IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
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MARKSCHEME

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ECOSYSTEMS AND SOCIETIES

Standard Level

Paper 2

11 pages

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Subject Details: Ecosystems and Societies SLP1 Markscheme

General

A markscheme often has more specific points worthy of a mark 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.

- 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 mark scheme, then award the mark.

- 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 "**U-1**" 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.

SECTION A

1.   (a)   (i)   20.6 (*accept 21*)   *[1]*

(ii)   50 × 50 cm quadrat = 0.25 m^2;
therefore 20.6 × 4 = 82.4 primroses m^{-2}; (*accept 82*)   *[2]*
or   21 × 4 = 84

(iii)   *e.g.* light levels would decrease with distance into wood   *[1]*

(iv)   along a profile or transect;
take reading at regular intervals;
enough to be statistically significant;
take samples using relevant equipment;   *[2]*

(b)   (i) $N = \dfrac{28 \times 32}{10}$;
$N = 89.6$;   *[2]*

(ii)   make sure all traps were working properly;
ensure all traps were equally baited;
ensure all animals were handled humanely and not hurt;
ensure all traps were in similar locations (*e.g.* all at the base of a tree, all on a
defined animal track);
traps checked at same time each day;
mark in a way that will not rub off;
mark in a way that does not compromise survival;   *[2 max]*
Accept other reasonable answers.

(c)   randomly place a series of quadrats in the meadow/grassland;
remove all vegetation from each quadrat;
dry the vegetation in an oven to remove water and measure the dry mass;
work out the average dry biomass per quadrat and multiply by total area of meadow;   *[3 max]*

(d)   (i) $D = \dfrac{51(51-1)}{\sum n(n-1)}$;
$D = \dfrac{2550}{596}$;
$D = 4.28$;   *[3]*

(ii)   low diversity index suggests that a habitat is newly colonised;
a monoculture dominated by a single species;   *[2 max]*

(iii)   abundance is a measure of the number of organisms per unit area;
diversity is the number of different species and the relative number of
individuals within a species;   *[2]*

SECTION B

> **General Essay Markscheme**
> Each essay is marked out of *[20]* of which *[2]* are for clarity of expression, structure and development of ideas.
>
> *[0]* Quality of expression, structure and development is poor.
>
> *[1]* Quality of expression, structure and development is limited.
>
> *[2]* Quality of expression is clear, structure is good and ideas are well developed.

2. (a) from 1880 to 2000 global mean temperature has shown a steady rise;
an increase from about –0.25 to about +0.6 °C / an increase of around 0.8 °C;
1880 to 1920 temperature below mean;
1920 to 1970 temperature around mean;
1970 to 2000 temperature above mean;
"noise" in the data represents individual years that have had exceptionally low or exceptionally high temperature readings and so do not fit the trend;
people may be playing a role in this upward trend due to an ability to modify climatic conditions through releasing greenhouse gases;
this period (1880 to 2000) represents the last expansion phase of the industrial revolution;
burning fossil fuels and releasing CO_2 in transport and industry;
deforestation leading to change in the carbon release cycle;
intensive agriculture leading to release of methane *e.g.* rice paddies/cattle;   *[7 max]*
Award [3 max] for description, [1 max] for anomalies, and [4 max] for explanation.

  (b) *Award [1] for each impact on people supported by an example.*
global warming will lead to biome shifts, sea level rise, and changing weather patterns;
in MEDCs and LEDCs one of the main impacts is likely to be agricultural change and stress;
e.g. changing rainfall patterns may destroy marginal cultivation in central and northern Africa;
e.g. there may be a significant shift north in the USA maize belt;
sea level rise will cause coastal inundation resulting in the loss of life and loss of resource–rich coastal lowlands;
e.g. the Ganges Delta, Dutch Lowlands;
more severe weather phenomena *e.g.* hurricanes leading to loss of life and property (*e.g.* Hurricane Andrew most expensive hurricane in US economy);
drier climates will exacerbate desertification (*e.g.* in Sahel) leading to famine and population migration;   *[5 max]*

(c)   *Global* **[2 max]**
at the global level society needs to set and abide by a series of ground rules and laws
that encourage the control of pollutants associated with global warming;
this requires intergovernmental and international agendas *e.g.* Rio Agenda 21 *etc.*;

National **[2 max]**
at the national level countries need to adopt policies that encourage reduced use of
fossil fuels;
e.g. encourage tree planting not harvesting / encourage renewable atmosphere–
friendly energy sources;
e.g. minimise resource use and reduce waste production;

Local **[2 max]**
at the local scale reduction of waste and reduction of raw material use;
use more recycled goods / avoid CFC goods / use less energy / produce less CO_2 and
other atmospheric contaminants;   **[6 max]**

Expression of ideas **[2 max]**

Total [20]

3.   (a)   *If no examples used award [4 max]*
habitat loss *e.g.* extinction of Tasmanian wolf due to expansion of agriculture;
hunting *e.g.* passenger pigeon;
alien predation and introduced species;
environmental pollution;
pathogens and disease;
most extinctions may not be due to a single cause but a combination of causes;
e.g. the wolf (*Lupus lupus*) in Europe and Britain became extinct due to over hunting and habitat loss;
global warming leading to rapid changes in biomes;   *[6 max]*

