UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

0680 ENVIRONMENTAL MANAGEMENT

0680/21 Paper 2, maximum raw mark 80

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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

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International Examinations

General notes

Symbols used in Environmental Management mark schemes.

/ separates alternatives for a marking point – other valid ways of expressing the same idea are also credited

; separates points for the award of a mark

[3] indicates the number of marks available

[max 3] the number shows the maximum number of marks available for the question where there are more marking points than total marks available

[max 3] when part of the marks of a question must come from part of the mark scheme, this is indicated by non-bold marks showing the internal maxima for different parts of the question
these non-bold marks are also used to show marks for bands where banded mark schemes are used

italic indicates that this is information about the marking points and is not required to gain credit
italic text is also used for comments about alternatives that should be accepted, ignored or rejected

ora or reverse argument – shows that an argument from an alternative viewpoint will be credited

AW alternative wording, sometimes called 'or words to that effect' –
AW is used when there are many different ways of expressing the same idea

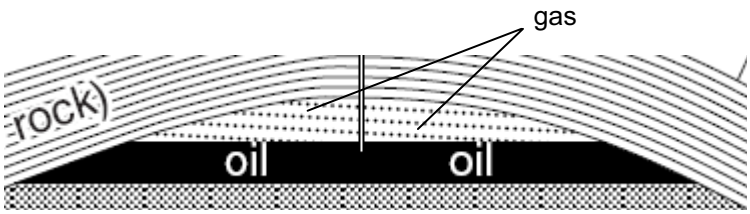
( ) the word / phrase in brackets is not required to gain marks but sets the context of the response for credit
e.g. (nuclear) waste – nuclear is not needed but if it was described as a domestic waste then no mark is awarded

<u>volcanic</u> underlined words – the answer must contain exactly this word

ecf error carried forward – if an incorrect answer is given to part of a question, and this answer is subsequently used by a candidate in later parts of the question, this indicates that the candidate's incorrect answer will be used as a starting point for marking the later parts of the question

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1 (a) (i) gas labelled on diagram above the oil in the sandstone rock;



[1]

(ii) 200 metres; **[1]**

(iii) porous rock/sandstone with spaces for the oil;
oil is trapped between two layers of shale;
shale is an impermeable rock which does not allow the oil to pass through it / AW;
[max 2]
anticline/upfold in the rocks traps the oil;
[max 1 for recognition of rock arrangement] **[max 3]**

(iv) 1500 metres; **[1]**

(v) (risk from) all oil wells of an explosion / fire / blow out / AW;
great depth means that they are more difficult to bring under control / AW;
oil spills directly into the sea where spills are more difficult to manage than on land / AW;
stormy weather at sea / cyclone damage / AW; **[max 2]**

(b) (i) costs of oil production lowest/cheapest in the Middle East;
supported by values from the graph e.g. US$ 5-30 compared with US$ 30-60 in deep water / less than half the average price of other locations; **[2]**

(ii) *factors affecting costs of oil production include*
land vs. sea for ease of assembly;
land vs. sea for simplicity of drilling;
shallow vs. deep for ease / speed of drilling;
shallow vs. deep for costs of drilling,
large vs. small reservoir of oil;
soft vs. hard rocks for ease / speed of drilling;
favourable vs. difficult rock arrangement; **[max 3]**

(c) (i) *production* Middle East
consumption Asia-Pacific; – both needed for the mark. **[1]**

(ii) *exporters* – Latin America, Russia (and independent republics), Middle East, Africa;
importers – North America, Europe, Asia-Pacific; **[2]**

(iii) ref. to mismatch between amounts produced;
through (some countries) having favourable geological conditions / ORA;
(compared with) low amount needed due to small total population / ORA;
(compared with) low amount needed due to low levels of economic development / ORA;
(compared with) low amount needed due to presence of other energy sources / large dams / ORA;
In each case ORA would be for oil hungry countries like the USA

high value of oil as a fuel for heating / transport;

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high value for other uses e.g. as a raw material for plastics and synthetics;
this phase of the Industrial Revolution is oil-based / AW;
every country uses some oil;
oil is cheaper / easier to use and control than other energy sources;
so the world has been slow to develop alternatives;

ref. to ease of moving oil;
between countries;
by pipeline / tanker;
since it is a liquid; **[max 3]**

(iv) ref. to the (open) sea route between a big net oil exporter / the Middle East and a big net importer / Europe / North America / AW;
ref. to size of tankers up to 500,000 tonnes as too big to use the shorter alternative route through the Suez Canal / AW; **[2]**

(d) (i) (8 times) circled Accept clear indication of the intended answer **[1]**

(ii) *Any two reasons given in the report*
penguins are sociable / breeding in large colonies / breeding mainly on islands / unable to fly; swim long distances to feed; [max 1]
Explanation about why penguins are more at risk than other sea birds
large numbers will be affected if the oil spill hits places where breed;
spend most of their lives in water;
unable to fly away to other non-oil affected areas;
AVP; [max 2 for explanation] **[max 3]**

