimum pH matches stomach pH **allow** idea it could be another type of enzyme
	(b)		**any four from:** (protein) not digested in mouth/oesophagus **or** is digested in stomach (1) no **protease** in mouth/oesophagus **or** **protease** is in stomach (1) protease needed to digest coat of tablet (1) protease needed to digest wall of beads (to release medicine) (1) early release from thin beads / later release from thick walled beads (1)	4	**allow** break down as an alternative for digestion **ignore** acid if answer clearly refers to protease (or protein-digesting enzymes) then do not need to keep repeating this to gain subsequent marks
			Total	**6**	

Question	Answer	Marks	Guidance
3 a	amino acids (1)	1	**allow** C, H, O, N.
b	denatures protein (1) as quickly as possible (1)	2	**allow** denaturing enzymes rather than proteins **allow** so stops acting as a poison (1) **ignore** idea of sterilising wound
c	(poison) **gene** is switched off (in all but the spine cells) (1)	1	**allow** allele is switched off **allow** higher level answers e.g. transcription prevented
d	**any two from:** (no – no mark) idea that small individual risk/small number of incidents (1) no serious harm caused (1) idea that can wear footwear (1) fish may move to other beaches (so will not stop the problem) (1) increase awareness of the danger (1) go on beach but not in the water (1) possible adverse effect on tourism/economy/jobs (1) (yes – no mark) idea that stings may be dangerous to some people / some people may have allergy (1) idea of liability if danger known and people not warned (1) idea that if many of the stings happened on a small number of beaches, they should be closed (1)	2	**allow** easily treated
	Total	**6**	

Question	Answer	Marks	Guidance
4 a	undifferentiated cells / unspecialised cells (1) idea that can develop/change into different types of cells (1)	2	 **ignore** can change into anything
b	made from skin cells (1) normal stem cells come from embryos (1)	2	**allow** made from differentiated cells **allow** stem cells come from bone marrow / umbilical cord
c	**any two from:** (no –do not credit) produced by meiosis (1) genetically / DNA different / contain different combinations of chromosomes (1) only contain one of each pair of chromosomes (1)	2	Yes = 0 **allow** phonetic spelling e.g. miosis
d	idea that just because it was successful in mice this does not mean it will be successful in humans/human cells might react differently (1) idea that this is germline treatment / that if anything goes wrong it can affect all descendants (1)	2	**ignore** it's unethical / immoral / against God etc. **ignore** any social/cultural aspects come under the umbrella of unethical **ignore** simply 'cost' **but allow** expanded economic argument e.g. money spent on this will be money taken away from other treatments/preventions (1)
e	energy (source) (1)	1	**allow** for swimming / movement **ignore** respiration **reject** producing energy **allow** release energy **allow** higher level, specific answers, e.g. active transport
f i	protein synthesis / make proteins / join amino acids together (1)	1	**allow** higher level answer: translation
ii	mRNA / messenger RNA (1)	1	**ignore** just RNA
iii	A, T, C, G (1)	1	must have all four **ignore** order **ignore** U / uracil **allow** names: adenine, thymine, cytosine, guanine
	Total	**12**	

Question	Answer	Marks	Guidance
5 a i	amino acids (1)	1	
ii	EAR = 7.2 (g) (1)	1	**allow** 0.0072 kg **allow** 7.20 (g)
iii	15 year olds body mass is larger (1) EAR is calculated using body mass (not age) (1)	2	**allow** 15 year olds are bigger / heavier ORA **allow** idea of growth spurts/adolescence/puberty(needing more protein) **ignore** just growth / growth stages **allow** weight for mass
b	parent genotypes/gametes (1) offspring genotypes (1) 0.25 / 25% / ¼ / 1 in 4 / 1 to 3 of having beta thalassaemia (1)	3	 Correct diagram = 2  **If no marks awarded allowed ecf for max 1 mark for either offspring genotypes or ratio** **allow** alternative letter code
	Total	**7**	

Question			Answer	Marks	Guidance
6	(a)		$6O_2 \rightarrow 6CO_2$	1	
	(b)		**Level 3 (5–6 marks)** RQ for both seeds calculated correctly. Compares calculated results to food type table and links pea seed with carbohydrate **and** peanut with a combination fat+protein. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** RQ for both seeds calculated correctly. Compares calculated results to food type table and links pea seed with carbohydrate **or** peanut with a combination fat+protein. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** RQ for both seeds calculated correctly **or** one correct RQ with a correct link to food source. Quality of written communication impedes communication of the science at this level. **Level 0 (0 marks)** Insufficient or irrelevant science. Answer not worthy of credit.	6	**This question is targeted at grades up to C.** **Indicative scientific points at level 2 and 3 may include:** consider following point with reference to RQ RQ for carbohydrate = 1.0 so peas must be/use RQ for fat = 0.7 RQ for protein = 0.9 peanuts must be/use combination of protein and fat **Indicative scientific points at level 1 may include:** RQ for pea seed = 1.0 RQ for peanut seed = 0.80 (allow 0.798) **allow** pea is $\frac{0.6}{0.6}$ and peanut is $\frac{13.0}{16.3}$ for 1 mark • for 2 marks need to be clear which RQ is which but both RQs correct in the table will score 2 marks 1 RQ correct only will score 1 mark at L1 **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**

Question			Answer	Marks	Guidance
	(c)		enzyme activity would stop (1) because enzyme and substrate cannot bind / enzyme has lost its 3-D shape / active site destroyed / enzyme denatured / protein coagulates / irreversible change (1)	2	**allow** enzyme is inactive **not** enzyme killed
			Total	**9**	