CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Ordinary Level

MARK SCHEME for the October/November 2013 series

5014 ENVIRONMENTAL MANAGEMENT

5014/11 Paper 1 , maximum raw mark 120

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

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CAMBRIDGE
International Examinations

Section A

Notes on application of the mark scheme for Section A

- marks are separated by commas. Each line usually represents one mark
- oblique lines separate ideas which are alternatives
- ideas in brackets are not essential to the answer but anything underlined is
- reward any equivalent way of expressing the ideas in the mark scheme
- reward any valid answer which is not in the mark scheme

1 (a) large increase overall,
slow increase to 1940 – 60 (any in between)
then rapid increase,
fluctuations,
highest in 2008 at 39 600 (accept 39 000 – 39 900)

credit the use of data to show a major change,

[3]

(b) (i) it is light in weight (so the plane will get off the ground easily)
/it is strong/long lasting (so will be economical), **[1]**

(ii) it is non-corrosive (so the drink will not be contaminated)
/it is strong (so the can is less likely to be damaged),

[1]

(c) HEP, **[1]**

(d) (i) accept any sensible idea, such as:

recycling,
a substitute/new material can be developed/used,
conservation/use it more efficiently/ prioritise its use,
new technology,
this may use less ore in the production of a material/another metal might be mixed with it, **[3]**

(ii) the pH will be lower/e.g. change from 5 to 4 etc., **[1]**

2 (a) (i) 1994 plot at 9700 (top of bar between the lines),
2007 plot at 2200 (top of line on the correct line), **[2]**

(ii) 10 200 to 10 300 in 1995, **[1]**

(iii) sporadic/unpredictable,
affects large numbers of people,
fast spreading/develops rapidly,
starts suddenly/stops suddenly,
variable intensity, **[1]**

(b) (i) typhoid/dysentery/diarrhoea, **[1]**

(ii) water-borne is carried in the water but originates elsewhere,
water-based is when the carrier lives in the water, **[2]**

(c) accept ideas, such as:

economy poorer/farmers gain little/no income/remain poor, =1

people become too ill to work,
crops not sown/harvested,
no surplus for sale in the cities,
cannot purchase fertilisers/improved seed etc
businesses that depend on farmers (e.g. shops) suffer,
explanation = 2 **[3]**

3 (a) anemometer, =1

cups,
rotate,
stand/shaft/pole,
dial/meter/counter, = 3
name + 3 descriptive points = **[4]**

(b) (i) no power output with wind speeds below 10 m per sec.,
output rises with wind speeds between 10 and 30 m per sec.,
maximum output between 30 and 60m per sec.,
no output over 60 m per sec., **[3]**

(ii) the wind is not strong enough to turn the blades,
the wind is so strong that it would cause damage (to the blades),
the machines are shut down, **[2]**

(iii) the cost of using another type of power when wind power cannot be used, **[1]**

4 (a) (i) nitrogen (in atmosphere),
ammonia (top box in soil),
nitrite (middle box in soil),
3 correct = 2
1/2 correct =1 **[2]**

(ii) in run-off after fertiliser application,
leaching down to the groundwater/in solution to the groundwater, **[2]**

(iii) decomposition,
bacteria/fungi/ detritivores etc., **[2]**

(b) (i) (nitrogen-fixing) bacteria, **[1]**

(ii) accept ideas, such as:
legumes can be ploughed in after the crop to increase nutrients in the soil,
legumes are a useful supply of beans/peas/animal fodder,
legumes are less expensive/fertilisers are more expensive,
danger to the environment of over-fertilisation/legumes are more environmentally friendly,
eutrophication, leads to death of plants/fish, **[3]**

5 (a) (i) light / energy from the Sun
water provided by rainfall / precipitation
dead leaves fall and decay / decompose into the soil
leaves take in the carbon dioxide from the air
water and nutrients are stored in the soil
roots take in water and nutrients (minerals)
permeable rocks / named example store water beneath the soil/ aquifers

9 spaces to be filled in – all 9 valid = 5 marks
7 or 8 filled in correctly = 4 marks
5 or 6 = 3 marks
3 or 4 = 2 marks
at least 2 = 1 mark **[5]**

