UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2008 question paper

5014 ENVIRONMENTAL MANAGEMENT

5014/01 Paper 1, maximum raw mark 120

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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UNIVERSITY of CAMBRIDGE
International Examinations

1 (a) (i) The north has most cultivable land but little/less water resources [1]

(ii) water is to be diverted from the south to the north
using canals (from rivers/dams) [2]

(iii) great cost
cost/difficulty of tunnelling through mountains/under rivers
many people will have to leave their homes
pollution might spread further/ecosystem altered
the climates of the two regions might be changed
cultural/historical features might be destroyed/need moving
difficulty of working in the remote west/Tibet
difficulty of working in great cold/frozen conditions in Tibet/on high mountains/plateau
water diverted by western canals would normally flow into other countries/likely to cause difficult relationships
silt accumulates in reservoirs/dams
avp [4]

(b) laws/regulations to prevent further pollution
education about conservation/damage to the environment
regular monitoring of water quality
fines/penalties for polluters
water treatment
sewage treatment
avp [3]

2 (a) (i) impermeable rock for the rock above and below the gas – pecked lines
oil for the layer above the water – dense shading
gas for the layer above the oil – circles [3]

(ii) anticline/upfold [1]

(iii) geologists examine rocks in the field/aerial photographs
search for structures likely to contain oil/gas
seismic surveys/use of gravimeters/magnetometers
drilling
avp [2]

(b) vegetation removed during pipeline construction
might not re-grow as before
extreme cold might cause breaks in pipeline
spills could kill plants/animals/effect on biodiversity as argued
warmth could melt permafrost/frozen ground
heated river water/thermal pollution
therefore river life might die
pipeline might hinder migration of animals
warmer habitats might not suit native animals
avp [4]

3 **(a)** up to 100 kg per hectare crop yield increases as amount increases
from 100 to160 kg per hectare there is no improvement in crop yield
over 160 kg per hectare causes a slight decrease in crop yield

Credit stated relationships without figures to 2 max. [3]

(b) pollution of rivers/groundwater
with excess nitrates/phosphates
algae multiply rapidly
on decomposition they reduce the oxygen in the water
eutrophication
plant/animal life in the water dies
avp [4]

(c) use organic fertiliser/manure
use compost
mixed farming
crop rotation
using nitrogen fixing plants
e.g. using leguminous crops/peas/beans etc. after cereals
avp [3]

4 **(a)** **(i)** coniferous
conical shape/tapering branches
straight trunks
downward sloping branches
thin trunks
trees in stands/similar
dense forest

features must be visible in the photo [3]

(ii) shallow roots because of permafrost/only top layer thaws
thick bark to protect from severe winter cold/frosts
conical shape/downward sloping branches to let snow slide off
needle leaves to reduce transpiration because little moisture available to the vegetation/little summer rain
conical shape/supple trunks to allow sway in strong winds
evergreen because short growing season/no time to grow new leaves
avp

relationship needed [3]

(b) (i) solar/sunlight [1]

(ii) clean/non-polluting source of power (important in a National Park)
quiet source of power will not disturb fauna
power for many hours each day in summer because long hours of daylight
(in taiga zone/cool interior climate/high latitudes)
will give most power in summer season when most tourists visit
available where no other power available/not near electricity grid

no/little power when no sun
little power as sun is at a low angle in the sky (in the taiga region/cool interior climate/ high latitudes)

avp must have at least one from each group for max.
A very well developed point can be awarded two marks [3]

5 (a) (i) X infiltration
Y runoff [2]

(ii) seeps down through spaces in the soil
reaches permeable rock
flows/passes through gaps/pores within the rock

Any two [2]

(iii) Letter I placed anywhere within the wooded area [1]

(iv) More quickly
down valley side slope speeding up surface runoff
less surface resistance of flow over the agricultural land
especially where the field is ploughed down the slope

More slowly
large area of woodland at top of slope to intercept rain
comment about how interception reduces runoff
permeable rock under the soil so that some can penetrate underground

Max 3 marks for an answer referring only to more quickly or slowly.
Also credit a clear reference to the different areas and their rates of runoff

4 points made along the lines suggested. [4]

(b) Possible reasons:
water supply for drinking
water supply for other uses e.g. washing, industrial use, power supply
easy waste disposal
fishing/food supply
easy access/transport
often fertile silt soils for farming in surrounding areas
flat land areas are on sides of rivers
Any three valid reasons provided that they are obviously different or made to be different, like the water supply examples above [3]

(c) (i) workers killed and injured
residents affected by orange cloud of smoke/air pollution
40,000 residents evacuated from their homes
toxic leak into river

Any two [2]

(ii) Harbin was lower down/downstream from the leak into the river
slick was too big (80km long) to be diluted/dispersed before reaching Harbin
officials made no attempts to control or stop the slick

Maximum 1 mark for merely quoting relevant information from the source
Two mark answers include comment/context [2]

(iii) Songhua River flows across the border into Russia
towns along the river in Russia like Khabarovsk use river water for drinking
China waited at least a week before informing Russia of the toxic leak
China did nothing to clean up a large slick like this
comment about likely Russian views on this.

