



MARKSCHEME

May 2010

ENVIRONMENTAL SYSTEMS AND SOCIETIES

Standard Level

Paper 1

13 pages

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Subject Details: Environmental Systems and Societies SLP1 Markscheme

General

A markscheme often has more marking points than the total allows. This is intentional. Do **not** award more than the maximum marks allowed for part of a question.

When deciding upon alternative answers by candidates to those given in the markscheme, consider the following points:

- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a “/”. Either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- Words that are underlined are essential for the mark.
- The order of points does not have to be as written (unless stated otherwise).
- If the candidate’s answer has the same meaning or can be clearly interpreted as being the same as that in the markscheme, then award the mark. Where this point is considered to be particularly relevant in a question it is emphasized by writing **OWTTE** (or words to that effect).
- Mark positively. Give candidates credit for what they have achieved, and for what they have got correct, rather than penalizing them for what they have got wrong.
- Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.
- Occasionally, a part of a question may require a calculation whose answer is required for subsequent parts. If an error is made in the first part then it should be penalized. However, if the incorrect answer is used correctly in subsequent parts then **follow through** marks should be awarded. Indicate this with “**ECF**”, error carried forward.
- Units should always be given where appropriate. Omission of units should only be penalized once. Indicate this by “**-1(U)**” at the first point it occurs. Ignore this, if marks for units are already specified in the markscheme.
- Do not penalize candidates for errors in significant figures, unless it is specifically referred to in the markscheme.

1. (a) Award [1 max] for any *two* correct sources.

Methane: [1 max]

wetlands/bogs/swamps/stagnant water bodies/rice paddies/tundra soils;
(breakdown of) organic material;
volcanic vents;
methane clathrates/hydrates (on ocean floor);
rocks containing coal/carbon;
dams/reservoirs;
livestock;
landfill sites;
extraction/processing/transportation of fossil fuels;
permafrost melting;
manure / sewage;

Chlorofluorocarbons (CFCs): [1 max]

refrigeration/air conditioning systems;
plastic foams;
aerosol cans;
solvents (electronics industry);

Carbon dioxide: [1 max]

respired by living organisms;
(breakdown of) organic material;
volcanic vents;
burning of fossil fuels/organic materials;
forest fires / bushfires;

[3 max]

Do not accept deforestation as a source.

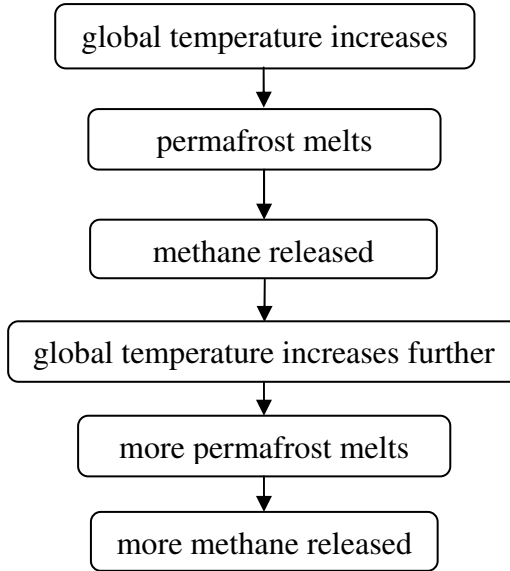
Accept any other reasonable examples.

Award only once for each source. Do not accept repeats of sources described in different contexts.

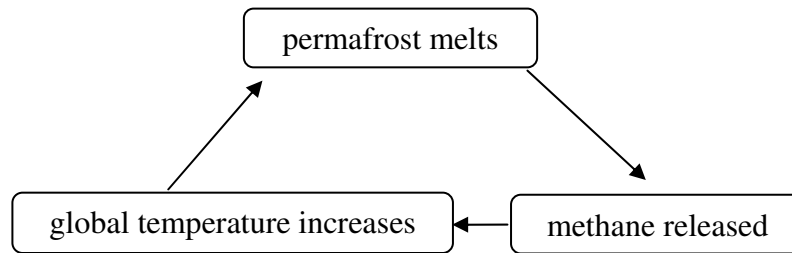
- (b) (i) negative feedback tends to damp down/neutralize/counteract any deviation from an equilibrium / promotes stability / *OWTTE*;
positive feedback amplifies/increases change/leads to exponential deviation away from an equilibrium / *OWTTE*; [2]
- (ii) *Diagrams may be linear, circular or other shape or format, provided they illustrate the concept.*
diagram clearly illustrates that positive feedback is understood;
appropriate example of genuine positive feedback involving methane; [2]

Examples of acceptable diagrams:

e.g.



e.g.



