CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2014 series

0680 ENVIRONMENTAL MANAGEMENT

0680/22 Paper 2, maximum raw mark 80

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CAMBRIDGE
International Examinations

1 (a) (i) from source, approx. 10 500 to 11 000 years ago;
people learnt how to plant crops and cultivate;
and how to keep their own animals (cattle, sheep etc.) for livestock farming;
any general comment about how this shows that farming had begun;

Accept quote from time line for one mark. [3]

(ii) hunter – hunting and killing wild animals for food;
gatherer – collecting fruits and berries / plants that were edible;
any general comment about obtaining natural food supplies / only what nature provided; [2]

(iii) survived because other more profitable / modern ways to make a living do not exist / there is no reasonable alternative;
local groups of people have the inherited skills to survive in these difficult environments;
further information about difficulties for human settlement in these areas;
examples of how they make a living, e.g. what is hunted in tundra lands;
what can be hunted and gathered in tropical rainforests;
general comment about abundance of wildlife;
low population;
Max. three marks

natural resources on which they depend are present in limited numbers / amounts;
large areas need to be exploited in order to support the group all year;
difficult / unpredictable way to make a living;
increased pressure / removing forests, from outside for mining, logging etc. making survival more difficult;
remain at a low level of economic development;
(young in particular) attracted to leave for better paid work / easier city life / other activities on offer;
food available in supermarkets;
minority of hunter-gatherers following family traditions;
Max. three marks. [4]

(iv) adds sufficient / appropriate water making crops grow when / where it is too dry for any / optimum growth;
reference to the desert climate as found in the Middle East and Egypt;
(enables the yield / output of crops to be greatly increased) more assured / reliable food supply;
may be able to get a second or third crop per year / allows all year planting and growth;
ref. to the biological use of water in growth e.g. in photosynthesis; [2]

(v) *title:* likely choices of modern method include: dam with channels leading from it / channel irrigation in the fields / sprinkler / or trickle drip irrigation;
labels: clear and relevant;
quality: clearly shows method chosen; [3]

(vi) *two advantages relevant to candidate's chosen method, such as:*
amount of water that is provided increases;
ease with which the water can be obtained because machines are doing the work / less physical work for people;
speed with which the water can be obtained because machines are doing the work;
can direct large amounts of water where needed by the crops;
less water wasted / less run-off / less evaporated;
comment about modern technology not already included in the above;
reduced risk of salination; [2]

(vii) easier to justify the choice of old methods, on the basis of
small / limited size and scale;
low level of technology with minimal influence / visual / noise pollution on surrounding areas;
only limited areas to be reclaimed from the natural environment for farming;
less likely to over-use groundwater supplies and reduce the level of the water table;
physical labour rather than using electricity;
less fossil fuels used;

if new methods are chosen, emphasis will need to be on the environmental safeguards
trickle drip irrigation, is less likely to lead to salinisation of soils;
small dams / small-scale schemes for which it is in local communities' interests to work with nature and sustain water supplies for future community / village use;
less water loss (as more controllable);

All the marks are for explanation. Answers which compare are equally acceptable as those which focus on the chosen method but must be a modern method of irrigation that is being compared. [3]

(b) (i) smooth line drawn; [1]

(ii) 1970–1990; [1]

(iii) no change at first, e.g. stayed / was low at about 2.0 between 1900 and 1940;
only increased by 0.3 in the 40 years from 1900 to 1940;
increase starts around 1940–1950;
from 1960 increase accelerates;
some general comment about how slow and small were the increases in yield;

Use of values needed for second mark. [2]

*Even if a later 20-year period is chosen than 1970–90 in answers to **(ii)**, the answer here can still be marked as above.*

(iv) Green Revolution based on use of high yielding varieties of seeds (HYVs);
further details such as examples of seed types;
broader comment about other accompanying farming improvements such as irrigation / fertilizer / pesticides to ensure that maximum yield was obtained;
AVP;

GM crops are new seeds genetically modified to withstand conditions better and thrive where conventional seeds might not;
such as seeds that are given built-in resistance to insect pests / herbicides so that crop output is not reduced;
or seeds which are modified to grow even in times of drought / inadequate rainfall;
or when minerals are deficient; [4]

(v) rise in yields coincide with development of new seeds and Green revolution (GM crops);
max. increase is when new seeds / green revolution occurred; [1]

(c) (i) graph values for Africa are lowest / has least increase of all at both dates;
they were only 0.6 in 1960 and 1.5 in 2010;
this increase of 0.9 was the smallest of all the continents;

Credit any meaningful use of figs:
yields per hectare were 4–5 times higher in the USA at both dates;
they were well below those of other developing countries / continents;
for example yield in China was more than double at both dates;
examples of higher rates of increase for others between 1960 and 2010;

Max. of two marks if no values quoted as comparisons. [4]

(ii) reasonably accurate plots of 15% and 22%;
population sector for Africa highlighted / shaded on graph and shown in key; [2]

(iii) very urgent;
the expected big increase in population will need to be fed / ref. to lack of food / starvation;
Africa's proportion of world population increasing;
plus world population growing;
ref. back to **(ci)** / Africa continues to have lowest productivity; [2]

