

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Ordinary Level

**MARK SCHEME for the October/November 2009 question paper
for the guidance of teachers**

5014 ENVIRONMENTAL MANAGEMENT

5014/01

Paper 1, maximum raw mark 120

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1 (a) (i) P

(ii) shading of layer below water level

(iii) Q because water is drawn upwards / alkaline / salty crust shows evaporation / no organic matter suggests few plants grow [1]

(b) over irrigation = 1

water drains down and dissolves salts / minerals water is drawn to the surface
evaporation

salts / minerals deposited on surface

repeated causes build up of salts = 3 [4]

(c) pH 4 too acidic for (most) crops

fertiliser / manure needed

sand very porous

fertilisers / nutrients wash down quickly out of reach of crop roots

soil too dry in periods of no rain

expense of improving soil / fertiliser / irrigation [3]

2 (a) (i) become smaller

larger islands / more islands

islands became a peninsula / joined together (almost) split into two / three

northern part completely detached

becoming shallower

greater change 1986–2004 than 1973–86

avp [3]

(ii) reduced rainfall / drought

global warming

increased evaporation

increased extraction of water for irrigation / other purpose

diversion of rivers feeding into the sea

increased silt / sand deposition

avp [3]

(b) (i) reversal of ocean currents

warm water flows eastwards across the Pacific / from Indonesia / to Peru

at end of year

every 3–8 years

(ii) pressure systems alter

trade winds weaken / reverse

cause droughts when winds offshore instead of onshore

cause increased rainfall when winds onshore instead of offshore

low pressure leading to more evaporation and rainfall

avp

at least one from each part for max. [4]

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- 3 (a) (i) barometer / barograph / aneroid barometer
- (ii) weight of air
- (b) (i) shading of area with lowest pressure [1]
- (ii) drawing of isobars at 984 and 988 [1]
- (iii) strong because isobars close / steep pressure gradient [1]
- (iv) strong winds
heavy rains / floods
winds causing storm surges in coastal areas [2]
- (v) time to put shutters over windows / board up properties
time to take down potentially dangerous metal signs / other objects
time to evacuate people
time to warn the population
time to mobilise emergency services, move to shelters
stock up on supplies of food and water [3]
- 4 (a) (i) chimneys
storage tanks / description of
avp [2]
- (ii) danger of spillage – marine pollution, effect on wildlife / food chain
air pollution, carbon dioxide / sulphur dioxide / nitrous oxide etc.
takes away farmland, loss of livelihood / food
avp
allow each point up to two if well developed [3]
- (b) fishing / boating / attractive scenery / avp [1]
- (c) industrial country
demand for power
demand for refined products from petroleum
cheaper to locate by sea because of cheaper transport costs
industrial lobby more influential than conservationists
provide employment
stimulate local economy
avp [4]

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- 5 (a) (i) both correctly plotted = 1 mark
attempt to use the same two types of shading = 1 mark
- (ii) Africa – both worse than the world average, especially people without water supply
Asia – without water supply is the same, but without sanitation is 14% worse
Europe – much better than the world average for both, especially for sanitation for which it is 34% better
- these are just some examples of answers; percentage differences other than the ones quoted here are equally valid
- general statements only, without necessarily focusing on the significant or indicating size of differences = 1 or 2 marks according to completeness
complete statements using key comparisons; highly likely that percentage differences will be used = 3 marks [3]
- (iii) basic answer is that water supply is easier and cheaper to provide than sanitation
more expensive infrastructure needed to lay pipes to take dirty water away, and to build and operate treatment works
governments have traditionally given higher priority to water supply for public health, by community work it is often more feasible to pipe clean water short distances than undertake sanitation works / access to a stated local water supply
water supply is seen as a more important basic human need
- valid reason established = 1 mark
some worthwhile development / elaboration = 1 mark [2]
- (b) (i) possible sources
from the atmosphere – rainfall catchment
from the surface – rivers, ponds/lakes, irrigation canals
from underground – wells, springs [1]
- (ii) answer will depend on source chosen in (i), since these sources can vary from very unsafe (mainly surface sources) to quite safe (underground sources)
however, there are exceptions to both, such as ice-melt rivers and contaminated wells (either naturally by arsenic in parts of Bangladesh, or by human activities such as spraying pesticides on farmland)
- mark according to validity in association with answer to part (i) [2]
- (c) sea water is the most expensive source of all for fresh water
countries named in the Middle East are oil-rich
also they are desperate for water because of their desert locations
water need has risen well above water availability from natural underground stores
other desert countries can have fresh water from outside their borders (e.g. Nile in Egypt)
- points made along these lines 3 @ 1 mark
maximum 1 mark for a correct plot using an incorrect method [3]