- (c) (i) older records may be hard to read/are ambiguous/less reliable/incomplete /few in number/subject to random and systematic errors; [1]
- (ii) models have to make some simplifying assumptions/algorithms uncertain; environmental factors are very complex/interrelated; impossible to take all variables into account; different models use slightly different data to calculate predictions; as models predict further into the future they become more uncertain; [2 max]
Accept any other reasonable suggestion.
- (d) (i) ozone / oxygen; [1]
- (ii) I: stratosphere;
II: troposphere; [1 max]
Both needed in correct order for [1].
- (iii) mutation / reduced rate of photosynthesis / skin cancer / cataracts / damage to plant tissues / death of primary producers / sun tan / production of vitamin D; [1]

2. (a)

Key to lower jaw bones found in owl pellets			Diagram letter
1	Large upward-pointing incisor tooth at front of jaw	Go to 2	
	No large upward-pointing incisor tooth visible at front of jaw	Go to 3	
2	Six or more tooth roots visible	Go to 4	
	Five or fewer tooth roots visible	House mouse	D;
3	Length of jaw is equal to or more than 1 cm	Common shrew	F;
	Length of jaw is less than 1 cm	Pygmy shrew	C;
4	Length of jaw is equal to or more than 1.5 cm	Field vole	A;
	Length of jaw is less than 1.5 cm	Go to 5	
5	Tooth roots are all of equal size	Wood mouse	B;
	Second tooth root from front of jaw is smaller than the others	Harvest mouse	E;

[3 max]

Award [1] for each **two** correct diagram letters.

(b) (i) number of animals of each species captured; [1]
 Must include both number of animals and indication that more than one species is likely to be captured for [1].

(ii) number of animals of each species captured **and** number marked from each species;

$$\text{population size (of a species)} = \frac{\text{total number captured and marked in first sample} \times \text{total number of animals in second sample}}{\text{number marked in second sample}}; \quad [2]$$

(iii) some small mammals species may be caught/eaten more often than others by owls because they;
 move more slowly;
 are easier to see than other species;
 forage for food/are active at night;
 forage in open areas with little cover;
 are bigger/more nutritious (so preferred by owls);

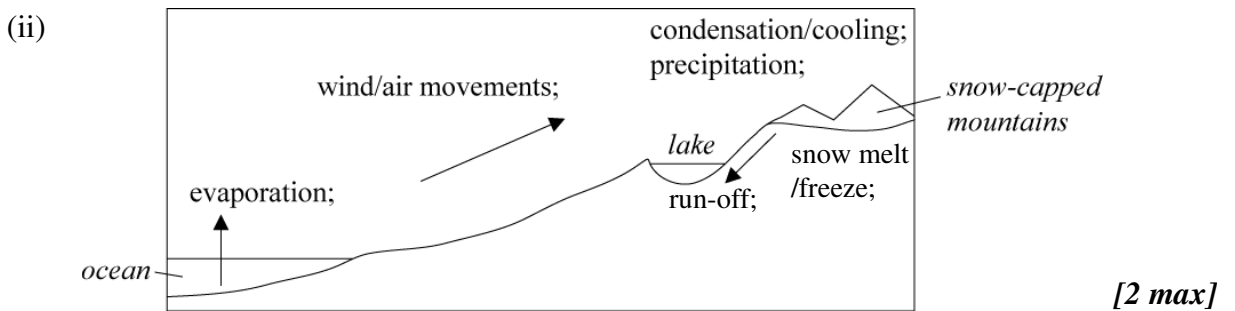
range of owl foraging may be very wide / area of foraging;
 sample of pellets may be too small to see full range of species;
 relative sizes of prey populations may vary through the year;

[2 max]

3. (a) carrying capacity is the maximum population/number of humans/“load” that can be sustainably supported by a given environment/area;
 ecological footprint is the area (of land and water) required to support a (defined) human population (at a given standard of living);
 carrying capacity and ecological footprint are the inverse of each other /
 carrying capacity = $\frac{1}{\text{ecological footprint}}$; [2 max]

- (b) *Rice crop from a paddy field:* renewable;
Copper minerals in rocks: non-renewable;
Animal wool: renewable;
Ozone layer: replenishable; [2 max]
 Award [1] for each **two** correct identifications.

- (c) (i) *transfer processes:* (flow through a system) move materials/energy from one place to another/involve a change in location;
transformation processes: lead to (an interaction within a system in) the formation of a new end product/involve a change of state; [2]



Award [1] for each **two** correct processes.

- (iii) *impact:*
 increased turbidity/biochemical oxygen demand (BOD);
explanation:
 caused by animals entering lake/addition of organic matter from feces/field run-off;
impact:
 increased levels of inorganic nutrients/phosphates/nitrates/eutrophication / changes due to eutrophication;
explanation:
 caused by animal urine/feces/soil entering lake; [2 max]
 Accept any other reasonable suggestion or good example.

