Question			Answer	Marks	Guidance
1	(a)		**[Level 3]** Changes to DNA may change **enzymes** / proteins controlling reaction rates, causing harmful changes to cell processes (leading to illness / cancer). Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Changes to DNA may cause different quantities or different types of protein to be made, causing harmful changes to cell processes (leading to illness / cancer). Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Changes to DNA may affect proteins. 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 C** **Indicative scientific points at Level 3 may include:** • enzymes are proteins / biological catalysts / control chemical reactions in cells • changes in enzymes result in harmful changes to cell processes. **Indicative scientific points at Level 2 may include:** • mutations may change the amino acid sequence of proteins • mutations may lead to production of different proteins • changes in proteins result in harmful changes to cell processes. **Indicative scientific points at Level 1 may include:** • changes to DNA may affect amino acids. **ignore** DNA changes are mutations

Question			Answer	Marks	Guidance
	(b)		**any two from:** the harm has already been done / no further harm will be done (1) unethical to deliberately expose people to radiation to investigate / otherwise it may be necessary to test people/animals (1) tells us more about cancer (eg how long it takes to develop) / helps us treat or prevent cancer / if we don't use this information more people may suffer (1)	2	if no other marks awarded **allow** 1 for idea that this is the best way to get this information **ignore** simply 'provide information linking radiation and cancer' (in question)
			Total	**8**	

Question	Answer	Marks	Guidance
2 a i	ciliated epithelial cells (1)	1	**allow** correct answer ringed, ticked or underlined on list
a ii	damages the cilia (1) unable to remove/clear mucus (1)	2	**allow** damage to hairs **allow** cilia are paralysed/can't move/can't work **ignore** affects cilia **ignore** cilia are destroyed/burned/killed **allow** damages / stimulates goblet cells **allow** unable to remove pathogens/bacteria/dirt/dust **allow** produce **more/build-up** mucus **ignore** causes smokers' cough **ignore** causes (lung) cancer
a iii	benign (1) malignant are cancerous / malignant tumours spread (1)	2	 **allow** malignant form metastases / benign don't metastasis **ignore** malignant tumours are uncontrolled cell growth **ignore** benign tumours are harmless/stop growing benign tumours aren't cancerous = 2 benign tumours do not spread = 2
b i	bar height between 7.8 and 8.8 (1)	1	
b ii	**any two from:** lowest risk/1% risk / (1) idea of catching people before they start (1) idea of less time for long term damage to cells / DNA (1) idea of easier to give up when younger / ORA (1) idea that under 30 year olds act more as role models for children (1)	2	**allow** risk nearly doubles for each 10 years after 30yrs
	Total	8	

Question	Answer	Marks	Guidance
3	**[Level 3]** Answer includes a correct calculation of index with a relevant conclusion **and** answer includes reference to a reduction in coronary artery diameter reducing blood supply to the heart muscle Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer includes a correct calculation of index with a relevant conclusion **or** a partially correct attempt at calculating the index and reference to a reduction in coronary artery diameter reducing blood supply to the heart muscle Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer includes some reference to the heart disease being caused by a reduced blood supply to heart muscle **or** a partially correct attempt at calculating the index. 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 up to grade A*** **Indicative scientific points about the link may include:** • **narrower / reduced diameter reduces blood supply to heart muscle** • **narrower / reduced diameter means heart cells have less oxygen or glucose / stop contracting / stop respiration** **Indicative scientific points concerning calculation may include:** • **correct calculation of area = $\pi 2^2$ = allow answer from 12.5 to 12.6** • **correct calculation of index = allow answer from 1.5 to 1.6** **Indicative scientific points concerning conclusion may include:** • **reference to Eric's index falling in both groups** • **however closer to the mean for the group with CHD** **Correct index only = L2,3**
	Total	**6**	

Question			Answer	Marks	Guidance
4	(a)		(mosquito) bites (infected) person (1) via the (plasmodium in) blood (1)	2	**ignore** feeding / drinking / inserting / depositing unqualified **allow** piercing/ injecting **ignore** plasmodium is in the saliva **allow** sucking blood (to get plasmodium out or into a person/host) **allow** correct reference to plasmodium if not stated e.g. it/parasite/protozoan **ignore** bacteria/viruses/disease
	(b)		(idea that removal will prevent ability to breed) so identifies that (swamps/water) is where mosquitoes breed / eggs or larvae found (1)	1	**ignore** it kills mosquitoes unless qualified **ignore** mosquitoes live in swamps
	(c)		idea that they thought nets were successful in stopping gas / gas can get through the nets / did not know mosquitoes caused malaria (1) idea that nets stopped mosquitoes (1)	2	 **allow** reduction of malaria put down to stopping gas transmission but in fact it was stopping the mosquito (2)
	(d)		smell (of person) (1) wings / wing muscles (1)	2	**allow** scent **ignore** muscles unless correctly qualified
	(e)	(i)	brain / hypothalamus (1) (monitors) temperature of **blood** (1)	2	**ignore** body temperature (in question)
		(ii)	**any two from:** (more) blood flows close to surface (1) (increased) heat loss (1) by radiation / conduction / convection (1)	2	**not** blood vessels move closer to surface **allow** any heat transfer but needs to be a loss from the body
			Total	**11**	