Points made along these lines 3 @ 1 mark [3]

(iv) Only real fact was that the main slick had moved downstream of the city
Perhaps half accurate was the statement that the water flowing in the river was now clean/safe water
However, water was not safe/chemicals still likely to be present according to what the expert living outside China said; nitro-benzine is a highly dangerous substance for humans
Possible that will affect people for a long time – especially since the leak was enormous (80km long slick) causing likely high concentrations; breakdown likely to be slow in cold water in winter
Possible that humans would be affected not only by drinking the water but also by eating fish from the river

Mark explanation which supports the view or views expressed. [4]

(d) (i) Plots – 10 or more correct = 2 marks
– at least 4 correct = 1 mark
Line used to link the candidate's plots = 1 mark [3]

(ii) Summer/June to September (or October) [1]

(iii) Although June & July were the wettest months, there had been 6 or 7 dry months before
rivers and ground could take more rainfall without flooding than after 3 months of high rainfall
between 1400 & 1500 mm of rain fell in the three months before September
it takes time for rivers to fill up from all the tributaries and start flooding

Some idea of the reasons why = 1 mark
Understood, particularly if supported by a specific reference to precipitation values = 2 marks [2]

(iv) One answer is April = 1 mark
Explanation – either zero precipitation, or better still it is preceded by at least 4 very dry months (each with only a trace of rainfall); also allow high temperatures leading to high rates of evaporation
Choice of May = 1 mark also; similar explanation based on length of preceding dry months; higher temperatures and high evaporation are even more valid
When another month is chosen, no mark for choice, but one mark is possible for valid explanation (easier to achieve the closer the month is to April/May) [2]

(v) Description of a method of irrigation – any acceptable (canal, sprinkler, large or small schemes etc.) although trickle drip is the only method of irrigation actually named in the syllabus.
water storage (from dam, reservoir, river etc)
method of transfer (if different from above)
pipes with small holes in them
water trickles out around the plants only where they are growing
reduces amount of water used/chances of salinisation

Three points made along these lines for this or for another method of irrigation
Also, credit answers about dry farming techniques and development of new drought resistant varieties of seeds, provided the context is made relevant. [3]

(e) (i) Benefits of high rainfall and river floods for farmers include:
deposits of fertile (silt) soils after floods
filling up reservoirs/ponds/rivers used for irrigation water supply
water seeping into ground and raising level of water table
renews the grass/vegetation in areas of livestock grazing
standing water essential for some crops such as wet padi

Any two – accept other points provided that they relate to farming. [2]

(ii) Agree – some of world's most productive farming areas, with highest densities of population are found on flood plains and deltas, especially in Asia – without annual floods and wet summers none of this would be possible. Reward references to examples. In these areas flooding on a larger scale than normal may cause loss and damage, but not as great as would be caused by non-arrival of the rains

Disagree – flooding is a major natural hazard which kills people and animals, ruins crops, destroys property, spreads water related diseases, keeps people stuck in the poverty trap, holds back economic development etc. Examples of bad floods could be used to support answers.

No mark for view held – all views from total agreement to total disagreement are equally acceptable. Instead reward the explanation.
Strong explanation which supports the view expressed = 3 or 4 marks
Some explanation, but less well developed; view not always clear = 1 or 2 marks [4]

[Total: 40]

6 (a) mixed vegetation cover
grass, bushes and trees dotted around
looks like wet season with fresh grasses and leaves on trees

Further comment about any of the individual vegetation types such as:
tree looks like an acacia/umbrella shaped
grasses in the open areas/reasonably deep/complete ground coverage

Three descriptive points like these based upon what can be seen in the photo. [3]

(b) (i) Reference to photosynthesis
formula given
explanation about how carbon dioxide and water are converted into sugar and glucose (carbohydrates) by light energy of the sun – up to 2 marks
oxygen released from process used by animals

Maximum 4 marks, minimum 2 marks

(ii) New supplies of minerals are obtained from underground from the continued weathering of rocks – up to 2 marks
can be new surface deposits such as silt from river floods
also from nutrient recycling from dead vegetation, animals and micro-organisms – up to 2 marks

Maximum 4 marks, minimum 2 marks [6]

(c) (i) Nutrients and energy absorbed by plants are passed to other living things
in this case the giraffe as it eats the leaves from the bushes
nutrients and energy are therefore moved along a food chain

Some understanding of what food chain means = 1 mark
Understanding well shown in the context provided by the diagram = 2nd mark [2]

(ii) The giraffe is a herbivore/plant eater
the giraffe can in turn be the food for carnivores (such as lions)
humans are often placed at the top of the food chain/tertiary consumers
numbers that can be supported decrease along the food chain
decomposers at end/others later in food chain

Two points made along these lines [2]

(d) (i) The Earth's natural resources of solar energy and water
the size of the Earth's land area

(ii) The Earth's natural ecosystems of vegetation and animals

Minimum of two correct needed for each one.