(iii) *1994* 50 *%* *2000* 90; *%* **[1]**

(iv) *reason*
emergency response teams better prepared in 2000;
explanation – marks can only be given if reason is given
after their experiences of the 1994 Apollo disaster;
in terms of equipment needed / AW;
knowledge about what needs to be done to help penguins / AW;

reason
quicker / better targeted response;
explanation – marks can only be given if reason is given
in light of 1994 experience;
with plans made for what to do after the next tanker disaster;

reason
high likelihood / risks of another tanker disaster;
explanation – marks can only be given if reason is given
given the long history of shipwrecks off the coast of South Africa;
ref. to higher the risk of a disaster, the better prepared the authorities tend to be;

reason
worth being prepared;
explanation – marks can only be given if reason is given
because penguins are easier to clean than other sea birds / AW;
so it is known that the success rate can be high;

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reason
greater (general) environmental awareness;

one or more reasons suggested but without explanation [max 1]
[max 3]

(e) (i) Bars plotted accurately for length = amount of oil;
graph complete with names, bars of same width and tidy; **[2]**

(ii) *ref. to the potential size of oil spill*
with a tanker this is limited to the size of the ship;
whereas in an oil well the size of spill can be up to the size of the oil store (for which there is enough pressure to force it out);
ref. to the uncontrolled nature of explosions/blow outs/fires from wells;
which makes them dangerous and difficult to control and stop; **[max 2]**

(f) (i) *Prevention*
- double hulls, outside of ship might be cut open by hitting rocks, but inner hull could remain intact i.e. gives a second line of defence after a ship is holed;
- old tankers are the ones with single hulls and not built to modern safety standards;
  old age means that some may be less seaworthy/less able to withstand storms than new ships;
- it is cheap and easy for ships to clean out tanks at sea;
  by banning this, tanks now have to be emptied in ports where the remains of oil can be cleanly disposed of; [max 3]

(ii) *Increase speed of clean up*
- when the company responsible for polluting has to pay for the clean up, it has the financial incentive to act quickly;
- the more it delays, the more the clean up is likely to cost; [max 2]

[max 4]

(g) *marks for view explained*

Not possible:
risks ever present when dealing with flammable/volatile materials;
now needing to explore in deeper waters/areas with more difficult physical conditions;
best placed, easiest wells are exploited first;
danger from natural hazards such as cyclones, earthquakes and tsunamis;
human error can never be eradicated;
economics driven short cuts taken to decrease costs of oil operations;

Possible:
continued improvements in technology / new more sophisticated technology to prevent blow outs;
companies learning from previous mistakes and instituting stronger and a wider range of safety measures;
more widespread use of back up systems, such as double instead of single hull tankers;
use even more pipelines over land for transport instead of tankers;
more government pressure on oil companies to improve safety standards; **[max 3]**

[Total: 40]

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2 (a) (i) 6 billion (allow 6.1); **[1]**

(ii) before 1950 gentle / steady / slow / AW increase compared with more rapid / fast / AW increase after 1950;
making use of values
before 1950 from about ½ million in 1700 to 2½ million in 2000 /
2 million increase over 250 years, compared with increase from 2½ to 6 billion / larger population increase in just 50 years than in 250 years / AW; **[2]**

(iii) (7 times) circled Accept clear indication of the intended answer **[1]**

(b) (i) food surplus shaded in between food supply and population lines on the left of the cross over point AND food shortage between the food supply and population lines to the right of the cross over point;
completion of key and completeness of the shading within the two appropriate areas; **[2]**

(ii) *main difference is that* food supply rises constantly but steadily, whereas population line increases more quickly (but then decreases); **[1]**

(iii) hunger and famine likely during the time of food shortages / after the cross over point on the graph / AW;

Some explanatory comment about this such as population increases faster than food supply / population increase continues until hunger leads to famine and deaths forcing a decrease in population / AW; **[2]**

(iv) *Answers should be directed at the question theme of increased food output per hectare of cropland ... and not, for example, about clearing forests and bringing new land into cultivation.*
3 x 2 marks, but allow max 3 marks on any one, while reserving a minimum of 1 mark for each improvement.

plant breeding
high yielding varieties / named example (e.g. IRN 8 rice seeds) enabling the Green Revolution;
seeds bred for special physical conditions e.g. more drought resistant varieties of wheat / shorter, more wind resistant wheat varieties / AW;
more recently GM crops for more consistent yields e.g. herbicide resistant means better weed control / bt toxin gene included to kill insects / AW; [max 2 (3)]

Chemical fertilisers
poor soils improved by adding synthetic phosphates and nitrates;
enabling soil nutrients taken out by previous crops to be replaced;
keeping the soil fertile enough for productive cultivation every year;
chemical fertilisers overcame the shortage/limited supply of natural fertiliser;
[max 2 (3)]

Irrigation
water from rivers, canals and aquifers piped and pumped to crop fields;
enabling good crops to be grown during droughts and dry times of the year;
sometimes allowing two or three crops per year from the land / the growing of crops able to feed many people such as wet rice;
and making crops produce / yield more; [max 2 (3)]