(ii) plants manufacture their own food from inorganic / abiotic materials
unique ability to do this makes them the main self-feeders on Earth
make food by the process of photosynthesis
using sunlight, carbon dioxide and water
further detail about photosynthesis such as giving the formula
release oxygen and provide food for herbivores

Three points such as these. 3 @ 1 mark **[3]**

(iii) description of vegetation + named example of an herbivore
+ named example of a carnivore + named example of a top carnivore

e.g. in savanna lands of Africa
grassland vegetation + zebra + lion + human / vulture

e.g. in tundra
mosses and lichens + caribou / reindeer + wolves + human / bears

five elements
location + description of vegetation + example of herbivore +
example of carnivore + example of top carnivore.

any four which follow on / fit = 4 marks
any three which follow on / fit = 3 marks
any two which fit and follow on for a location = 2 marks
some idea of a food chain from examples stated = 1 mark **[4]**

(iv) energy lost = 1 mark: 90% reduction at each level in the food chain = 1 mark
up to 2 marks

energy lost in life processes in every stage such as breathing, generating heat, growing and moving around, which is why a smaller number of organisms can be supported at each level up to 2 marks **[3]**

(b) (i) animals and soils in any of the two empty boxes = 1 mark

(ii) climate and soils – abiotic; animals and natural vegetation – biotic;
and key completed for shading used = 1 mark **[2]**

(c) (i) length of bars correct = 1 mark
bars kept the same width = 1 mark **[2]**

(ii) B & C – description of classic savanna vegetation such as tall grasses with scattered trees; examples of trees such as acacia and baobab also possible
C & D – short grasses (and absence of / reduced number of trees)
D & E – thorn scrub / tufted grasses/ more discontinuous cover/ other desert plants

3 @ 1 mark for some valid description.
4th mark for additional detail, most likely for savanna or hot desert **[4]**

(iii) rainfall – because the decrease in rainfall from 2000 mm to 250 mm from 5ºN to 20ºN coincides with a decrease in vegetation height, biomass and surface cover, as well as a change towards more drought resistant plants such as thorn scrub and / or to seasonal variations in the savanna between wet season with trees with leaves and tall grasses compared with dry season short grasses and trees without leaves

the lowest temperature shown is 22 ºC, which is hot enough for plants still to grow; the largest annual range is only 14 ºC; the conclusion is that rainfall is controlling the type and amount of vegetation cover, not temperature

temperature based answer is increasing rates of evaporation with increasing temperatures inland – fierce desert heat dries out vegetation

simple statements, but with little elaboration or development = 1 or 2 marks
more complete answer, ideally referring to temperature as well in rainfall based answers = 3 or 4 marks **[4]**

(d) (i) capable of being more disruptive / damaging = 1 mark

2nd mark for further elaboration or greater context; although some indigenous peoples live like other animals as part of the natural ecosystem, people move in from other places, in greater numbers, and with the technology to destroy, ability to replace with different vegetation / crops **[2]**

(ii) accurate plots = 1 mark
ecosystem losses consistently identified (by shading / colour) and indicated in key = 1 mark **[2]**

(iii) **1** percentage loss differences reflect human opportunities for settlement and making a living; shortage of fresh water for crop growing / lack of pastures for livestock rearing make the hot desert regions the least attractive in the tropics

density of vegetation limits access to tropical rainforests especially for people with low levels of technology, which applied more strongly in the past than it does today

points made along these lines – minimum 2 marks, maximum 3 marks

2 limiting factor for human settlement and living in cold temperate and polar environments is the cold / short growing season; much more limited variety and size of the natural vegetation makes living off what natural ecosystems provide more difficult; (many indigenous groups in polar lands rely more on ocean than land food supplies); although lack of rainfall may be a problem in some tropical ecosystems, it is always hot enough to grow crops and irrigation technology was developed early by humans

some points made from within these ideas – minimum 2 marks, maximum 3 marks **[5]**

