



MARKSCHEME

November 2010

ENVIRONMENTAL SYSTEMS AND SOCIETIES

Standard Level

Paper 1

12 pages

1. Follow the markscheme provided, do **not** use decimals or fractions and mark only in **RED**.
2. Where a mark is awarded, a tick (✓) **must** be placed in the text at the **precise point** where it becomes clear that the candidate deserves the mark. One tick to be shown for each mark awarded.
3. Sometimes, careful consideration is required to decide whether or not to award a mark. In these cases write a brief annotation to explain your decision. You are encouraged to write comments where it helps clarity, especially for moderation and re-marking. It should be remembered that the script may be returned to the candidate.
4. Unexplained symbols or personal codes/notations on their own are unacceptable.
5. Record subtotals (where applicable) in the right-hand margin against the part of the answer to which they refer next to the mark allocation. Do **not** circle subtotals. **Circle the total mark** for the question in the right-hand margin **at the end of the question**.
6. Where an answer to a part question is worth no marks, put a zero in the right-hand margin next to the square bracket.
7. Add together the marks for each question and enter this in the box marked TOTAL in the Examiner column on the front cover of the exam paper.
8. After entering the marks on the front cover check your addition to ensure that you have not made an error. Check also that you have transferred the marks correctly to the front cover. **All scripts are checked and a note of all clerical errors may be given in feedback to examiners.**
9. Every page and every question must have an indication that you have marked it. Do this by **writing your initials** on each page where you have made no other mark.
10. A candidate can be penalized if he/she clearly contradicts him/herself within an answer. Make a comment to this effect in the left-hand margin.

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:

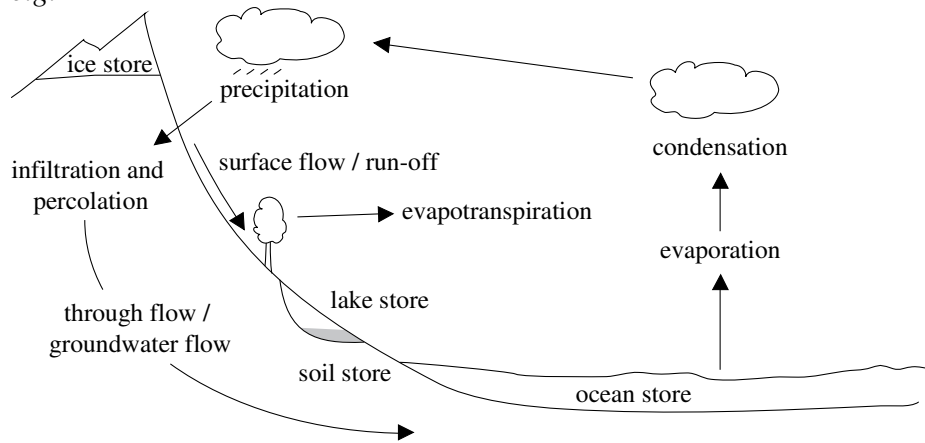
- Each marking point has a separate line and the end is signified by means of a semicolon (;).
- An alternative answer or wording is indicated in the markscheme by a “/”. Either wording can be accepted.
- Words in (...) in the markscheme are not necessary to gain the mark.
- Words that are underlined 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) (i) water scarcity relates to water availability/demand;
 water scarcity is a human concept rather than a natural phenomenon;
 water scarcity can be due to humans using water unsustainably/not having the economic means to access sufficient water; [1 max]
Do not accept responses which define water scarcity in terms of aridity or low rainfall.

- (ii) there is a broad band of economic water scarcity in the equatorial zone;
 economic water scarcity is found in LEDCs;
 generally MEDCs have little/no water scarcity;
 South America has little/no water scarcity;
 Africa experiences large amounts of water scarcity;
 areas of no data have low populations; [3 max]

*Award [2 max] for descriptions at continental level.
 Accept other reasonable responses.*

- (b) (i) *Award [1] for showing the cycle in some way i.e. diagram of a cycle;
 e.g.*



*Award [1] for any two of the following stores:
 oceans / groundwater / soil / ice / lakes / atmosphere / rivers / biotic;*

