Question	Answer	Marks	Guidance
1 a	low doses will not kill the (most) resistant bacteria (1) (so) they will (survive and) reproduce (1)	2	**ignore** immune bacteria
b	**[Level 3]** Answer fully explains the effect of antibiotics on the yoghurt-making process. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer partially explains the effect of antibiotics on the yoghurt-making process. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer states that bacteria are added to milk to make yoghurt **and** states that antibiotics kill bacteria OR States that as antibiotic concentration increases, pH of yoghurt increases 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 should:** increasing concentrations of antibiotic kill **more** bacteria **less lactic acid** made so higher pH so yoghurt production reduced **Indicative scientific points at level 2 should include:** • bacteria are added to milk to make yoghurt because they make **lactic acid** which lowers the pH • antibiotics will kill the yoghurt-making bacteria Must mention lactic acid to get level 2 **Indicative scientific points at level 1 should include:** • bacteria are added to milk to make yogurt • antibiotics kill bacteria **ignore** less yoghurt, less profit **allow** *Lactobacillus* as alternative for bacteria **Use the L1, L2, L3 annotations in Scoris. Do not use ticks.**
	Total	**8**	

Question	Answer	Marks	Guidance
2 a i	family ☐ genus ☐ kingdom ☐ order ☐ phylum ☐ species ✓	1	more than one answer = 0 **allow** other unambiguous answers, e.g. X in box, underlining, circle
ii	variety of life is a continuous spectrum AW (1)	1	**allow** different living things look very similar/have similar characteristics **allow** they have features that fit into more than one group **allow** they can't see the genetic code/DNA **allow** they can't see if they produce fertile offspring **allow** animals could look different but still belong to the same group due to common ancestors
b	natural systems are based on evolutionary relationships / (large number of) common characteristics (1) and artificial systems are based on one/a few/limited number of characteristics (1)	2	**must be clear which type of system they are referring to** **allow** natural based on ancestors / archaeological evidence / record in the rocks / physiology / biochemistry / reproduction / DNA **allow** artificial systems only based on what can be seen /physical features or behaviours e.g. flight or no flight
	Total	**4**	

Question			Answer	Marks	Guidance
3	(a)		(a group of organisms) capable of interbreeding / mating produces offspring (1) **but** (interbreed to) have fertile offspring (2)	2	**allow** can mate / can reproduce / have offspring **allow additional marking point:** organisms which share the same gene pool / share the same genetic information (1)
	(b)		class ☐ family ☐ genus ✓ order ☐ species ✓	2	each incorrect tick above 2 loses 1 mark down to zero
	(c)		**any two from:** (avoid predation) by distraction / scare off predators (1) attract their food source / act as bait (so they catch more food) (1) attract mates (to increase chance of reproducing) (1)	2	**allow** green oval structures may act as 'flares' that predators chase rather than attack the worms **allow** may be poisonous / toxic (to predators) **ignore** simply 'escape from predators' (in earlier part of question) **ignore** use structure to help them see (idea that it acts as a torch)

Question			Answer	Marks	Guidance
	(d)		**any three from:** (in ancestral population) some worms had green oval structures / some worms did not have green oval structures (1) green oval structures allowed worms to live in deep water / worms living in deep water developed green oval structures (1) idea of isolation between worms in deep and shallow water / isolation between worms with and without green oval structures (1) idea of independent evolution between two groups (1)	3	**ignore** simply 'worms show variation' **allow** clear AW for green oval structures eg 'can glow' generic explanation with no reference to green oval structures = max (2) ie ideas of isolation and independent evolution **allow** adapt differently
			Total	**9**	

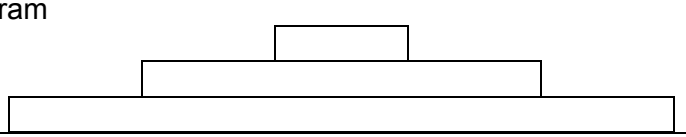
Question			Answer	Marks	Guidance
4			**[Level 3]** Answer gives a complete explanation using all three ideas. Quality of written communication does not impede communication of the science at this level. (5 – 6 marks) **[Level 2]** Answer gives a clear explanation using at least two of the three ideas. Quality of written communication partly impedes communication of the science at this level. (3 – 4 marks) **[Level 1]** Answer includes a simple explanation using one of the three ideas. 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 may include:** • Idea 1: Evolutionary relationships between organisms can be tested by using DNA analysis or by looking at similarities between multiple characteristics. • Idea 2: Organisms can share similar characteristics due to evolutionary but also ecological reasons • Idea 3: Members of a species can reproduce / produce fertile offspring.
			Total	**6**	

Question	Answer	Marks	Guidance
5 a	Drosophila (1)	1	**allow** drosophila and phonetic spelling
b	idea that a species can produce fertile offspring and **hybrids** cannot/are infertile so are not a species (1) Catalina macaw can (sometimes) produce fertile offspring so could be classified as a species (1)	2	
c i	**any two from:** idea it went against other scientific theories / Lamarck (1) insufficient evidence / DNA not discovered (1) went against religious beliefs (1)	2	 **allow** lack of proof **allow** made people fearful of their ancestry (1)
c ii	Idea that there is more evidence now / shown by fossil record / DNA mapping made clear the closeness of different organisms / selective breeding provides direct evidence of being able to change organisms (1) because it has been tested by (a wide range of) scientists (1)	2	**allow** now we have more proof **allow** mechanism (genes) for evolution wasn't realised / known **allow** scientists can't disprove it / other theories have been proved wrong
	Total	7	