(e) (i) agro-forestry, community forestry, reforestation, sustainable harvesting of hardwoods, fuelwood planting and genetic engineering

exemples such as, selective logging under the heading of sustainable harvesting of hardwoods, reforestation and community forestry

1 mark for naming the method and just enough description to show that they know what it is
another 2 or 3 marks for fuller description related to question context

minimum 2 marks, maximum 3 marks

(ii) less easy / more expensive than just clearing patches of forest / felling all the trees, people tend to look in terms of short-term gains rather than long-term sustainability, difficult to be selective when using modern machinery to cut down the trees, other advantages to clearing forests to use land for farming / allow economic development, where relevant lack of laws, no monitoring, corruption

points made along these lines
minimum 2 marks, maximum 3 marks **[4]**

[Total: 40]

6 (a) (i) bar drawn of correct length matching the width of others already drawn **[1]**

(ii) mainly developed – North America, Australasia, Europe
mainly developing – Central America & Caribbean, Asia, South America and Sub-Saharan Africa
allow Middle East and North Africa in either group (although mainly developing would be the usual heading) **[1]**

(iii) developing: graph evidence is that carbon dioxide emissions are quite a bit lower per person than in the established developed continents; in general there is a close relationship between high incomes / industrialisation and high emissions; knowledge that these countries lie on the southern / developing world side of the North-South divide, or other relevant knowledge about developing countries such as dependence on farming and primary activities
or
some countries in the Gulf are among the world's highest for income per head and for carbon dioxide emissions due to their oil based economies.

credit points to support the choice for up to 2 marks **[2]**

(iv) 18 100–18 300 kilograms **[1]**

(v) most carbon dioxide emissions come from burning fossil fuels, fossil fuels most used in transport, electricity, and manufacturing industry, much higher individual / domestic levels of consumption among richer people, whereas in poor countries fossil fuel use is not always a part of people's everyday lives, more work done manually in farming and industry, more limited access to electricity and private means of transport, waste of energy etc. more likely in developed world
Ethiopia is a poor country in sub-Saharan Africa with many subsistence farmers

points made along these lines
1–2 marks for answers which concentrate only on what happens in rich / developed countries, or for narrow answers with limited development
3–4 marks for broader answers, most likely referring to rich and poor, bringing out the variations in fossil fuel use between them, supported by explanation **[4]**

(b) (i) one from methane, CFCs or nitrogen oxides **[1]**

(ii) they enhance / increase / speed up / accelerate the natural greenhouse effect, they trap some of the heat which is radiated from the surface at night, preventing heat loss beyond the upper atmosphere into space, making the Earth's surface warmer than it would otherwise be, without 'greenhouse gases' in the atmosphere the Earth would be about 30ºC colder

three points made along these lines 3 @ 1 mark **[3]**

(iii) physical evidence:
average world temperatures in 1900 and 2000
rising sea levels 18 cm higher than 100 years ago
sea ice melting mountain glaciers retreating

effects:
more extreme weather events happening more often and stronger
higher flood risk in coastal areas especially in low lying countries
risk of less water for irrigation in Asia from rivers starting in the Himalayas

2 @ 1 mark **[2]**

(iv) in some cases it depends on location – low lying island countries in the Pacific and Indian Oceans, such as the Maldives, or delta countries such as Bangladesh and the Netherlands, are at greatest risk of coastal flooding, whereas higher or landlocked countries will be unaffected; matters less in big countries than small countries

it is also depends on climate type – more difficult / marginal climates for people to make a living such as savanna and monsoon, where many people rely upon the wet season rains; areas naturally prone to flood and drought such as those near the edges of deserts, or tropical storms, may find natural disasters more frequent / more intense

poverty / wealth of a country also relevant – rich countries better able to prepare and repair, poor countries have more people trapped in the poverty cycle; less chance to recover before being affected by the next adverse climatic event

simple statements, limited elaboration, nothing more than passing references to named examples, narrow coverage concentrating on one aspect without addressing 'some more than others' – 1 or 2 marks
fuller statements, broader coverage, quality may be raised by references to examples of both more and less affected countries, 'some more than others' part of the question definitely addressed – 3 or 4 marks **[4]**