(b)   evidence for past mass extinctions can be found in the fossil record;
it is clear that at certain times large numbers of species disappeared from the fossil record;
Possible causes could be:
large meteor impact (*e.g.* Mexico strike) leading to dust in atmosphere;
volcanic activity on a large scale (*e.g.* Decan trap eruptions) causing environmental change;
global climate change *e.g.* ice age;   *[4 max]*

(c)   *Arguments for conserving [4 max]*
ethical – we have a moral obligation to species / species have as much right to exist as we do;
aesthetic – creatures are beautiful and there is aesthetic value in their existence *e.g.* dolphins;
genetic resource – provide present and future material for human resource needs for food, medicine / diversity = more options;
commercial – value of species if sustainably managed provide long term resources *e.g.* for fur;
ecosystems depend on their component parts, *i.e.* species;

Evaluation [4 max]
captive breeding strengths include:
management of gene pool enables greater survivability of offspring because perceived strengths can be selected;
greater post–natal survival because threats to infants can be high in the wild;
artificial insemination increases fertility rate;

weaknesses include:
protecting animal without protecting habitat so not a long term survival strategy;
no natural selection so traits which are a disadvantage in the wild may be passed on;
animals unable to cope in wild due to learned behaviour in captivity;
e.g. lack of inhibition towards people;   *[8 max]*

Expression of ideas [2 max]

Total [20]

4. (a) the area of land and water required to support a defined human population at a given standard of living;
takes account of the area required to provide all the resources needed by a population and to assimilate all wastes;
ecological footprint is the opposite of carrying capacity;
it is accepted that if a population has an ecological footprint larger than the country's land surface are, it is living beyond the country's sustainable threshold;
if a population has an ecological footprint smaller than the country's land surface area, the population is living sustainably / within it's resource base;
in conservation terms ecological footprinting allows for the identification of areas likely to suffer from ecological stress;
if people require more land area than the country possess, natural habitats will suffer;
e.g. clear felling virgin forest / over harvesting marine resources;
it allows quantitative ways of measuring impact and therefore setting limits to negate that impact;
but major weakness is that it only takes certain aspects into account *e.g.* focussed on carbon dioxide;
e.g. ignores land / water required to provide aquatic resources;   *[7 max]*
Award [5 max] for evaluation, but [3 max] if answer looks at only strengths or weaknesses.

(b) reducing dependency on fossil fuels / hydrocarbons;
by switching to nuclear power or more renewable power resources
e.g. wind/hydroelectric/wave/solar;
recycling waste more efficiently;
reusing packaging / minimising packaging;
using waste crops as fuel *e.g.* biogas / biomass;
using biotechnology to produce food more efficiently *e.g.* GM crops;
more efficient birth control to reduce population growth;
producing goods that last longer and run more efficiently/on renewable fuels *e.g.* electric cars;   *[6 max]*
Accept other reasonable suggestions.

(c) *Award [4 max] if there is no clear evidence of what the candidate thinks is the best environmental philosophy.*
For full marks answers must evaluate both philosophies, though one is favoured.
Answer must link evaluation to long term sustainability.

e.g. econcentrism is best suited to achieving long term sustainability;
because long term sustainability is intrinsic to the ecocentric philosophy;
people have to restrain their resource use and live within their resource base;
technocentrism does not accept that there are any limits to resource use;
resources are presently only limited by lack of technological know-how;
technology will increase the effective life of a resource by allowing us to use it more efficiently *e.g.* fossil fuels;
technology will help us find and develop new resources *e.g.* hydrogen fuel;
technology will allow greater resource cycling;   *[5 max]*

Expression of ideas [2 max]

Total [20]

5.　(a)　over the last 2000 years death rates have fallen more rapidly than birthrates;
infant mortality decreases and life expectancy increases and therefore population grows rapidly;
due to technological improvements to living standards, medical care, hygiene;
food supply and resource base;
industrial revolution marked a critical phase in accelerating technological knowhow;　*[4 max]*
Credit should be given to answers which refer to demographic transition model and/or population pyramids.

　　　(b)　exponential population growth will lead to an increase in demand for resources;
these will be land, water, food and materials;
resource base is finite so shortages will occur if demand outstrips supply;
therefore there is an implication (see quote) that the current users of resources (few whom are alive) hold resources in trust for future generations;
many believe technology offers a way to enhance the resource base *e.g.* through alternative fuel sources;
the idea of sustainable development is that we must ensure current use of resources does not compromise ability of future generations to meet their own needs;
carrying capacity is a measure of an area's ability to meet resource demand for a given population;
exponential growth in population is likely to exceed carrying capacity;
this will lead to environmental stress and over use of current resource base *i.e.* an unsustainable system;　*[7 max]*

　　　(c)　Possible strategies could include:
reducing birth rate with contraception;
education / leading to the empowerment of women;
reduction in infant mortality;
setting quotas *e.g.* China's one child policy;
changing marriage ages;
advertising campaigns to challenge cultural norms about family size;
legalising abortion;　*[4 max]*
Award comprehensive answer covering most of the above [4], partial coverage [2] or [3].

　　　　　Obstacles include:
religious belief – contraception not natural;
cultural inertia *e.g.* over family size / male potency / status of women;
economic factors – large families needed to support parents in old age / work on farm / develop the country;
practical issues – *e.g.* access to contraception in remote rural areas / inefficient communication;　*[4 max]*
　[7 max]

Expression of ideas [2 max]

Total [20]