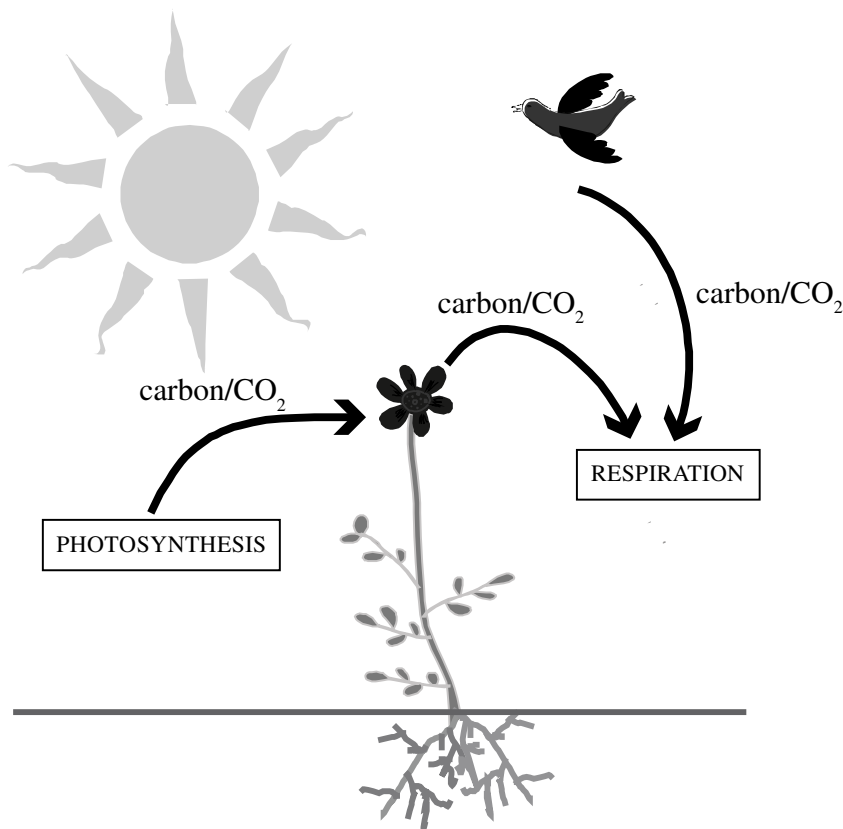
*Award [1] for any two of the following flows and processes:
 evaporation / condensation / precipitation / rainfall / infiltration / percolation /
 through flow / groundwater flow / surface flow / run-off / evapotranspiration /
 rivers;* [3 max]

Do not award "rivers" twice if used in both stores and flows and processes.

- (ii) *Award [1] for any two of the following:*
 dam to construct reservoir;
 well / borehole / groundwater abstraction / water pump;
 spring / rivers;
 desalinization;
 rainwater harvesting;
 iceberg harvesting;
 water pipelines / canals / channels;
 solar condenser;
 recycled through sewage treatment; [1 max]

Accept any other reasonable suggestion.

2. (a)



input:

carbon/CO₂ entering the plant and labelled photosynthesis;

output:

carbon/CO₂ leaving the bird and plant/leaves/roots and labelled as respiration; [2]
 To award the mark for output, diagrams must indicate respiration from birds and plants.

(b) *Transformation of carbon: [2 max]*

carbon transformed from carbohydrates to carbon dioxide;
 carbon dioxide transformed to glucose/carbohydrates;
 carbon dioxide going to calcium carbonate/any rock/shells; (*accept converse*)
 combustion of any organic matter/fossil fuels to carbon dioxide;
 conversion of organic matter into fossil fuels;
 dissociation of carbon dioxide in water;
 bacterial decomposition of (dead) organic matter/DOM releasing methane;
 breakdown of carbohydrates into simple sugars; (*accept converse*)

Transfer of carbon: [2 max]

carbon dioxide moves from respiring organism to atmosphere / carbon dioxide moves from atmosphere into algae/plants;
 carbohydrates move from leaves to storage structures such as tubers;
 movement of fossil fuels naturally/by humans;
 dissolving of carbon dioxide into water;
 movement of organisms from place to place;
 rain of organic matter/marine snow in any large body of water;
 moves between organisms by predation (*do not award if digestion is inferred*);
 sinking of dead animal into soil;

[4 max]

3. (a) a particular world view/set of paradigms that shapes the way an individual/group of people perceive/evaluate environmental issues / *OWTTE*; [1]

(b) (i) Award [1] for three correct answers in priority column in the table below. [1 max]

(ii) Award [1] for each reasonable example in the table below. Each example should illustrate the priority and how it would lead to sustainable development. Answers may be broad principles or relate to specific examples. [2]

	Priority	Example
Self-reliance soft ecologist	social;	<i>Community cooperative set up to sell local produce and share production costs to increase profits.</i>
Conservation biologist	environment;	<i>e.g. preserving standing forest to generate revenue through ecotourism;</i>
Banker	economic;	<i>e.g. investing in renewable technologies to meet energy needs in the future;</i>

[Accept other reasonable responses as examples.]

(c) alternative energy can be more expensive than fossil fuels;
 technologies in place for fossil fuels (inertia);
 political pressures to maintain the status quo/stick with fossil fuels;
 technology is not sufficiently advanced to meet all energy needs;
 sometimes physical conditions are not suitable;
 cultural factors can prevent societies changing to new energy sources; [2 max]

Accept any other reasonable suggestion.

4. (a) water content stays fairly level until about 2 cm³ of rainfall, then between 2 cm³ and 5 cm³ the water content starts to increase; an exponential increase in water content after 2cm³ of rainfall; [1 max]

(b)

<i>Soil type</i>	<i>Soil A, Soil B or Soil C</i>
<i>Sand soil</i>	soil C;
<i>Clay soil</i>	soil A;
<i>Loam soil</i>	soil B;

[1 max]

Award [1] if all three soils are correct.