Question			Answer	Marks	Guidance
5	(a)		substitution: (minimum) mass in kg = 24.9×1.8^2 (1) calculation: (minimum) mass in kg = 80.7 (1) calculation: needs lose 120 – 80.7 kg = 39.3 (kg) (1) acceptable final answer to one decimal place (1) each marking point is dependent on the previous marking point	4	mark final answer line first final answer of 39.2 or 39.3 (kg) (with no working) (4) (difference in BMI = 12.1×1.8^2 = 39.2) **or** final answer of 39 or any number that can be rounded to 39 (3) **or** final answer of 40 or any number that can be rounded to 40 (2) (arrived at by a method of estimation where a mass of 80 gives BMI of 24.7) allow 1 ecf for clearly deducting mass from 120 i.e. third marking point (plus can still get last marking point if to 1 d.p.)

Question			Answer	Marks	Guidance
	(b)		**Level 3 (5–6 marks)** Explains the specific consequences of high blood pressure **and** how cholesterol build up in coronary arteries can lead to a heart attack. Quality of written communication does not impede communication of the science at this level. **Level 2 (3–4 marks)** Explains **either** specific consequences of high blood pressure **or** how cholesterol build up in coronary arteries can lead to a heart attack. Quality of written communication partly impedes communication of the science at this level. **Level 1 (1–2 marks)** Idea that high blood pressure and/or build up of cholesterol can lead to heart disease/attack. 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 A.** **Indicative scientific points at level 2 and 3 may include:** • there is a link between the amount of saturated fat eaten, the build up of cholesterol (plaques), and the incidence of heart disease • narrowed coronary arteries / arteries to heart muscle, together with a thrombosis, increase the risk of a heart attack • possible consequences of high blood pressure include: burst blood vessels, brain damage, stroke, kidney damage. **Indicative scientific points at level 1 may include:** • high blood pressure can lead to heart disease • build up of cholesterol can lead to heart disease **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
			Total	**10**	

Question			Answer	Marks	Guidance
6	(a)		glycerol (1)	1	**allow** phonetic spelling
	(b)		contain all the essential amino acids / contain the amino acids the body cannot make (1)	1	**ignore** of animal origin / come from meat
	(c)	(	26.2 (2) **BUT** 85 ÷ 3.24 or 85 ÷ 1.8^2 (1)	2	**allow** 26 / 26.23 / 26.234568 (2) **but** 26.0 (incorrect rounding) max (1)
		(ii)	(yes) his BMI is between 25-29.9 (1)	1	answer must include numbers from the box **allow** more than 25 **and** less than 30 **allow** ecf from (i) e.g. if BMI = 32: no, because his BMI is over 30 (1)
		(iii)	(yes) (no mark) idea that unhealthy means you have a disease (and not overweight) / ora (1) idea that an England rugby player would need to be very fit (to be able to compete at that level) (1) **OR** idea that England rugby players have a lot of muscle not fat (1)	2	if no, then no marks at all must have one idea about health-free from disease idea and one about fitness – ability to perform play rugby (at high level) **or** idea of muscle not fat idea about fitness must relate to rugby players; idea about health need not **ignore** just 'rugby players have a lot of muscle'
			Total	**7**	

Question	Answer	Marks	Guidance
7 a	protein coat / protein outer layer / AW (1) (containing) genetic material (1)	2	protein cell wall = 0, but protein wall =1 **allow** DNA or RNA **allow** genes **ignore** chromosomes
b i	**any two from** idea that only estimates / not completely accurate as some sufferers might not go and see a doctor / not everyone is tested (for salmonella) (1) (flu estimate less reliable as) flu-like symptoms may not be flu (1) (salmonella more likely to be accurate as) positive tests for salmonella (bacteria) (1)	2	
ii	idea that flu more common in winter / salmonella more common in summer / ORA (1) (flu more common in winter) because more likely to be indoors/on buses or trains so flu more likely to be passed on / ORA (1) (salmonella more common in summer) because of BBQs / food may not be kept cold enough / ORA (1)	3	**ignore** simply food not cooked properly / stored at incorrect temperature (in question)
	Total	**7**	