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- (d) (i) plots all correct = 2 marks
no more than three mistakes = 1 mark
plots linked by a line (whether or not all plots are correct) = 1 mark
- (ii) summer, or November to March (accept January to March as the minimum and October to April as the maximum) [1]
- (iii) end of summer or April to May as the minimum (allow as wide as February to July) [1]
- (iv) malaria cases are highest at the end of wet season / lowest at end of dry season
after the three driest months (J/J/A) cases fall to their lowest in N/D/J
related to amount of standing water / breeding sites for the mosquitoes
these take time to form during the wet season / slow to dry up in dry season
therefore there is a relationship between rainfall and cases of malaria but with a time lag

points made along these lines; mark the answer as a whole according to amount of understanding shown [3]
- (e) (i) death rate from people ill with malaria has always been higher in Africa than in the rest of the world
rate has reduced since 1900 more quickly in the rest of the world
90% reduction 1900–1975 compared with under 50% in Africa
more significant rise again in Africa from 1975 to 2000
at least a third of the people in the world who die from malaria are Africans

three descriptive points such as these [3]
- (ii) contracting malaria two or three times a year reduces working capacity
costs of medicines / preventative measures
frightens off investment / tourists from outside (non-malarial) countries
high mortality rates among babies and young children encourages high birth rates
keeps people in the poverty trap

two different ways stated = 2 marks [2]
- (f) (i) female lays eggs in standing water where larva pupates
.... or similar [1]
- (ii) method 1 – Stage 4
method 2 – Stages 1, 6 [2]
- (iii) cheap methods – cost is critical to poor African countries
cost-effective; only small amounts of DDT needed for effective results [2]
- (iv) A targets places where people are most likely to be bitten / to contract malaria
less environmental damage will be caused here than in breeding grounds

B insecticide in the nets kills the mosquitoes (instead of merely keeping the insect off the sleeping person's body)
no general use of insecticide which damages beneficial insects / wildlife as well

C new drug to which there is no mosquito resistance yet; fact that it acts quickly over three days reduces the chance of mosquitoes developing resistance

a full answer for one method can gain two marks, allowing the maximum to be achieved from comment about any two of the three 'improved' methods [3]

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- (g) (i) in South Africa, without DDT, cases of malaria increased 6 fold in 4 years; with use of re-using DDT, cases cut by half, deaths by almost two thirds

in Kenya, reduction by 50% and more in childhood deaths and hospital admissions

values quoted and stated without a context = 1 mark

values quoted and evidence described in question context = 2 marks [2]

- (ii) poverty is one factor – even cheap items like mosquito nets needed to be subsidised or given away free to the poorest in Kenya
US\$10 for drug treatment is a lot of money in countries where many people earn less than US\$1 per day
food for survival is more important

ignorance is another – as shown by the way mosquito nets were either wasted or used for other things in Kenya

typical developing country problems affecting distribution to rural areas where they are most needed, including inadequate transport, poor organisation, corrupt officials, lack of instruction and education

belief among many that malaria in Africa can never be stopped because of the great number of breeding sites for mosquitoes during the wet season

the above are just some of the reasons that can be used

reasons stated in a general / non-precise way; may be over-reliant upon content in newspaper reports without much adaptation to the question = 1 or 2 marks

either a good range of reasons, or one or two reasons well supported by detail = 3 or 4 marks [4]

[Total: 40]

- 6 (a) (i) A Northern Canada – gold, copper, nickel, iron-ore, tin
B Baltic / Sweden / Scandinavia – iron-ore, nickel
C Rocky Mountains – copper, gold, iron-ore
D Andes Peru / Bolivia / Chile – copper, tin, iron-ore
E Brazilian Plateau – gold diamonds, iron-ore, nickel
F Southern Africa – gold, diamonds, copper, nickel, uranium
G Middle East – oil
H Western Australia – gold, nickel, iron-ore, uranium

2 marks for names

2 marks for minerals

should the area not be precise enough for the name mark, the mineral mark can still be awarded, provided the letter for area is given

no letter and no name = no marks [4]

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- (ii) good choices include:
oil – not only petrol, diesel etc., but also plastics, polythene, paints etc.
lead – cables, batteries, roofing
potash – fertilisers, explosives, glass, soap, medicines
diamonds – jewellery, industrial uses for cutting

two uses for one mineral = 1 mark

three or more different uses, or even two with relevant comment after stating clearly
different uses = 2 marks [2]

