Diploma Programme
Programme du diplôme
Programa del Diploma

Markscheme

November 2015

Environmental systems and societies

Standard level

Paper 1

7 pages

Subject details: Environmental systems and societies SLP1 markscheme

Mark allocation

Candidates are required to answer **ALL** questions. Total = **[45]**.

1. A markscheme often has more marking points than the total allows. This is intentional.

2. Each marking point has a separate line and the end is shown by means of a semicolon (;).

3. An alternative answer or wording is indicated in the markscheme by a slash (/). Either wording can be accepted.

4. Words in brackets ( ) in the markscheme are not necessary to gain the mark.

5. Words that are underlined are essential for the mark.

6. The order of marking points does not have to be as in the markscheme, unless stated otherwise.

7. If the candidate's answer has the same "meaning" or can be clearly interpreted as being of equivalent significance, detail and validity 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 **WTTE** (or words to that effect).

8. Remember that many candidates are writing in a second language. Effective communication is more important than grammatical accuracy.

9. Occasionally, a part of a question may require an answer that is required for subsequent marking points. If an error is made in the first marking point then it should be penalized. However, if the incorrect answer is used correctly in subsequent marking points then **follow through** marks should be awarded. When marking, indicate this by adding **ECF** (error carried forward) on the script.

10. Do **not** penalize candidates for errors in units or significant figures, **unless** it is specifically referred to in the markscheme.

1. (a) many air spaces/good aeration;
good drainage;
potential to hold organic matter;
water holding capacity;
good access to minerals;
balance of sand silt and clay gives good structure/texture/tilth; **[2 max]**

(b) harvest sample of the crop;
dry and weigh the sample;
multiply for whole field area/calculate per hectare biomass/calculate mass per unit area; **[2 max]**

(c) eating lower down the food chain;
less land area to produce the food needed;
more efficient use of the energy fixed by photosynthesis;
less energy lost to respiration and wastes;
entropy increases so energy cannot all be passed to the next trophic level; **[2 max]**

2. (a) (i) $\frac{36(36-1)}{5(5-1)+2(2-1)+6(6-1)+1(1-1)+22(22-1)}$;

Index = 2.45; **[2]**

(ii) logging/deforestation has occurred and habitats have been lost;
change in season and those species have migrated/hibernated;
different life cycles of insects so they are not in this form at this time;
sampling error the insect is found in a different micro-habitat;
extinction due to inability to adjust to change in abiotic features, such as pollution event/climate change/fire;
extinction due to biotic factors, *eg* disease / predation;
random/stochastic event and they have not been collected during the survey; **[2 max]**
Accept any other reasonable point.

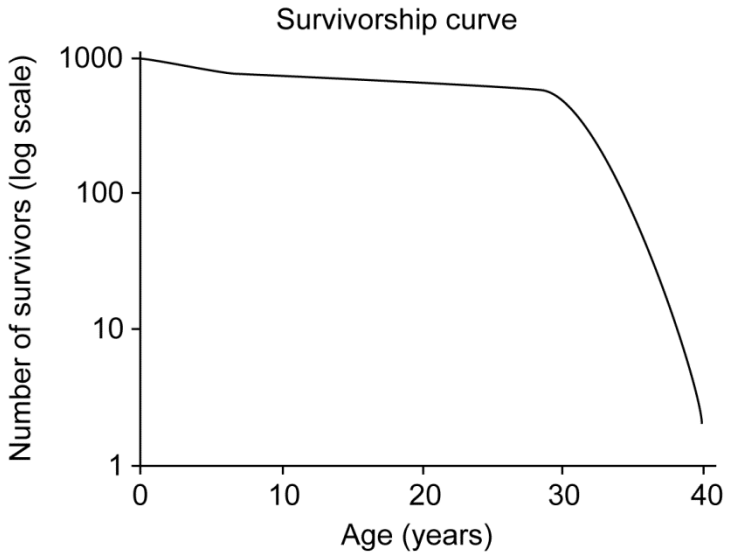
(b) (i) climate;
water supply;
temperature;
humidity;
pH; **[1 max]**
Accept other reasonable responses.
Do not allow biotic factors eg predation.

