Question		Marks	Guidance Notes
1 (a) (i)	single celled / unicellular ; no (true) nucleus / no nuclear membrane ; loop of DNA ; no, (membrane-bound) organelles ; e.g. no mitochondria / chloroplasts (peptidoglycan / murein) cell wall ; reproduce by binary fission ; small(er) / 70S, ribosomes ; plasmids ;	[max 2]	**I** DNA strand unqualified **A** naked DNA **I** flagella, capsule, pili, cilia **R** cellulose cell wall
(ii)	swim / movement / AW ;	[1]	
(b)	harmless / attenuated / dead / AW, form of, (named) pathogen / antigen used ; (vaccine) injected / swallowed ; ref to <u>specific / unique / AW</u>, antigen ; <u>lymphocytes</u> make <u>antibodies</u> ; ref to memory cells ; ref to <u>active immunity</u> ; <u>rapid</u>, immune response / AW, if exposure to <u>same</u> pathogen ; herd immunity ; AVP ; e.g. detail of active immunity / smallpox became extinct	[max 4]	**A** long term immunity
(c) (i)	12 – 0.4 ; 11.6, <u>au</u> / <u>arbitrary units</u> ;	[2]	
(ii)	large / rapid / immediate increases ; peaks at, <u>50</u> s / <u>12</u> AU ; then decrease to, around 5 – 4.6 AU / by 125 –150 s ; fluctuates / stays (fairly) constant, between 125 – 150 s and 250 s / 4.4 and 4.8 ± 0.2 AU ;	[max 3]	**I** comparisons to 'without toxins' on graph **A** increases and decreases from 50 s

Question		Marks	Guidance Notes
(iii)	active transport; (through) protein (molecules / gates / pumps / AW) ; (protein) in cell membrane ; using, energy / ATP (from respiration) ; (movement) against a concentration gradient / AW ;	[max 3]	
(d) (i)	(small) intestine ;	[1]	**A** large intestine / duodenum / jejunum / ileum / rectum / colon
(ii)	oral rehydration (therapy / salts / treatment / solution) ; drink mixture of, sugar / nutrients and, salt / ions ; replace lost, water / fluids ; water must be, uncontaminated / boiled / sterilised / clean / AW ; antibiotics ;	[2]	**A** receive intravenous fluids **I** drink more water
		[Total: 18]	

Question	Answers	Marks	Additional Guidance
2 (a)	**E** **A** **B** **D** **C**	**[max 3]**	all 5 correct = 3 marks 3 / 4 correct = 2 marks 1 / 2 correct = 1 mark
(b)	soft body **;** not segmented **;** mantle **;** visceral mass **;** (muscular) foot **; ignore** feet / legs produce slime / have slimy body **; A** mucus radula / rasping tongue / AW **;** hydrostatic skeleton **;**	**[max 2]**	
		[Total: 5]	

Question	E	Answers	Marks	Additional Guidance
3 (a) (i)		go to 2 | go to 5 | *Gymnopis multiplicata* | **B** go to 3 | *Triturus cristatus* | **C** go to 4 | *Necturus maculosus* | **D** *Ambystoma tigrinum* | **G** go to 6 | *Oreophrynella quelchii* | **E** *Polypedates leucomystax* | **F** *Rana temporaria* | **A**	[max 3]	5 / 6 right = 3 3 /4 right = 2 1 /2 right = 1 0 right = 0
(b)	**1**	habitat, destruction / change **;** **A** examples of destruction, e.g. deforestation, soil erosion	[max 3]	
	2	(named) pollution **;** **A** global warming / climate change / acid rain		
	3	(fungal) disease **;**		
	4	hunting (for pet trade / food) **;**		
	5	lack of food / starvation **;** **ignore** competition for food		
	6	competition, with alien / introduced / exotic, species **;**		
	7	predation by introduced species **;**		
	8	roadkill **;**		
	9	AVP **;**		
		Total:	**[6]**	

Question		Marks	Additional Guidance
4 **(a (i)**	reptiles ;	[1]	
(ii)	go to 2 ; go to 3 ; go to 4 ; *Chalcides minutus* B ; go to 5 ; go to 6 ; *Brookesia perarmata* G ; *Calumma parsonii* C ; *Amblyrhynchus cristatus* A ; *Cyclura lewisi* E ; *Abronia graminea* F ; *Varanus komodoensis* **D** ;	[3]	5 / 6 right = 3 3 / 4 right = 2 1 / 2 right = 1 0 right = 0

Question		Marks	Additional Guidance
4 **(b)**	encourages biodiversity ; **ora** prevents extinction ; encourages genetic diversity (within each species) ; maintain food, webs/chains ; food for predators ; increasing research / source of medicine ; AVP ;; e.g. maintain habitats for other organisms / ethical / moral / aesthetic reasons / tourism	max [3]	**A** species diversity **A** an example of feeding
(c) (i)	reduced genetic diversity ; identical offspring ; negative traits passed on ; more competition for local resources ; less chance of survival in a varying environment ; one disease could wipe out total population ; AVP ; e.g. less chance of evolving	max [2]	**A** no genetic diversity **A** unfavourable / bad traits.
(ii)	offspring may not be as well adapted to environment ; slower process / takes longer (than asexual reproduction) ; requires partner / two parents ; less energy efficient / requires more energy / many eggs is wasteful ; AVP ;	max [2]	**A** description e.g. good characteristics are not always passed on.
(d) (i)	reduction division / chromosome number is halved / one set of chromosomes ; diploid to haploid ; for production of gametes ; daughter cells are not genetically identical / genetically different ;	[2]	to each other or parent

Question		Marks	Additional Guidance
4 (ii)	for adaption to, new / changed environment ; causes (genetic) variation ; competition for survival ; best suited reproduce ; allows natural selection ; allows evolution ; AVP ;	max [3]	**ignore** mutations unqualified.
		[Total: 16]	

5	**(a)**	**1** antennae ; **2** elongated bodies ; **3** segmented body / many segments ; **4** many (⩾10) legs ; **5** (one or two pairs of) legs on each segment ; **6** exoskeleton ; **7** jointed legs ;	max [3]	
	(b)	**1** length of antennae ; **2** number of sections on antennae ; **3** presence / absence, of tail pieces / AW ; **4** length of tail pieces ; **5** length of legs ; **6** number of leg joints ; **7** total number of legs ; **8** position of legs on body ; **9** number of legs per segment ; **10** size / shape of segments ; **11** number of body segments ; **12** length of body ; **13** head shape ; **14** presence / absence 'spots / markings' ;	max [3]	

(c) (i)	nucleus **;**	[1]	**Ignore** chromosomes
5 **(ii)**	**1** *idea that* animals are identified accurately **; R** identify unqualified **2** barcoding is, cheap / easy / quick / efficient **;** **3** barcoding is useful if distinguishing characteristics / dichotomous key are difficult **;** **4** identify previously unknown species **;** **5** helps to identify, threatened / endangered species **;**	max [2]	
(iii)	**1** ref to genes **;** **2** codes for (specific) proteins **;** **3** stores genetic information **;** **4** can be copied to pass on information to new cells **;**	max [2]	
(d) (i)	**1** all arrows point from food to feeder **;** **2** millipedes eat dead leaves and fungi **;** **3** food chain : bacteria → nematodes → springtails → centipedes **;** **4** centipedes eat millipedes, springtails and earthworms **;**	[4]	
(ii)	**1** ref to, respiration / decomposition **;** **2** release carbon dioxide **;** **3** carbon dioxide is taken in by, plants / photosynthesis **;**	max [2]	
		[Total:17]	