Version : 1.0 0708

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Science 5441

ESC3 The Biosphere

Mark Scheme

2008 examination – June series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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Dr Michael Cresswell Director General

Environmental Science

June 2008 **ESC3**

Instructions: ; = 1 mark / = alternative response A = accept R = reject

Question 1

	Letter	
A frame used to sample an area in order to study the organisms it contains	(C)	
A sequence of organisms through which energy is transferred	**L**	;
A measure of the amount of living matter present in a unit area	**H**	;
A large area, usually named for its dominant vegetation group, which has distinctive climatic and soil conditions	**B**	;
A community of living organisms interacting with each other and the non-living environment	**D**	;
The position in a food chain at which an organism feeds	**I**	;

Total marks = 5

Question 2

2 (a) (i) $\frac{1200 \times 1157}{120}$; 11570 ; 2

2 (a) (ii) Individuals may not be recognised/be counted more than once;
relative not absolute numbers/only an estimate;
immigration/emigration from area;
qualified reason for not being seen eg underwater/diving/scared away by boats;
births/deaths/caught by whalers;
may not mix randomly; MAX 3

2 (b) IWC/International Whaling Commission/international co-operation;
encourages sustainable whaling/restriction of whaling/ban on (commercial) whaling;
quotas/closed hunting season;
allows reproduction/repopulation;
whaling only allowed for scientific purpose/subsistence of indigenous people;
listed by CITES/IUCN/red data book;
trade banned;
whale sanctuaries set up/marine nature reserves/protected zones;
methods of increasing public awareness /pressure groups/Greenpeace;
drift net bans;
control of oil exploration/seismic/sonar surveys;
protection of food supply qualified eg restrict fishing of prey species; MAX 5
[**R** captive breeding]

Total marks = 10

Question 3

3	(a)	(i)	Both in cycles/both rise and fall; out of phase/peaks of predator numbers follow peaks of prey numbers/ ref to time delay between peaks; density dependent relationship;	MAX 2
3	(a)	(ii)	Prey provide food for predators; predator numbers increase/increased reproduction of predators; increase in feeding decreases prey population; causes increased competition for food among predators; predator numbers fall/predator mortality; prey numbers able to increase again;	MAX 4
3	(a)	(iii)	Presence of other predators/other prey species/increased complexity of food web; increased competition for food; disease; variation in food supply eg for prey species; influence of named abiotic factors/weather/density independent factors; [**A** pollution qualified]	MAX 2
3	(b)	(i)	Concept of steady state/equilibrium/self regulating system;	1
3	(b)	(ii)	Concept of sum total of all environmental factors preventing maximum population growth/affecting survival;	1

Total marks = 10

Question 4

4	(a)	(i)	Enables water to exist as a liquid; allows enzyme activity/chemical reactions/metabolic activity;	2
4	(a)	(ii)	Rate limited by factor nearest to minimum value/in shortest supply; low rate at low/high temperature despite optimum levels of other factors; related to rate of enzyme activity;	MAX 2
4	(b)	(i)	Water holds less oxygen; so suffocation/reduced respiration occurs; enzymes denature/too hot for enzyme activity; so metabolic activity/chemical reactions fail; death of other species; loss of food supply;	MAX 2
4	(b)	(ii)	Food in short supply/lack of food; high food demand for reproduction/birds breed in spring;	MAX 2
4	(c)		Named abiotic factor; effect on named organism (relating to distribution); eg light on plants, water on amphibians etc [**R** disease]	2

Total marks = 10

Question 5

5 (a) Maintaining field boundaries (eg hedges/stone walls);
maintaining other existing features for biodiversity (eg ponds/old meadows/water meadows/ farm woods)/creating new ponds;;
encouraging traditional farming methods (eg reduced use of large machinery/ crop rotation/reduction of monoculture/delaying haymaking);;
reducing use of fertilisers/pesticides/organic farming methods;
planting wild flowers/hedges/trees;
creating or clearing footpaths/bridle ways; MAX 3
[**R** answers not directly related to land management eg 'raising awareness']

5 (b) (i) Rare/endangered/threatened species;
rare habitats [**A** example];
(rare) geological features/mineral deposits/fossils;
physiographic features [**A** example]; MAX 3
[**R** landscape protection]

5 (b) (ii) May not carry out operations likely to cause damage/eg of damaging activity; (eg building/draining ponds/cutting woodland)
without asking for consent/needs permission;
from Natural England [**A** English Nature]/CCW/SNH/DEFRA;
may have increased public access;
financial implications for landowner/possibility of compulsory purchase; MAX 2

5 (c) Aesthetic/beauty;
ethical/moral/duty of care/stewardship;
ecological/prevention of extinction/sustainable ecosystem;
educational;
recreational;
present economic resource eg food/medicines/raw materials;
genetic resource/future resource/research; MAX 2

Total marks = 10

Question 6

6 (a) (i) Use of quadrat;
random/systematic;
[**R** stratified]
extra detail;
[**R** 'throw' quadrats]
use of large number of quadrats/10 or more;
count daisies and divide by area; MAX 3

6 (a) (ii) Gives precise numerical value/more accurate;
% cover subjective/ only an estimate;
enables statistical test to be carried out;
daisy plants may vary in size/overlap; MAX 2

6 (b) *Quality of Written Communication is assessed in this answer.*

Vegetation growing where nothing has grown previously;
suitable example (bare rock/lithosere/sand dune/psammosere/xerosere/salt marsh/halosere/lake/pond/hydrosere or similar);
ref to appropriate pioneer species/first colonisers/colonisation;
colonisers withstand harsh/unfavourable conditions;
ref to long time scale (>100 years); (MAX 5)
plants die and decompose/increase in dead organic matter;
formation of soil;
change in pH/salinity;
increase in nutrient availability;
changes in abiotic factors (temperature/light/wind/humidity);
root binding/increase in stability;
increase in water retention/water availability;
increase in of soil depth;
concept of changing conditions allows growth of larger/more complex/different species;
woodland/climax community develops;
plant succession accompanied by change in animal populations;
more food sources/niches available;
influence of climate on climax community;
influence of soil type on climax community;
concept of plant communities replacing each other over time;
(MAX 6)

MAX 8

Quality of Written Communication

Mark	Descriptor
2	All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.
1	Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate. Some minor errors. At least half a page of material is presented.
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.

MAX 2

Total marks = 15