Biodiversity

Mark Scheme 6

Level	International A Level
Subject	Biology
Exam Board	CIE
Topic	Biodiversity, classification and conservation
Sub Topic	Biodiversity
Booklet	Theory
Paper Type	Mark Scheme 6

Time Allowed : **62 minutes**

Score : **/ 51**

Percentage : **/100**

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 **(a** *ignore reference to, first / third / fourth, trophic level*

(primary) producer ;
secondary consumer ; **A** second / 2°, consumer
tertiary consumer ; **A** third / 3°, consumer [3]

(b) 1 polar bear is, tertiary / quaternary consumer / top carnivore ; **A** in fourth / fifth, trophic level
2 feeds (only) on ringed seals ;
3 therefore limited, food / energy, supply ;
4 reference to ringed seals competing for food / food for seals shared with, others / named ;
5 reference to energy loss, within / between, trophic levels ; **A** approx 90% loss from one trophic level to the next
6 any two examples of, energy / heat, loss in lower trophic levels ; e.g. heat loss from, respiration / movement / digestion / excretion / egestion / indigestible parts / to decomposers / death but not eaten [max 4]

(c) *decrease in population of Arctic cod so higher trophic levels*
1 less, food / energy, (for consumers of cod / higher consumers) ;
2 more competition for food ;
3 consumers / named consumers, of cod feed on other levels ;
4 starvation / decrease in population / extinction(s) (of other species) ;
5 migration to areas where food is more plentiful ;

lower trophic levels
6 increase in numbers of *either*, copepods / AW *or* arrow worms / AW ;
7 (so) decrease in population of phytoplankton ; *only if mp 4 not scored*
8 (so) increased competition with bivalve molluscs ; *only if mp 2 not scored* [max 3]

[Total: 10]

2 **(a** biotic and abiotic, components / AW ;
A alternatives to biotic and abiotic
including commumity / AW for biotic and habitat / environment, for abiotic
interacting / AW ; *idea of* interactions between organisms *or* interactions between organisms and abiotic environment
in an identifiable / a defined / a self-contained area / place / unit / environment / AW ;
A *idea of place if qualified with correct example* [2]

(b) (i) grasses / shrubs / trees ;
A singular or plural [1]

(ii) spider / predatory insect ;
A singular or plural [1]

(c) *energy loss at each level because of*
1 inedible parts / not all of the organism can be eaten ;
2 indigestible parts / not all is digested / egestion / faeces ;
3&4 *energy / heat, losses from* ;;
respiration **R** energy used for respiration
movement **A** energy used for movement
excretion
digestion
ignore *energy not utilised by plants by e.g. reflection from leaves, etc.* [max 3]

(d) *following death of organisms or excretion of nitrogenous waste*
1 decomposers / saprotrophs / bacteria / fungi / scavengers / detritivores ;
2 digest / breakdown / hydrolyse, protein / urea ;
3 *idea of* assimilation in / growth of, decomposers / AW ;
4 deamination ;
5 production of ammonium (ions) / ammonification ; **A** ammonia / NH_3
6 nitrification described *or* denitrification described ;
A formulae for ammonium ions, nitrite ions and nitrate ions but must be correct including signs
A nitrification described in terms of ammonium (ions) to nitrate (ions)
ignore nitrogen fixation as used correctly (N_2 to fixed N)
ignore uptake of nitrate ions or ammonium ions by plants
do not credit nitrification if any confusion with nitrogen fixation [max 3]

[Total: 10]

3 **(a)** 'self contained' / 'self-sustaining' / determined by same physical feature / defined area **;**

community / all organisms / biotic factors, **and**, physical factors / abiotic factors / non-living factors / environment **;**

ref. to interaction between, organisms (and physical environment) **;** [2 max]

(b) *award two marks for the correct answer (5.5%)*
if no answer or incorrect answer or answer to too many decimal places, award one mark for working (88 / 1609)
88 / 1609 (× 100)
5.5 (%) **;;** [2]

(c) *these are points for producers to primary consumers – accept ora for secondary consumers to tertiary consumers*
1 some parts inedible **;**
2 indigestible / cannot digest cellulose or lignin **;**
3 more material goes to decomposers (rather than consumers) **;**
4 plant material is less energy rich / animal flesh is more energy rich **;**
5 manipulated data in support **;** e.g. ×2 to decomposers from producers
0.8% (energy available to primary consumers divided by the energy available to plants)
[3 max]

(d) *decomposers in recycling nitrogen*
protein → ammonia / ammonium ions = 1 mark
1 convert protein → amino acids **;**
2 deamination **;**
3 urea / amino acids → ammonia / ammonium ions **;** **A** ammonification
4 make, ammonia / ammonium ions, available to nitrifying bacteria **;**
A role of nitrifying bacteria / correctly named [2 max]

[Total: 9]

4 **(a)** *community*

all populations / all organisms / all plants + animals (+ microorganisms) **;**
R all the species

in same, place / ecosystem / area / (common) habitat, (at same time) **;** [2 max]

(b) (i) *award two marks for the correct answer (4.5%)*

if no answer or incorrect answer or answer to too many decimal places, award one mark for working (2946/65 800 × 100)

2946 / 65 800 (× 100)

4.5 (%) **;;** [2 max]

(ii) energy available (from secondary consumers) is too small **;** **R** no energy
2 kJ m^{-2} (per week) **;** [2]

(iii) decomposers are, saprophytes / saprotrophs / saprobionts / bacteria / fungi **;**

plant matter provides little, protein / AW **;** ora **A** high carbon / low nitrogen
plant matter / cellulose / lignin, not easy to decompose **;**
ref. to organic matter / energy source, in plants not easy to obtain **;**
supply of nitrogen is, limiting factor / limits growth of decomposers **;**
(animal waste) protein / amino acids / urea, provides nitrogen **;**
(animal wastes) provide materials for growth of, decomposers **;**
further detail e.g. amino acids for proteins / membrane proteins / (hydrolytic) enzymes / other named protein(s) / nucleotides / nucleic acids **;**

more decomposers leads to faster decomposition (hence more energy flow) **;** [3 max]

[Total: 9]

5 **(a)** *one mark for each row*

statement	hae	DNA	phospholipids	antibodies	
contains iron	✓	x		x	;
contains phosphate	x	✓	✓	x	
able to self-replicate	x	✓	x	x	;
hydrogen bonds stabilise the molecule	✓	✓	x	✓	;
contains nitrogen	✓	✓	✓	✓	;

[5]

Question		Expected Answers	Marks
6	**(a)**	similar morphological, physiological, biochemical and behavioural features ; *(minimum 3 for mark)* interbreed / reproduce ; produce fertile offspring ; occupy same niche ; reproductively isolated;	**2 max**
	(b)	isolating mechanism – land barrier / AW ; *accept geographical isolation* type of speciation – allopatric ;	**2**
	(c)	1 geographical barriers / description ; 2 barrier to gene flow ; 3 no interbreeding / separate breeding populations / reproductively isolated ; 4 (gene) mutations occur / new alleles ; 5 different selection pressures / e.g. of selection pressure ; 6 ref. natural selection / description ; 7 change in allele frequency / OWTTE ; 8 develop different chromosome numbers / ref. polyploidy ;	**4 max**
			[Total: 8]