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; 2 fill up / takes up space in, landfill sites / rubbish dumps; 3 suffocate / choke, animals; 4 kills animals that get trapped in it; 5 release, toxins / poisons; 6 AVP;	max 3	**MP1 A** 'can't get rid of them' / takes a long time to breakdown **MP3** and **MP4** do not allow kill unqualified **MP5** maybe in context of leaching out, burning or eating **I** references to recycling **I** pollution unqualified • (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]	**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]	