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Mechanisation
tractors and combines can do more work than people;
more speedily;
farmers able to take advantage of favourable weather conditions / more chance of avoiding bad weather;
allowed more specialised farming on a larger scale than ever possible with hand labour;
[max 2 (3)]
[max 6]

(c) direct use of values or just restating them; [max 1]
OR
fertility rates are 0.5 per woman higher than would be needed for no growth / about 20 per cent higher than what is needed for stable population numbers / AW;
this is why global population increase is 80 million per year and why world population is estimated to be going to increase by 2.44 billion by 2050 / AW; **[2]**

(d) (i) 10 (children per family); **[1]**

(ii) no knowledge or use of family planning/contraception;
big family increases influence/importance in the village;
the people described in the paper are happy to have large families; **[max 2]**

(iii) *answer may rely upon just one reason with limited breadth*
answer may make little attempt to relate to explanation of population growth
[max 2]
better answers will make broader references to a range of different reasons
one or two of the reasons given may be further explained [max 4]

good answers will give at least three reasons referred to in the answer
each with some further explanation and there may be mention of a named example
[max 5]

reasons include
- children valuable as workers
- children valuable for looking after parents in their old age
- lack of education of women
- early marriages
- religious objections to use of family planning methods
- ref. to the high labour needs of growing a crop such as rice
- no government population policy or one that is weak and not enforced
- governments too poor to send health workers to remote rural areas
- continued decrease in death rates / longer life expectancy due to medical improvements

explanations should make clear how the reasons contribute to population growth
[max 5]

(e) (i) *examples of improved technology referred to in the diagram* [1]
- ever more powerful machines and equipment for cutting down forests
- bigger fishing boats with more scientific and larger equipment
- even bigger dams and diversion canals along rivers

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- For aquifers, the technology part needs to be inferred, such as with electric pumps to bring up ever larger quantities of water from underground [1]

description how one or more of these lead to more food production [max 2] **[max 3]**

(ii) *general answer about non-sustainability*
little beyond recognising the types of actions and activities that are unsustainable
entire answer may refer to one activity only. [max 2]

better answers give broader answer and fuller explanation of two or more of the actions / activities
material relevant to the theme of the question well [max 4]

good answers have good breadth and depth of coverage with clear explanation how the actions and activities cannot be sustained long-term
ref. to an example or examples. [max 5]

aspects of deforestation
loss of biodiversity, breakdown of nutrient cycling, soil erosion, land degradation and desertification

aspects of over-fishing
not enough young and breeding age fish to maintain numbers, in some seas below the critical numbers to maintain stocks, decreasing catches of fish types eaten most such as cod, tuna, other specific fish species

aspects of large dams
adverse environmental consequences of their construction, water taken out of lower courses of rivers, changing river ecologies, salinisation from over-use of irrigation water

aspects of draining aquifers
balance lost between amount of new rain water infiltrating into underground rocks and amount of stored water used each year
negative balances cannot go on for ever; some water being used is rain water that fell hundreds or thousands of years ago **[max 5]**

(iii) *2 x 2 marks, but allow max 3 marks on any one*

deforestation – forest management techniques including selective logging; reforestation; community management; agro-forestry; [max 2 (3)]
over-fishing – quotas, regulations for net sizes; regulation for net types; conservation areas; enforcement of territorial rights; [max 2 (3)]
dams – switch focus to small-scale; local water stores on rivers; appropriate technology; [max 2 (3)]
aquifers – economise on water use; e.g. use trickle drip irrigation; find alternative water sources; to give aquifers time to replenish; e.g. desalination of sea water in coastal desert regions; [max 2 (3)] **[max 4]**

(f) *mark according to the merit of the explanation*
vague/imprecise or limited to one valid point only *[max 1]*
some support for the view expressed; answer is of the type

expected but without being fully developed *[max 2]*

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valid points made to support the view expressed.
reference to a named example will help *[max 3]*

candidate argues for gloomy Malthusian view to come true ...
points that might be made in support
- examples of deaths from hunger and famine already widespread in some countries, especially those in the drought belt / Sahel in Africa, such as Niger which has high population increase and repeated famine
- some say that current climate change is leading to more drought and storms reducing farm output, and that it will only get worse
- each year people over-consume the Earth's natural resources; the deficit, made worse by continually increasing populations, cannot go on for ever
- critical water shortages already exist in some countries, without which crop growing cannot be maintained at its current output
- plentiful and increasing evidence for land degradation
- no signs in some countries that population increases are going to stop; the world is full of young people soon to reach marrying age

candidate argues against the gloomy Malthusian view ...
points that might be made in support
- over last 200 years new technology has large kept food supply ahead of population increases; no reason why should not continue to do so
- hopes for increased food output from new scientifically developed GM crops
- technology exists to bring new areas into cultivation, extending further areas of settlement as deserts are reclaimed and rainforests are cleared
- even though some suffer from malnutrition, the world still produces more than enough food to feed everyone; the problem is that it is not always available where needed

[max 3]

[Total: 40]

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