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CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0680 ENVIRONMENTAL MANAGEMENT

0680/23 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.

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1 (a) (i) *Credit three descriptive points.*

Increased;
by 50%;
from 8000 in 1990 to 12 000 tonnes in 2010;
credit accurate detail from graph, e.g. more rapid increase from 2003; decrease in 2009; rapid rise back up after 2009; [3]

(ii) 33.3% *but accept 33%*
Reject 'one third'. [1]

(b) (i) three accurate plots for CO_2 60% CO 20% and SO_2 1%
ignore shading issues. [1]

(ii) *Award a max. of three marks* on either **SO_2** or **CO_2**.

sulfur dioxide (SO_2):
one of the main gases causing acid rain;
increases acidity levels in soils;
trees die (leaves / needles fall, trees become less resistant to drought / frost disease);
rivers and lakes acidified / pH lowered;
causing deaths of fish and plant life;
accelerates corrosion of buildings and monuments;
causes respiratory problems / coughing / wheezing / shortness of breath / chest tightness;
increased levels of bronchitis / lung cancer;

carbon dioxide (CO_2):
is a greenhouse gas;
one of the main causes of (enhanced) global warming;
leading to more extreme weather events; rising sea levels; flooding; climate change;
more CO_2 more frequent / severe heat waves; more heat-related deaths;
more CO_2 increase in pollen allergies; asthma; smog pollution; infectious diseases; [4]

(c) (i) *Credit two descriptive points.*

not all that accurate / under-estimates / low;
predictions have been extended by 2010;
oil by 33 years and natural gas by 22 years;
possibly accurate but new finds have extended time; [2]

(ii) *Credit three reasons or two reasons with at least one developed*.

new discoveries of oil / natural gas;
in more remote / difficult areas such as the Arctic;
in deeper water in the oceans; e.g. deep water drilling in Gulf of Mexico / off Brazil;

new / improvements in technology;
economics of costs benefits / demand;
allows more oil / gas extraction from existing oil / natural gas reserves;
fracking to extract oil and gas from oil / gas shales;
fracturing / applying pressure to the rocks to stimulate the flow of trapped natural gas;
injecting low salt water into a reservoir to push out oil trapped in rock pores;
injecting carbon dioxide into wells;

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feeding in microorganisms that stimulate / increase oil flow;
3D seismic; horizontal drilling; tension leg platforms (deep sea exploration);

Not using less oil. [3]

(iii) *Credit three points.*

fossil fuels;
non-renewable / finite;
more and more are consumed each year;
formed over millions of years;
from accumulation of dead plants and sea creatures on sea bed;
rotted / decomposed to form natural gas and oil;
used more quickly than they form; [3]

(d) (i) *Credit four advantages with max three in either section.*

nuclear (compared with fossil fuels)
only a small amount of raw material / uranium needed;
to release a large amount of power;
clean source of energy / no emissions of CO_2 / pollutant gases into atmosphere;
low operating costs;
long-term reliable source of energy;

nuclear (compared with renewables)
known / developed / widely used technology;
reliable / consistent source not subject to changes in the weather;
cheaper per unit of energy produced than most renewables;

Or reverse argument. [4]

(ii) *Credit four points, these may be four different ideas or fewer ideas with marks for development.*

dangers to life associated with radiation leaks;
exposure to high radiation levels can cause cancers / leukemia in humans;
nuclear waste remains radioactive for thousands of years;
problems with storage of highly toxic nuclear waste;
high cost of decommissioning nuclear plants;
nuclear plant explosions have led to loss of public confidence / support;
Chernobyl explosion 1986 (highly radioactive zone unsafe for 100s of years);
Fukushima disaster 2011 (caused catastrophic damage to the nuclear power plant);

Max. one mark for advantages of renewables.
*Max. one mark for using stem of next question **(e)** as all / part of answer.* [4]

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(e) (i) *Credit reason for one mark with second mark for explanation development.*

public opinion turned against nuclear power / thought too dangerous / fear;
disaster had long-term effects on health and the environment;
Japan is prone to earthquakes / Pacific Ring of Fire / tsunamis;
floods occur every year / frequently;
future earthquakes / floods likely to affect other power stations;
possibility worse accidents / radiation leaks / loss of life in future;
unsafe radiation levels meant crops destroyed;
Japanese government decided to phase out nuclear power;
devastation was beyond what the Japanese government was prepared for;
Dec 2013 still problems with essential services (health care; infrastructure);
risk to fishing grounds; [2]

(ii) *Credit four points, these may be four different ideas or fewer ideas with marks for development.*

safety of different ways of generating electricity;
waste produced and means of disposal;
capital costs of energy production;
running costs of energy production;
cost to consumer;
pollution / environmental impact;
stage of development / availability of technology;
sustainability;

Allow above applied to one particular energy source for max. two marks. [4]

(f) (i) 0.83–0.90 $ per watt
accept 67–68% reduction [1]

(ii) accept anything between 0.35 and 0.40 $ per watt [1]

(iii) *Credit two points.*

solar panels will not be sustainable if minerals used for the panels are rare / run out;
the minerals need to be recycled in new solar panels to ensure sustainability;
solar energy will still be sustainable (expected lifetime 5–6 billion years) problem will be the panels which have an expected lifetime of 25 years;
could be sustainable if new technology replaces rare minerals; [2]