- (iii) certain geological conditions are needed for their formation in deposits large enough to be worth mining
areas of old hard igneous rocks / old shield area (e.g. Canada, Baltic, Southern Africa) is one example
another is in young fold mountain ranges with recent and great earth movements
fossil fuels relate to presence of tropical forests / shallow swamps 150–300 million years ago

basic ideas; credit elaboration or exemplification [3]

- (b) (i) 75 (allow 70–80) [1]

- (ii) formed at a slow rate / takes millions of years for new deposits to form
being used up at a faster rate by humans than they can ever be formed
reference to an example of how long it takes for vegetation to rot to become coal and oil
minerals will still exist but in amounts too small to mine for economic use

three points made along these lines – credit use of or reference to mineral examples [3]

- (c) (i) **A** shows re-use – same bottle used more than once
B shows recycling – the glass is made into another bottle

both save on the natural resources used for making glass

- (ii) **A** only needs cleaning / washing out before it can be used again
B needs more transport (bottle bank to recycling and glass plants)
B uses/needs more energy in the glass factory to make it into another bottle

with fewer stages and less energy use, re-use must be better for the environment than recycling

mark both parts together

some relevant points made = 1 or 2 marks

good understanding and well argued = 3 or 4 marks [4]

- (d) (i) two essential requirements fulfilled
supply of water – from dam / lake / from stated natural sources
head of water to drive the turbines – from difference in height / steep relief / plant on valley floor below the steep mountain side

mention of both needed for 2 marks [2]

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- (ii) built a dam to increase water supply / make a lake or reservoir
 built a pipe to link the reservoir to the power station
 fed the water pipe through the mountain at a high level / horizontally
 placed the HEP works on the valley floor below the steep water drop
 made an outflow lake below the power station

three points made along these lines. [3]

- (iii) HEP is renewable – will never run out
 HEP is greener – no release of greenhouse gases
 HEP sites are available in more countries around the world than are oil deposits

any two of these (or any others that are valid) [2]

- (iv) oil is easier to use / more flexible in use
 HEP is only electricity whereas oil is a direct fuel and can also be used for making electricity
 oil is easier to transport to where it is needed being a liquid / does not have the transfer losses of electricity through wires
 HEP requires certain physical conditions before a power station can be set up
 world is geared to use of oil
 for a long time it was a very cheap fuel

three points made along these lines; allow good elaboration of one point up to a maximum of 2 marks
 minimum of 1 mark for a definite point about oil [3]

- (e) correct plot = 2 marks
 correct except for one major or two minor mistakes = 1 mark

countries identified for sectors shown (irrespective of method used) = 1 mark [3]

- (f) (i) sugar cane [1]

- (ii) output from one hectare of land is greater
 lower costs for fossil fuel and transport to make it

one of these [1]

- (iii) the carbon dioxide reduction from sugar cane in Brazil is much greater / by 70%
 this means that greenhouse gas emissions are much lower
 also less land is needed to make more ethanol saving on farm inputs
 some of which, like sprays, can damage the environment
 less need to make new vegetation, clearances destroying habitats, releasing CO₂

points made along these lines
 it is only feasible to answer in terms of sugar cane in Brazil [3]

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(g) *for* more use of biofuels

already shown to have cost and environmental advantages compared with the use of fossil fuels – applies to corn from the USA even though the advantages are not as great as sugar cane from Brazil

avoids the main problem with fossil fuels – greenhouse gas emissions

even the generally hostile UN report had to admit to the environmental advantages of biofuels

increased output can be achieved on existing cropland; new land clearances are not always necessary

improvements in technology are increasing efficiency of ethanol production

particularly attractive in countries without any or enough fossil fuel deposits of their own

against more use of biofuels

crop growing competes for scarce natural resources such as water and land

some think that the priority in crop growing should be for food crops for people, not industrial crops, especially since world population is still growing so quickly

palm oil and sugar cane are tropical crops which grow in areas formerly covered by rainforests, thereby contributing to further world losses in biodiversity; risks to forests will increase because ethanol production from them is cheaper than from temperate crops like maize

only an outline response, restricted to one or two pertinent points, which may keep being repeated = 1 or 2 marks

more substantial response, with a clear view expressed after consideration of arguments for and against further biofuel use = 3 or 4 marks

as above but with a higher level of argument = 5 marks

[5]

[Total: 40]