Human Influences on Ecosystems
Mark Scheme 4

Level	IGCSE
Subject	Biology
Exam Board	CIE
Topic	Human Influences on Ecosystems
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 4

Time Allowed: 63 minutes

Score: /52

Percentage: /100

Question			Marks	Additional Guidance
1 (a (i)	**1** concentration of PCBs increases up the food chain/**ora**; **2** concentration is much higher in larger organisms/**ora**; **3** big(gest) increase between herring and porpoise; **4** (only) herring/porpoise/animals at top of food chain, have a range of concentrations; **5** use of figures (arbitrary units) to make a comparison between two, trophic levels/organisms;		max 3	**MP4** must be a qualitative statement, not just statement of figures **MP5** – must be a comparison not just figures unqualified, e.g. use of 'but', 'and', 'only', etc. and accept ×1.8/2, ×4, ×30, ×384, ×1900
(ii)	animals at higher trophic levels live longer; eat many of the animals below them in the food chain; PCBs cannot be, excreted/eliminated/removed/broken down; so build up in the body (tissues); bioaccumulation/biomagnification;		max 3	
(b) (i)	mutation/change in DNA; any mutagen; gene(s) code for, AHR/protein; any sensible suggestions about change to protein molecule; fish susceptible to PCB poisoning died; fish with changed protein survived and reproduced; passing on mutant allele; reference to (natural) selection;		max 5	**A** ref to genetic variation **R** AHR/protein, mutates e.g. radiati e.g. different amino acid sequen
(ii)	fish with mutant allele not at an advantage/no selection for PCB resistance; PCB resistant fish may not compete well with others/**ora**; so less successful at breeding/**ora**; leave fewer offspring/**ora**; idea that mutant allele is diluted as fish interbreed;		max 2	**A** 'the altered AHR protein is of less/no use'

Question			Marks	Additional Guidance
1 (c)	**1**	persistent / does not breakdown / accumulates;		**MP1 A** 'can't get rid of them' / takes a long time to breakdown
	2	fill up / takes up space in, landfill sites / rubbish dumps;		**MP3** and **MP4** do not allow kill unqualified
	3	suffocate / choke, animals;		
	4	kills animals that get trapped in it;		
	5	release, toxins / poisons;		**MP5** maybe in context of leaching out, burning or eating
				I references to recycling
				I pollution unqualified
	6	AVP;	max 3	• (fill with water to become) breeding grounds for mosquitoes • blocks light for, photosynthesis • negative effect on tourism / visual pollutant • blocks drains • blocks flow of water in, rivers / streams • reduces soil, drainage / aeration • interferes with water treatment allows spread of alien species in the oceans
			[Total: 16]	

2	(a)	(i)	L = (primary) producer(s) ; N = secondary consumer(s) ;	[2]	**ignore** (green) plant **ignore** carnivore

		(ii)	energy, of / at, each trophic level ;
			    A shows that energy, decreases / is lost (at each trophic level)
			    e.g. '**L** has more energy than **M**'
				[1]	**R** biomass / numbers
					R 'production of energy'
					ignore energy passed on – shown by the arrows not the boxes

		(iii)	*idea that* **1** no, energy left ; **2** use figures from Fig. 2.1 to show that all energy to **O** is already **3** little / not enough, energy available from eating, tertiary consumers / **O** / AW ; **4** loss of (90%) energy, at / between, each trophic level / AW ; **5** would be very small population of predators of **O** ; **6** (population of) predators of **O** unlikely to survive ; **7** AVP ; e.g. *idea that* difficult to be a predator of **O** because **O** is likely to be 'large and fierce'	[max 3]	**A** 'needing to eat a lot to get enough energy'? MP4 *no need to use the term trophic level if idea is implied*
		(iv)	**1** loss of energy (from, each / all, trophic level(s)) ; **2** (by) <u>respiration</u> ; **3** (to the) environment / atmosphere / surroundings ; **4** as, heat / thermal energy ;	[max 2]	*accept once only*
	(b)		*M is the herbivore* **1** more (biomass of / energy in), producers / **L** ; **2** as fewer / no, herbivores / primary consumers / predators (to eat **L**) / **M** ; **3** fewer / extinction of, carnivores / secondary consumers / **N** ; **4** fewer / extinction of, tertiary consumers / **O** ; **5** as less, food / energy ; **6** more competition ;	[max 3]	**ignore** any changes to decomposers / recycling **A** the argument that more primary consumers will migrate into the ecosystem **ignore** predators / organisms unqualified

		Answer	Marks	Guidance for Examiners
3	(a)	segments ; antennae / 'feelers' ; projections over whole of the body / AW ; *idea of* heads / tails ; **A** not parasitic / free living / AW ; max [3]	max [3]	**A** 'sections' / 'divisions' / 'rings' / 'parts' / 'sub-parts' **A** bristles / chaetae / hairs **R** feet / legs / AW
	(b)	genus / generic (name) ;	[1]	**A** 'genus part of species name'
(c)	(i)	(all the) organisms / community ; in a given area / AW ; and non-living factors / abiotic factors AW ; *idea of* interacting together ;	max [3]	**A** place / location / region / habitat **R** ecosystem i.e. physical factors / nam e.g. feeding (*ignore* feeding on each other)
	(ii)	arrows point from food → feeder ; organisms in correct sequence ; plankton → annelid / named → wading bird(s) → bird of prey = 2 marks	[2]	
	(iii)	shows complex feeding relationships / AW ; all organisms in the ecosystem ; **A** (many) more / part of / wide range of each species has more than one food source / AW ; each species has more than one predator / AW ; AVP ; e.g. shows possible chain reaction to an animal's population change	max [2]	**A** all possible connections

3	**(d)**	many, sperm and eggs / gametes, released at the same time ; increases chances of gametes fusing ; (many individuals so more genetic) variation ; may occur at a time when food is available ; for development of, young / offspring ; or when there are currents to disperse young ; smaller proportion of, eggs / zygotes / embryos, eaten by predators ; AVP ;	max [3]	**R** fewer predators
	(e)	*assume answer is about meiosis unless told otherwise* *mark differences between meiosis and mitosis to max 3* 1 two divisions ; 2 four, cells / nuclei / gametes, produced ; 3 halves chromosome number ; 4 (diploid to) haploid ; 5 variation (between cells / nuclei / gametes) ; 6 gametes have different <u>alleles</u> ; 7 gives (more) variation in offspring ; 8 so chromosome number remains the same in next generation ;	 max [4]	***ignore*** quoted numbers of chromosomes **R** genes **A** number does not double with each generation / full pairs of chromosomes when fertilized / AW **A *ora*** for mitosis
			[Total:18]	

4	(a)	group of organisms of the <u>same species</u> ;		**A** 'of a kind' / <u>a</u> species
		in the same area / at the same time ;	[2]	**A** same habitat / ecosystem / community
	(b) (i)	greater predation by owls / more predators / more owls; lack of food / starvation / more competition for food ; adverse (named) weather condition (s) ; disease / sickness / illness; emigration ; AVP ; habitat destruction	max [3]	**R** climate change
	(ii)	1 owl population increases, after / AW, vole population increases ; 2 owl population crashes (in year 7) ; 3 immediately after crash in vole population ; 4 vole population crashes / decreases (in year 6) ; 5 when there are most owls ; 6 if owls ate (much) other prey there would not be a close relationship / AW ; 7 ref to numbers of owls from the graph ;	max [2]	**if MP1 and MP2** not given accept the idea that 'owl population follows changes in vole population' if answer does not refer to the increase or decrease
			[Total:7]	