(c) (i) best sectors to shade / colour in for fossil fuel emissions are; energy supply, manufacturing industry, transport, heating and lighting buildings **[1]**

(ii) credit for stating percentages taken from the graph ; in the order of the above in **(i)**;
25 + 19 + 19 + 8 = percentages from graph
total 71% (allow 69 – 74%) = 2 marks

part answers / answers based on narrow selection in (i) = 1 mark **[2]**

(iii) forest clearances: deforestation and burning wood releases carbon dioxide, also nitrogen oxides; deforestation and decomposition of vegetation releases methane.
credit also references to carbon sinks

farming: rice farming and keeping cattle are examples of types of farming which release methane; use of chemical fertilisers releases nitrogen oxides

people's wastes; rotting organic matter on landfill sites releases methane; burning / incinerating wastes also releases nitrogen oxides

precise description for chosen sector = 2 marks
just named or stated for the sector = 1 mark **[1]**

(iv) comment about the big size and dominance of the total percentage in the graph, with some supporting comment about how the sectors include activities that virtually everyone participates in / many are considered essential; only farming and forest clearances involve little fossil fuel use

some comment / understanding shown = 1 mark
fuller understanding of fossil fuel dominance = 2 marks **[2]**

(d) (i) all rely upon what nature provides / all are natural sources,
all are sources that will not run out / will always be available in those areas where they are plentiful

well stated = 2 marks
some understanding shown = 1 mark **[2]**

(ii) more expensive than fossil fuels
more recent / newer technology / people not as familiar with their use since they are natural, not all of them are available everywhere more difficult to harness, transport and use than just burning oil etc.
unreliable output / limited efficiency

two points such as these – 2 @ 1 mark **[2]**

(iii) solar: photovoltaic panels for electricity, roof panels for water heating, quite widely used in tropical countries even in some developing countries, on roofs of buildings in developed countries, part of going green and reducing carbon dioxide emissions, for government to meet carbon reduction targets

wave: barrages in places with high tidal range for waves to drive turbines, newer technology of snakes / tubes on surface oscillating in the waves, at frontiers of technology so much is experimental and restricted to a few places in developed countries with high wave energies such as UK

geothermal: heat from the Earth, most in tectonically active places such as Iceland and New Zealand; water forced down underground where it is heated, steam used to drive turbines for electricity, hot water may be used in municipal heating systems; well developed technology but areas for easy use restricted

hydro-electric: most widespread and oldest alternative; most from water storage behind large dams on the world's big rivers driving giant turbines; plentiful examples in all inhabited continents; makes use of rainfall and rivers, with sources in mountainous areas, where steep terrain makes dam building easier

mark awarded will reflect:
– number and precision of examples of areas / places where it is used
– precision of the information about how it is harnessed and used
– any other relevant information such as prospects for wider use

point mark on the basis of amount and precision of information given **[4]**

(iv) most depend on new technology and bringing down the price; for example there has been a big reduction in the price of solar panels made in China; they halved in price in not much more than a year; more mature sources such as hydro-electric may be more difficult to expand, likewise geothermal, because of more limited availability of new sites.

answers need to be source specific

content will depend on the chosen source – effectively answered = 2 marks, some progress = 1 mark **[2]**

(v) life expectancies of fossil fuels, increasing and high oil prices, but at the same time some reluctance to give up dependence on fossil fuels, which are so useful especially in transport; will the push to move away from fossil fuels be stronger than it is now?

optimistic or otherwise about research and development into new and cheaper ways to harness natural sources, about humans ability to innovate, and create new technology, especially as there is likely to be more pressure to do so

pressure from green organisations, perhaps noticeably worsening effects of climate change, perhaps international summits which actually agree on meaningful carbon emissions reductions

the ease and inertia of using fossil fuels cannot be overcome; there may be big oil and gas finds in polar lands which ease the pressure to change

simple statements, limited comment directed at the question, may be just one idea that is restated, candidate's view may not be clear = 1 or 2 marks

broader exploration of the possibilities, clear indication of the chances, answer based on ideas from within the content in the mark scheme = 3 or 4 marks **[4]**

[Total: 40]