- (c) the total gain in energy/biomass per unit area per unit time by photosynthesis; [1]
Do not accept per unit area without indication of time. Per unit time with no reference to area is acceptable.

- (d) *Soil with highest primary productivity:*
 loam/(Soil) B;
Note ECF – Award marks if candidate has referred to soil C or A but has previously indicated that these are loam.

Reasons: [1 max]

not waterlogged / particle size adequate so roots aerated / living biotic components present;
 not too dry so adequate water for growing plants;
 levels of leaching/speed of drainage are not excessive so nutrients available for growing plants;

[2 max]

5. (a) the amount of biological living diversity per unit area;
it includes concepts of species, habitat and genetic diversities; [2]
At least two concepts of diversity must be included for second marking point.

- (b) *plate activity: [2]*
as plates move populations become isolated;
plate activity results in the creation of new/diverse habitats;
contribution: [2 max]
island populations are separated from each other allowing speciation;
populations become separated by mountain uplift/other physical barriers;
the uplift creates new habitats promoting biodiversity;
adaptation to new habitats/niches;
formation of new land through volcanism/volcanoes;
isolation can lead to behavioural differences leading to reproductive isolation;
collision of plates allows mixing of genes/habitats/hybridization;
causing changes to ecosystem and hence biodiversity; [4 max]

Accept other reasonable responses.

- (c) (i) population size;
genetic diversity within a species;
habitat quality;
numbers of reproducing adults;
geographic range;
degree of endemicity;
size of habitat;
specialized habits (*e.g.* prey that are rare);
threats to habitat/species (*e.g.* over-fishing);
rarity; [2 max]

Award [2] for four of the above.

Award [1] for two or three of the above.

Award [0] for only one of the above.

- (ii) *Name of species: e.g. mountain gorillas;*
Description of human factors: [1 max]
population pressure leading to *e.g.* encroachment into the habitat;
bushmeat trade;
souvenir industry/witch doctor ingredients;
fragmentation of habitat;
deforestation;
civil war; [2 max]

Award [0] if no critically endangered species or endangered species named.

Please check named species is on the IUCN critically endangered or endangered Red List. (www.iucnredlist.org)

Allow some tolerance where scientific species name is not perfectly quoted (must be recognizable).

Do not accept broadly defined taxa (e.g. crocodile).

6. (a) *Award [1] for description of sampling / analyzing data.
Award [1] for comparisons to standards/upstream sites/non-polluted areas/monitoring changes over time.*

e.g. to measure nitrate levels in a local freshwater lake:

collect water samples and use test kit;

compare readings with standardized chart/colour chart/table of known samples;

[2]

- (b) non-point source

Do not award mark for the correct identification of the pollution.

it is the result of cumulative actions (vehicle/power station emissions, etc.) that cannot be pinpointed on a single event/location;

[1]

Award [1] if reason correctly exemplifies non-point source pollution.

Award [0] if reason correctly exemplifies non-point source pollution but candidate selects point source pollution.

- (c) halocarbons/CFCs/HCFCs/methyl bromide/bromine/halons from refrigerators/air conditioners/aerosols/foamed plastics/pesticides/fire extinguishers/solvents;

[1]

To award [1] responses need to address the name and the source of the chemical.

- (d) the most significant international agreement for reducing emissions of ozone-depleting substances;
governments signed up and implemented the agreed changes;
subsequent revisions have reduced the phasing out timescale because of success;
the Protocol provided an incentive for countries to find alternatives;
the Protocol raised public awareness on the use of CFCs;
technology has been transferred to LEDCs to allow them to replace ozone-depleting substances;
but some of the substances used are still ozone depleting *e.g.* HCFCs;
the long-life of the chemicals in the atmosphere means that damage will continue for some time;
it is harder for LEDCs to implement changes / second-hand appliance market means old fridges are still in circulation;
it is a protocol which depends on national governments being willing to comply;

[3 max]

Award [2 max] if only strengths or only weaknesses of the Protocol are mentioned.

- (e) positive feedback is feedback that amplifies/increases change/leads to exponential deviation away from an equilibrium;
ozone depletion is an example of positive feedback because the ozone-depleting substances break apart ozone molecules to provide more oxygen atoms for chlorine bonding;
and also bond with available oxygen, depleting the available oxygen atoms for O₂ to bond with to form new ozone;
chlorine/bromine/halons catalyze the destruction of ozone;

[3 max]

Responses may either define positive feedback and show how ozone depletion is an example of this or they may provide a detailed explanation/diagram of ozone depletion in which an understanding of positive feedback is implicit. Credit diagrams.

Note ECF – Award [3] to a candidate who has confused ozone with global warming earlier in the question, but positive feedback is accurately described for global warming.