Question	Answer	Marks	Guidance
6 a i	fungi (1) 7 (%) (1)	2	 **allow** any correct rounding of 7.0376432 no ECF
ii	some species have been given more than one name / counted more than once (1)	1	**allow** some have gone extinct (since being discovered) **allow** new species have evolved/mutated/appeared (faster than expected)
b	**any two from these ideas** birds are easier to spot / beetles are more difficult to spot (1) more people watch/are interested in birds than beetles (1) birds migrate / move around more (1) beetle species are similar and only recently have people realised they are different species (1) there are more niches for beetles (1) beetles are older than birds and have had time to evolve into more species (1) identification/collection techniques (for beetles) have improved (1)	2	**ignore** descriptions of differences between the graphs with no explanation e.g. there are fewer bird species than beetle species **allow** birds are bigger than beetles **allow** people have been recording birds for longer / idea that birds already known in 1750 **allow** beetles may live in places with few people

Question	Answer	Marks	Guidance
c i	**any two from these ideas** (no) (no marks) a correlation does not prove causation (1) need more evidence (to prove) / could be other factors (causing extinction) (1) there is not a (complete) match between the two graphs (1) it could just be that we are better at recording extinctions now compared with 200 years ago (1)	2	yes = 0 marks **allow** there have always been extinctions so any match could be a coincidence **allow** human population is increasing exponentially but extinction is not / **allow** not much increase in extinctions in first 100 years although there is an increase in human population **allow additional mark point** the graph may be from a biased source (1)
ii	idea that this will help support the website's aim / stop extinctions (1) idea of making the two lines look as similar as possible / look like there is a correlation (1)	2	**ignore** simply 'biased' **ignore** simply there is a correlation **allow additional marking point** to fit them both on the same graph / easier to compare / if used same scale or axis then difficult to plot both lines (accurately) / idea that the (range of) numbers are very different (1)
iii	(increasing human population leads to extinction because of) habitat destruction / pollution / climate change / hunting (1)	1	
	Total	**10**	

Question			Answer	Marks	Guidance
7	(a)	(i)	(more) tourism / generates income / more employment (1)	1	**allow** examples e.g. (more) safaris **ignore** (have more) ivory **ignore** uses of elephants (e.g. for transport / work)
		(ii)	prevent or reduce poaching / hunting / killing (1)	1	**ignore** less elephants dying **ignore** less harm to elephants
	(b)		**any two from** allows sun's rays / radiation / IR / heat pass through atmosphere (1) (carbon dioxide) stops / reduces the (re-radiated) radiation / heat / IR passing out in to space (1) because (carbon dioxide) reflects back the radiation / heat / IR (1)	2	**ignore** sunlight **ignore** UV **not** allows **more** radiation / IR / heat to enter atmosphere **allow** (carbon dioxide) traps heat (from Earth) **ignore** traps heat from sun **ignore** references to ozone
	(c)	(	**any two from** idea that acquired characteristics do not have a genetic basis / can not be passed on (1) hair length is controlled by genes / DNA (1) hair can not be grown longer by mammoths (when it's cold) (1)	2	**allow** Lamarck's ideas do not have a genetic basis
		(ii)	(variation:) some animals were born with / have longer hair (than others) (1) (competition:) those with longer hair (had an advantage and were) more likely to survive (1) (inheritance:) they will reproduce and pass on the gene / long hair OR pass on gene / long hair to offspring (1)	3	**allow** (some mammoths have) mutation for long hair **can allow generic natural selection statements with no reference to hair length up to max 2**
			Total	**9**	

Question			Answer	Marks	Guidance
8	(a)	(i)	three box pyramid correctly drawn or described (1)	1	mark the written answer line first, if correct then ignore diagram 
		(ii)	**any two from:** (for pyramid of biomass) need dry mass (1) which involved killing organisms (1) difficult to collect all parts of the plant (1)	2	
	(b)		Ixodes (1)	1	
	(c)	(i)	(idea of no link) qualitative description e.g. peaks/troughs do not coincide (1) quantitative description e.g. Lyme disease peaks in 2000 highest temperature is in 1995 (1) **OR** (idea of there is a link) qualitative description e.g. overall they are both rising (1) quantitative description e.g. both have lowest values in 1986 (1) **OR** (idea of there is a weak link) two descriptions (qualitative or quantitative) that show contradicting evidence e.g. both graphs go up (1) but they don't peak at the same time (1)	2	

Question			Answer	Marks	Guidance
		(ii)	if it is warmer then more people will go for walks in the country / wear less clothes / ticks breed more (1)	1	**allow** ticks feed more in warm weather **allow** more ticks in warm weather **ignore** ticks more active in warm weather (in question)
			Total	**7**	