(iv) specific problems / disadvantages associated with the Green Revolution include:
cost of buying the new seeds / very expensive;
need more precise conditions for cultivation than old seeds;
which increases farmers' costs for irrigation water / fertilisers / pesticides / machinery;
small farmers need to borrow money and can get into debt;

specific problems / disadvantages associated with GM crops include
high costs of seeds which need to be bought new every year from commercial companies;
which means they can only be afforded by large-scale farmers;
no uptake by small farmers who dominate farming in many developing countries;
in some countries that could afford to use them public / environmentalist opposition to their use is strong;

other more general reasons include
new seeds only for certain varieties of crops;
mainly cereals and soya;
in many parts of the world traditional farming dominates, often with minimum contact with the outside world / pressure against the new methods;
poor subsistence farmers are engaged simply in survival, often afraid to change;
lack of knowledge / skills / education;

Award one mark for a general statement of not being able to afford the new developments. [4]

2 (a) (i) 61:39 [1]

(ii) blue water is that which is in natural reservoirs, not being used by plants;
green water is that which is within plant systems;
Accept quotes from the diagram. [2]

(iii) accurate plot of oceans at 36% / plot of evaporation plus city and industrial use being 1.3 and 0.2 / total of 1.5;
key or obvious identification of the plots / attempt to indicate what at least two sectors show; [2]

(iv) total 7%; [1]

(v) green is from rain (and farmers obtain this with no charge)
(but it is not enough so is topped up by) farmers using water from “stored” blue water e.g. from dams / reservoirs / rivers; [1]

(vi) *the advantages of plants and forests to humans:*
for natural food supplies, and providing the seed base for crops used in farming;
for raw materials such as wood, rubber / paper etc.;
for fuel-wood;
for use in medicines / drugs;
for wildlife habitats creating plant and animal biodiversity;
for tourism / education;
for environmental advantages such as carbon stores, evaporation, maintaining rainfall patterns, protecting the soil / keep fertility etc.; [4]

(b) (i) has increased in amount of water consumed;
continues to increase;
at a slower rate;
values used to support the answer such as 10 fold increase from 1900 to 2020; [2]

(ii) the two main reasons are:
increase in world population;
increase in consumption per head / increased economic development and greater use;
increase in industry;
increase in food required / agriculture:
increase in levels of hygiene; [2]

(iii) agriculture uses more water at every date;
values to support this such as about 90% in 1900 / still around 60% by 2020;
percentage proportion used by agriculture has gradually decreased over the years (although still high);
actual increase in agricultural use has been steadily growing year-on-year;
but actual increase has been more rapid in industry over the same period;
rate of increase in both is now slowing down; [2]

(c) (i) high in many areas in the tropics;
greatest concentration in
North Africa;
West Africa;
South Africa;
OR most of Africa;
Middle East / UAE;
South Asia / China / India;
South of North America;
Central America;
coinciding with desert areas;
references to other locations such as west coast of South America / Australia; [2]

(ii) low in the north of the northern hemisphere continents;
across northern North America;
N Europe;
E Europe;
OR most of Europe;
N Asia;
Canada;
Russia;
Iceland;
Alaska:
around the Equator in central Africa (DR Congo);

Accept other correct ref. to northern places. [3]

(iii) the main reason is climate;
either deserts (dry all year) or climates with a dry season such as savanna;
in the tropics hot temperatures lead to high rates of evaporation;
also temperatures are high enough for crops to be grown all year in the tropics, provided that water is available;
type of crop grown, e.g. rice;
GM drought resistant crops grown;
method of growing crop e.g. hydroponics;
(Vice versa for temperate latitudes, N Russia / N Canada / Alaska, especially tundra where climate stops farming taking place, thus no need for water for agriculture)
ref. to developing countries operating an agro-economy;

likely areas of choice – home areas in India / Pakistan / Middle East for high water use / or more generally Sahara / Sahel;
somewhere in tundra lands for low water use;

Two marks for references to climate and related reasons.
Two marks for references to areas to illustrate reasons. [4]

(d) (i) irrigation water in large concentrations on the surface;
evaporation leaves salts behind in the soil;
further evaporation of moisture draws salts up to surface;
leads to the formation of a hard salt crust on the surface;
salt concentrates around plant roots; [3]

(ii) strategies target the amount needed by the plant (e.g. controlled water use with sprinklers instead of open channel irrigation);
supplying the water directly to plants and plant roots instead of the land around them (e.g. as in trickle drip irrigation);
right time of day, e.g. sun rise and sun set;
porous pot use explained;

One method well explained or two with minimal explanation for two marks. [2]

(e) (i) bilharzia and malaria; [1]

(ii) biharzia:
snail lives in still water (larvae grow and multiply inside the snail) /
enters through the soles of the feet of people working in irrigated fields;

malaria:
stagnant waters are breeding grounds for mosquitoes /
larva pupates here; [2]

(iii) people are regularly / semi-permanently ill;
which means that their capacity for working is reduced (reducing family income / food supply);
cost of treatment is expensive; [2]

(iv) *water-related is most important factor:*
water-related diseases such as malaria never properly goes away once it is in the bloodstream;
people keep suffering from bouts of fever;
so cannot work long term;
more child deaths;
which encourages people in rural areas to keep on having more children / larger families so that some will survive;

other factors:
landlessness;
land held in big estates and by big companies, especially the best farmland, small producers exploited;
pressure on the land leading to over-cultivation and soil erosion;
expense of obtaining irrigation water to increase output;
too poor to invest in new seeds / fertilisers / machinery etc.;
earning potential is low in farming;
high cost of living, e.g. education, food, housing costs, sanitation;

Max. of two marks if no ref. to the factor being most important. [4]

[Total: 80]