- (iv) population growth outstripping rate of replenishment;
 currently developing countries will need more water as they become more developed;
 improved standards of hygiene/health require more water;
 some freshwater resources/aquifers becoming contaminated by pollution/saltwater incursion;
 climate change leading to extensive drought/monsoon failure; [2 max]
 Accept any other reasonable suggestion or good example.

4. (a) reflection / scattering / absorption / (dust from) volcanic eruptions / global dimming; [1]
Award [1] for any two processes.

(b) $\left(\frac{0.2}{30} \times 100 = \right) 0.67\% / 0.7\%$; *Accept 0.66 as lower range.*

to

$\left(\frac{0.2}{50} \times 100 = \right) 0.40\% / 0.4\%$; [2]

Workings not required for credit.

- (c) conflict/war/civil war/minifields destroys agricultural infrastructure;
differences in climate/soil/water availability for irrigation;
lack of facilities for food preservation/storage in LEDCs;
lack of infrastructure to distribute food in some countries;
political systems that reduce incentives to increase food production;
problems caused by natural hazards *e.g.* tsunamis / volcanic eruptions / hurricanes / droughts;
problems caused by human impact *e.g.* increased desertification due to climate change/overgrazing;
sudden availability of food aid may reduce the price of locally produced food to a point where it is uneconomic to produce; [2 max]
Accept any other reasonable suggestion.
Award [2 max] for responses that use examples to explain above concepts.

5. (a) a (detailed) study/investigation/survey required before a major development, to examine environmental impact; and suggest appropriate monitoring; should include a baseline survey/study; [2 max]
Do not accept reference to a document without reference to a survey or study.

- (b) *landfill site A advantages:*
close to road/rail;
furthest away from city;
low lying/flat land easier to manage/less visually obtrusive;

landfill site A disadvantages:
scenic coastal location could be spoilt;
prevailing winds could carry smell to city;
at risk from coastal flooding;
could cause coastal pollution;

landfill site B advantages:
close to road/rail;
close to city so short transport time;
low lying/flat land so landfill easier to manage/less visually obtrusive;
wind carries smell away from city;

landfill site B disadvantages:
on flood plain so could be at risk of flooding;
leaching pollutants could contaminate nearby river;
close to city so land may be expensive to buy/needed for expansion;
land likely to be good agricultural land for food production;

landfill site C advantages:
far away from city so fewer people affected by development;
higher land so no risk from flooding;
smell unlikely to carry to city;

landfill site C disadvantages:
near wildlife reserve;
not near road/rail network;
waste must be transported uphill;
site high up so more visually obtrusive;

[2 max]

*Award [1] for two correct advantages and [1] for two correct disadvantages.
Do not accept vague responses e.g. pollution without reference to specifics.
Accept any other reasonable suggestion.*

- (c) (i) paper/packaging/cardboard;
glass;
metal;
plastics;
organic waste/food;
textiles;
nappies/diapers;
electrical appliances *e.g.* computers/fridges *etc.* (WEE);
waste wood;
rubble/bricks;
ash;
- Award [1] for any **three** of the above.
Accept any other reasonable suggestions.*

[1 max]

- (ii) *recycling: [2 max]*
advantage:
less energy used in recycling metal/paper/glass;
reduces amount of resources used;
maintains stocks of non-renewable/replenishable resources;
- disadvantage:*
uses energy;
causes pollution;
affected by economic demand and supply factors (and so sometimes uneconomic);
- re-use: [2 max]*
advantage:
little energy used;
provides cheap resources for people of limited means;
- disadvantage:*
may use some energy to clean;
may be heavy to transport *e.g.* reusable milk bottles;
eventually wear out/must be disposed of;
- composting: [2 max]*
advantage:
produces fertilizer;
reduces volume of waste;
reduces use of chemical fertilizers;
- disadvantage:*
unpleasant smells / can attract vermin if not done properly;
requires effort/space;
takes time;

incineration: [2 max]

advantage:

reduces volume of waste;
heat produced can be used in place of burning fossil fuels;
kills pathogens;
produces ash for construction;

disadvantage:

toxic chemicals released / incomplete combustion releases dioxins;
produces greenhouse gases;
ash still needs disposal;
expensive;
considerable community resistance to building of new incinerators;

dumping at sea: [2 max]

advantage:

no smells;
land is available for other purposes;
no problem with vermin;

disadvantage:

damage/disruption of marine ecosystems;
waste may be washed up on beaches;
encourages algal blooms;

[2 max]

Accept any other reasonable suggestion.

A management strategy (recycling, re-use, composting, incineration, dumping at sea) must be stated, although no marks are awarded. Award [1 max] if no management strategy is stated or if only advantages/disadvantages are given.