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(g) *No credit for reference to hope, three marks are for supporting explanation, credit three points.*

onshore wind and solar power are renewable, natural gas is not (a fossil fuel);
onshore wind is the cheapest energy source;
onshore wind cheaper than natural gas; by 5 cents;
onshore wind depends on wind blowing;
could be opposition to land-based wind farms (NIMBY);

solar power is the most expensive energy source;
solar power more expensive than natural gas; by 45 cents;
less opposition to solar power;
cost of solar has fallen sp will probably continue to fall; making it economically viable; [3]

(h) *Credit two reasons or one reason with development.*

to improve quality of life / standard of living / reduce poverty;
for cooking / heating / light / pumping water / refrigerating food;
without it coal / wood / dung burnt for heat / cooking causing pollution / lung / health issues;
increases educational opportunities / study at night/use of computers;
powers cell phones for mobile banking / access the internet;
electricity for economic development which will provide more jobs; modern farm machinery / factories / office buildings;
make life easier; [2]

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2 (a) (i) 25 circled or otherwise clearly identified [1]

(ii) *Credit three points.*

partially true;
true from tropical rainforest to tundra if exclude hot desert / treat it as an anomaly;
true for 0° to 25°;
hot desert does not fit the pattern / anomaly;
true for taiga to tundra; [3]

(b) (i) *Credit three points.*

hot / high temperatures all year;
high annual precipitation / wet climate;
(vegetation) growth possible all year / continuous growth;
many different species / lot of plant life;
rapid growth;
OR explanation why other biomes less productive; [3]

(ii) precipitation; *(then credit two supporting points)*
highest precipitation = highest NPP / lowest precipitation = lowest NPP;
lowest temperature (14 °C) is warm enough for plants to grow if there is water / precipitation;
differences in precipitation are greater than differences in temperature;
lack of rainfall / dry season limits the productivity in savanna compared with tropical rainforest;
low rainfall in desert limits vegetation; [3]

(iii) temperature; *(then credit one supporting point)*
temperatures are very low / below freezing much of year;
ground will be frozen in winter / part of the year;
short growing season limits vegetation;
difference in temperatures explain the drop in NPP between taiga and tundra;
low precipitation not so important as little evaporation as temperatures are low;
Max. one mark if states precipitation and that tundra is a desert. [2]

(c) (i) *Credit three points.*

vegetation falls on to on the forest floor;
vegetation decays / decomposes;
decomposer organisms break down the organic material;
minerals / nutrients released into soil;
minerals / nutrients absorbed by the tree / plants roots (and so recycled); [3]

(ii) *Credit four points.*

recycled before it can be removed;
vegetation roots hold soil in place;
vegetation / interception reduces the amount of rainfall / water reaching the ground;
vegetation / interception reduces the force of rainfall / water reaching the ground;
minerals released are quickly taken up by the roots of plants;
little loss of nutrients by leaching;
trees / vegetation reduce loss of nutrients by wind action; [4]

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(d) (i) hunter-gather [1]

(ii) *Reason clearly identified and stated for one mark.*
Explained for one mark.
Explanation developed, one mark.

low level of technology;
'bows and arrows' / 'blowpipe' / 'canoe from a solid log hollowed out';
kills will be related to 'luck' / skill;
for family / tribe / subsistence (economy);

human population numbers remain small;
numbers related to the amount of food available;
in a large area of forest;
no high pressure placed on certain areas of forest;

hunter-gatherers;
little impact on forest;
unlike clearance involved in shifting cultivation;
only use what forest provides; [5]

(e) (i) *Credit four points.*

no trees for interception;
no plants to take up water so more surface runoff;
no plants / roots to hold soil in place;
rainfall hits surface of (bare) ground / soil;
erodes / washes away the soil / water carries soil down slopes (in runoff);
rain drops cause splash erosion;
wind dries out soil;
lack of shelter from wind;
wind picks up soil particles;
wind carries / blows soil away; [4]

(ii) *Credit two points.*

soil has no protection from (heavy) rain so nutrients dissolved by water;
removed by surface run-off; leaching / washed deeper into the ground / soil; [2]

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(f) (i) *Credit four points.*

General points regarding unsustainability are acceptable and do not have to be related to particular land uses.

dam building for HEP
large areas flooded; rotting vegetation emits methane (a greenhouse gas);

mining (iron nickel gold)
surface layers removed and replaced by large open pits; toxic materials leak into rivers / groundwater;

farming; cattle ranching and/or cultivation of crops, e.g. soy beans
surface not always continuously covered; dangers of overgrazing / overcultivation damaging soil structure;

logging hardwoods
destruction of wider areas of forest; commercially useful trees are scattered over large areas;

building the infrastructure of access routes, houses and support services
increases areas cleared;
puts remaining areas of forest more at risk;
makes remaining forest easier to clear; [4]

(ii) *Credit five points these may be five different ideas or fewer ideas with marks for development.*

tourism
encourage ecotourism;
ecotourists observe / learn about the ecosystem;
some of the money earned is used to protect the ecosystem;
some of the money benefits local people economically;
local traditions / cultures are respected;

forestry
protecting the rainforests by preserving blocks of forest in national parks / nature reserves;

dam building for HEP
instead of big HEP projects build smaller schemes closer to where power is needed;

mining (iron nickel gold)
reclaim the land after mining is finished;

farming; cattle ranching and / or cultivation of crops, e.g. soy beans
agroforestry;
use forest crops (e.g. rubber) to provide shelter to the soil;
plant fast growing trees for commercial use (e.g. eucalyptus);
leave natural forest cover over a minimum percentage of the farm unit;

logging hardwoods
selective logging; of only mature trees; [5]

[Total: 80 marks]

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