(ii) *eg temperature.*
decide on sample site/sampling technique;
use thermometer/temperature probe to record temperature at regular intervals over time; **[2]**

(c) mutualistic both species benefit;
whereas in a parasitic one only the parasite benefits, (usually the host is only affected slightly); **[2]**

(d) *No credit for saying it's a predator/prey relationship.*
as more prey is available more predators survive;
too many predators reduces the prey and the predators may starve;
prey starts to recover from predation and the numbers grow;
the cycle repeats with a lag time for the predators/prey to reproduce; **[2 max]**
WTTE.

3. (a) (i)



[1] for correctly labelled axes;
[1] for the correct shape of the graph;
[1] for both axes labelled correctly / x-axis age/% of maximum lifespan and y-axis number of survivors/individuals/number of survivors per 100/1000; **[2 max]**

(ii) *Any one of the following:*
most K species survive until after offspring bearing age/maturity;
death rate increases near the end of the lifespan;
a few K individuals will die at a young age; **[1 max]**

(b) (i) a factor whose impact increases as the population density increases; **[1]**
WTTE.

(ii) medicines/vaccinations for disease/improved sanitation;
Increasing intensity of food production/food yields *eg* through GMOs/technology;
abstract/transport water from distant areas;
importing food resources from elsewhere;
more high rise buildings/land reclamation/construction on green belts; **[2 max]**
Accept any other reasonable point.

4. population will have tripled/doubled/grown significantly as death rates have reduced;
birth rates reduced so the 0–5 age group is not larger than the next age group in 2050;
population is aging/average age is increasing/proportion of young people has decreased;
life expectancy has increased as no visible population above 85–89 in 1950 but above 50 million for male and female in 2050;
population has gone from expanding structure to a more stable structure as seen in the minimal decline for population in cohorts up to 35–39 in 2050;
gender balance has changed/significantly more females in older age brackets by 2050; **[4 max]**
*If no specific data is used to support the answers then **[3 max]**.*

5. (a) (i) absorbs (incoming) UV radiation;
UV radiation energy breaks bonds in O_2 and O_3 in the ozone layer and heats the atmosphere;
less UV radiation reaches the Earth's surface/protects life from damaging effects of UV; **[2 max]**

(ii) *Any one of the following:*
find substitutes for Ozone Depleting Substances (ODS);
ban ODSs;
international agreements, *eg* Montreal Protocol;
develop new technology, *eg* pump action aerosols; **[1 max]**

(b) (i) oxides (*eg* NOx) from fossil fuel combustion;
react in sunlight with oxygen from air; **[2]**

(ii) *Strategies include:* ban fossil fuel vehicles from urban areas, increase public transport, have pedestrian only areas;
eg increasing public transport;
reduces the number of vehicles on the road, so less emissions;
some cost to local government/investment in infrastructure;
long term gain from reduced fossil fuel emission is preferable to short-term costs; **[3 max]**
*Award **[1]** for pro, **[1]** for con, and **[1]** for concluding statement.*

(c) acid rain/deposition;
eutrophication;
oil spills;
nuclear accident/spill (*eg* Fukashima);
pesticides/plastics in international waterways/oceans; **[1 max]**
Accept any other reasonable examples.
Do not accept global warming or ozone depletion.

6. (a) (i) climate change/global warming;
Milankovitch cycles;
solar cycle/sunspot activity;
shifting ocean currents;
El Niño; **[1 max]**

(ii) *March:* $16.5 - 15.2 = \frac{1.3}{16.5} \times 100 = 7.9\%$ reduction (*accept 8 %*);

September: $7.0 - 3.5 = \frac{3.5}{7.0} \times 100 = 50\%$ reduction; **[2]**

(iii) slight reduction in March/remains steady since 1979;
greater reduction in September/downward trend; **[2]**

(b) ***[1]*** *for clearly articulated viewpoint.*
Award ***[1]*** *mark for each subsequent development point up to a maximum of* ***[3]****.*
eg I do not agree with mineral extraction in the arctic;
even though the mineral extraction may bring economic benefits to companies/countries;
the environmental damage *eg* to polar bear habitats, does not outweigh these benefits;
wilderness areas should be protected for future generations;
eg I do agree with mineral extraction from the Arctic;
the world is running out of some essential resources and so countries/communities require them;
new technologies can minimize environmental impacts;
this area is part of global commons and so other countries will exploit, so it is better to divide the areas and exploit; **[4 max]**