One from each; 2 @ 1 mark [2]

(iii) Massive increase in human population
while the Earth's land area and natural resources have remained the same, resulting in an increase in the agricultural land area at the expense of woodland and wildlife, CO_2 increase related to fossil fuel use

Well understood = 2 marks
Some understanding = 1 mark [2]

(e) (i) Collecting plants/berries etc. (wild products)
hunting wild animals
Allow references which may come from knowledge such as fishing

Two different ways = 2 marks [2]

(ii) Advantage – had to be sustainable to survive/population could not increase beyond what was provided by nature/low technology meant minimal environmental impact

One advantage along the lines suggested = 1 mark

Disadvantage – precarious existence with food supplies not always guaranteed, availability highly variable from year to year/season to season, had to spend a lot of time searching for food, few opportunities to specialise and advance knowledge

One disadvantage along the lines suggested = 1 mark [2]

(iii) 25% (allow one quarter) [1]

(iv) Chemical fertilisers and pesticides:
fertilisers add/replace nutrients in the soil that crops/grasses need for growth
examples include those containing nitrogen and phosphates
stop the need for fallow land/allow preferred crop to be grown every year
allows extension of farmland into areas unsuitable because of infertile soils
pesticides kill/destroy what would otherwise eat or damage the farm output
allow high yields/outputs to be achieved every year

New varieties of seeds and animals:
HYV (high yielding varieties) of seeds associated with the Green Revolution
examples such as IR8 rice seeds/mainly for cereals wheat, maize and rice
can be genetically selected for better adaptation to difficult physical conditions (such as dryness or short growing season)
genetically modified crops developed to resist pests better/give a more guaranteed output
specialised breeds of animals developed e.g. beef and milk cattle
larger animals/those better adapted to physical conditions by cross-breeding

Modern technology:
machines such as tractors and harvesters do more work more quickly
big ploughs allow land to be cultivated that was formerly too heavy for wooden ploughs to turn over
bad weather less of a problem because the work can be done more quickly when the weather is good
scientific study/analysis of soils to know what needs to be added for improved output

scientific breeding of plants and animals
large dams to store more water/allow larger areas to be cultivated
examples given e.g. Aswan Dam and its effects for farming in Egypt

Points made like these – what is given here is no more than a selection of the points that can be made. Credit references to named examples of types and to places.

Maximum 4 marks, minimum 2 marks for each reason chosen [6]

(f) (i) Other temperate forests [1]

(ii) Reasons which could be used:
suitability or otherwise of physical conditions for farming – polar and coniferous forests more difficult, cold environments than temperate and tropical areas with their higher temperatures; within the tropics savanna has more rainfall and vegetation than hot deserts, while access is easier than in the high density rainforests where heavy rain falls all year

levels of technology – advances in modem technology/Industrial Revolution began in temperate lands, which allowed more forests to be cleared, more people had to be fed, more land needed for farming etc. Most developed countries are located in temperate areas; developing countries are located mainly in the tropics

One answer/theme can be good enough for full marks – reward according to validity of points made i.e. according to the worth of the answer. For all three marks some comment towards the theme of variation between ecosystems is needed. [3]

(iii) Tropical rainforest [1]

(iv) Community forestry:
planting trees to fill/replace gaps in forest
especially in vulnerable areas such as on slopes
make use of forest products such as rubber instead of clearance
use dead branches etc. for firewood rather than chopping trees down
educate and train local people into sustainable ways of use

Agro-forestry:
plant fast growing agricultural tree crops like rubber and oil palm
maintain a complete forest/vegetation cover to prevent soil damage
the tree crops can be used to shelter smaller food crops
wood needed for other purposes such as fuel can be provided by planting patches of fast growing eucalyptus trees

Sustainable harvesting of hardwoods:
selective logging of trees of greatest commercial value
taking out only mature trees and leaving the rest to grow to full size
keep forest clearances small so that rapid regeneration is possible
do a preliminary survey to find the most suitable logging areas
check cutting of timber and ensure a long gap before next cutting

3 points such as these for chosen technique [3]

(v) Usually sustainable conservation measures are not easy to implement because:
restrictions imposed on what can be done, where and when
increased costs of operations/make profits harder to achieve
easier to clear all the forest with big machines than seek out the valuable trees which are dotted around within the rainforests
often there are commercial, social and political pressures for use of resources
examples of this e.g. by reference to the Amazon Basin
many of remaining forests are located in developing countries which are seeking economic development
controls over companies/developers are weak or not enforced; also widespread corruption

On the other side, there is more pressure upon governments and authorities from environmental groups and international organisations to implement sustainable techniques. Possible to educate politicians and local people about the commercial benefits associated with sustainability. Problem is that benefits are medium and long term whereas non-sustainable methods bring immediate income.

Any view is acceptable, but candidates are likely to find it easier to support an answer which focuses on difficulty of implementation.

Answer worth 1–2 marks
Limited explanation; one idea may be stated (and perhaps restated) without much explanatory support.

Answer worth 3–4 marks
Fuller explanation used in support of the views expressed. The question is answered/supported by relevant detail/content. [4]

[Total: 40]