Question	Answer	Marks	Guidance
1 a	**[Level 3]** Gives a full explanation that pesticide movement is driven by transpiration and occurs through the xylem **and** explains why pesticide movement is greater on warm sunny days. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Gives an explanation that pesticide movement is driven by transpiration and occurs through the xylem. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Gives a partial explanation explaining that pesticide movement is linked with transpiration **or** that it occurs through the xylem. 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 (HD) may include:** **transpiration** is greater when it is warm / sunny because: • (higher temperatures) increase rate of evaporation / diffusion • (on sunny days) stomata open (more widely) **Indicative scientific points at levels 1 and 2 (SD) may include:** • pesticide moves by transpiration • transpiration involves evaporation / diffusion • transpiration is greater when it is warm / sunny • movement through xylem if refer to stem/veins/vessels/phloem instead of xylem, limit to 5/3/1 marks if refer to just evaporation/diffusion instead of transpiration, limit to 5/3/1 marks if only give L3 indicative points, limit to L1 **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
b i	do not break down / can not be excreted (1)	1	**allow** stays around / can not be removed / keeps working
ii	gets into food chains / passes along food chains / bioaccumulation / idea that may harm other organisms (1)	1	**allow** builds up /accumulates
	Total	**8**	

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2 a i	**any two from:** as mass increases, heart rate decreases / AW / ORA (1) as mass increases, life span increases / AW / ORA (1) as heart rate decreases, life span increases / AW / ORA (1)	2	if get 2 correct and 1 wrong then award 2 marks 'as mass increases, heart rate decreases and life span increases' = (2)
ii	(yes) – idea that the life time heart beats are all around 1 or 2 billion (1) (no) – idea that some life time heart beats are more than twice / three times the value of others / AW OR chicken does not fit pattern (1)	2	**ignore** most are about the same (simply repeating question) **allow** all between 0.7-2.2 billion / within 1.5 billion (yes) – idea that most are about the 1 billion / within 0.5 billion, but chicken is the odd one out as it's about 2 billion / a lot more = (2) **allow additional marking points:** sample is not large enough to reach a valid conclusion (1) idea that there is still a large difference between eg 0.7 and 0.8 billion (1)
iii	no (no mark) **any two from:** for their mass, heart rate is too low (1) for their mass, life span is too high (1) for their mass, life time heart beats are too high (1)	2	**if yes, no marks** **if trend not clear, check table in 13ai to see if/where human placed** **allow** any two other correct comparisons

Question	Answer	Marks	Guidance
b i	idea that can use these findings to target treatment / preventative care (1) idea that results are reliable because they involved many people / involved people from around the world (1)	2	**allow** can inform / identify patients (with potential risks) **allow** idea that results are reliable because 4 years is a long time OR idea that results are not reliable because 4 years is not a long time **ignore** idea that it's not worth treating heart disease patients
ii	idea that the study only included heart disease patients / AW (1) idea that results only show patients with heart beats below 58 and above 78 (beat per min) / do not show results for all heart beats / AW (1)	2	**ignore** not enough data **allow additional marking points:** 4 years is not a long time (1) idea that data only shows a correlation and does not prove causation (1) there are (many) other factors affecting heart disease (1)
	Total	**10**	

Question	Answer	Marks	Guidance
3	**[Level 3]** Describes the results AND gives a detailed explanation of the experiment. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Describes the results AND gives a limited explanation of the experiment. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Describes the results of the experiment OR gives a limited explanation of the experiment. 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*** **Detailed explanation could include:** • air movement increases / maintains **concentration** gradient • air movement increases / maintains diffusion **gradient** • air movement lowers **concentration** of water outside plant **ignore** references to osmosis **Limited explanation could include:** • (increased) air movement / fan causes loss of water • (water is lost by) evaporation / diffusion of water **ignore** references to osmosis **Description:** • loss of mass/water/readings go down in B / shoot • no change in A (**allow** small decrease) To get full credit for description there needs to be a comparison between A and B. Description of only A or B limits mark to 1/3/5 **if no other marks, allow** air movement increases transpiration for L1, 1 mark **Use the L1, L2, L3 annotations in Scoris; do not use ticks.**
	Total	**6**	

Question	Answer	Marks	Guidance
4 a i	1 (cm) (1)	1	
ii	1727 (2) but 3.14 x 1 x 550 (1)	2	**allow** answer in range 1727-1728 (2) **allow** π x 1 x 550 (1) **allow** ECF from (i) **allow** correct rounding
iii	**any two from:** real lining has: villi (1) folds / creases (1) microvilli (1)	2	 **allow** finger-like projections **ignore** bumps / not smooth / stretched **ignore** cilia
b	**any two ideas from:** breast-feeding rats develop more villi/folds/microvilli (in small intestine) (1) breast-feeding rats absorb more food / faster (1) breast-feeding rats need more food to produce milk (1)	2	 **allow** reverse arguments **note** *absorb more food* to make *milk* = 2 **allow** nutrients as alternative to food
	Total	**7**	