CAMBRIDGE
International Education

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ENVIRONMENTAL MANAGEMENT **0680/22**

Paper 2 Management in Context **May/June 2024**

MARK SCHEME

Maximum Mark: 80

Published

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 International will not enter into discussions about these mark schemes.

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Generic Marking Principles

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

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GENERIC MARKING PRINCIPLE 5: Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).
GENERIC MARKING PRINCIPLE 6: Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1	Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.
2	The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.
3	Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).
4	The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.
5	‘List rule’ guidance For questions that require ***n*** responses (e.g. State **two** reasons …): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked *ignore* in the mark scheme should not count towards ***n***. • Incorrect responses should not be awarded credit but will still count towards ***n***. • Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response. • Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

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6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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Question	Answer	Marks
1(a)(i)	69(.3);	**1**
1(a)(ii)	*any two from:* M1 mainly desert; M2 soil is infertile (most of country) / (only) fertile in east or valleys; M3 availability of jobs; M4 availability of stated resource e.g. water / food / agriculture / energy; M5 availability of infrastructure or named example e.g. roads; M6 availability of education; M7 availability of healthcare / sanitation or named example e.g. hospitals; M8 risk of natural disasters e.g. drought;	**2**
1(b)(i)	3.1 (million);	**1**
1(b)(ii)	M1 *0–54:* (approximately) the same / similar / even; M2 *55–100+:* more females than males / females live longer / for both males and females from 55 to 100 population decreasing;	**2**
1(b)(iii)	*any two from:* M1 education, use or access to or lower cost of, birth control/contraceptives; M2 stated or described government policy that limits or discourages number of children born e.g. anti-natalist; M3 idea of change healthcare; M4 reduction in availability of stated resource e.g. food, (clean) water; M5 improved education / increased opportunities for women; M6 disease;	**2**
1(b)(iv)	*any two from:* M1 reduced, economy / GDP; M2 less taxation / less income, (for government or country); M3 reduction in, work force / economically active people / less people available to work; M4 idea of increase in **share of cost** to workers or younger people for, healthcare / education / pensions / elder care; M5 less spending on, schools / education;	**2**
1(c)	industry;	**1**

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Question	Answer	Marks
1(d)	*any three from:* M1 crop rotation; M2 use of fertilisers / named method e.g. manure; M3 use of, pesticide / insecticide / herbicide / fungicide; M4 mechanisation; M5 selective breeding; M6 genetic modification / GM; M7 controlled environments e.g. greenhouse / hydroponics / aquaculture / aeroponics; M8 lower price of seeds or seedlings; M9 reduce soil erosion / or described method of reducing soil erosion, e.g., bunds, contour ploughing, terracing, intercropping, wind breaks M10 use of biological control;	**3**
1(e)(i)	distance in range 260–285 (km)	**1**
1(e)(ii)	M1 1100 – 95 **OR** 1005; M2 91(.4)%;	**2**
1(e)(iii)	*any two from:* M1 reduction in stated sector e.g. industry, agriculture, services; M2 no longer able to fish / reduced fish exports; M3 reduction in food or reduction in yield or food **AND** so people need to buy it or food prices increase; M4 decrease in agriculture or crop yield **AND** as less water available or need to pay for water or irrigation; M5 loss of jobs; M6 less tourism; M7 reduced work force **AND** due to migration; M8 idea of time involved or distance to travel to collect water;	**2**
1(e)(iv)	*any three from:* M1 trickle or drip irrigation; M2 rainwater harvesting; M3 use of, reservoirs / dams; M4 use of bunds;	**3**
1(e)(v)	M1 use of, coordinates / grid (on a map); M2 (random) number generator (to identify sampling point);	**2**

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Question	Answer	Marks
1(e)(vi)	*any two from:* M1 idea of impact of different, times / seasons / weather / climate; M2 results can be compared / identify a trend; M3 identifies, anomalous results or outliers; M4 improves, reliability / validity;	**2**
1(e)(vii)	**total** number of (different) species decreases (when salinity increases); **OR** overall decrease in species (when salinity increases); **OR** correct description of individual groups fully described, e.g. fish increase **AND** shellfish decrease **AND** plants decrease;	**1**
1(f)(i)	M1 sectors in clockwise rank order; M2 largest first starting at 'noon' going clockwise or anticlockwise; M3 correct plotting; M4 key completed and matches sector shading;	**4**
1(f)(ii)	(synthetic materials) *any two reasons from:* M1 uses or extracts less water / uses a lot of water; M2 energy needed could come from non-renewable sources; M3 need a large quantity of energy / uses more energy; M4 idea that oil is, a fossil fuel / non-renewable or finite or energy comes from fossil fuels; M6 more CO_2 / greenhouse gases, emitted;	**2**

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Question	Answer	Marks
2(a)(i)	*any three from:* M1 prevent or limits hunting or poaching; M2 prevents or limits, mineral extraction / mining; M3 zoned / access restricted / controlled environment / protected area; M4 monitoring / allows for research / idea of scientists allowed in some areas; M5 raises awareness / education (of public); M6 treatment of diseases / medical support; M7 (eco)tourism / minimises impact of tourism;	**3**
2(a)(ii)	M1 labelled axes: *y*-axis (Bukhara deer) population AND *x*-axis year M2 sensible linear scale that allows for plotted points to cover at least half the grid; M3 5 correct plot; M4 plotted points joined point to point with a ruled straight line;	**4**
2(b)(i)	the **maximum** population or number of species that the ecosystem can sustain;	**1**
2(b)(ii)	*any two from:* M1 shortage of food / starvation; M2 shortage of water; M3 migration; M4 overcrowding; M5 idea of deer may need to be culled or killed; M6 animals become weak / disease spreads;	**2**
2(c)(i)	*any three from:* M1 removal of waste; M2 fill with stated material / replace or put back overburden; M3 addition of (top) soil; M4 test (water or soil) for toxins; M5 bioremediation or described / improve soil / add fertiliser or organic matter; M6 planting (of vegetation) / food source / plant trees or plants; M7 provide water supply (for deer);	**3**

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Question	Answer	Marks
2(c)(ii)	*max four: max three benefits:* M1 increases number of deer / increases population of the deer / reintroduction where deer had been extinct; M2 increases area or geographical range (deer found); M3 less risk of a whole deer population being affected by disease; M4 manage plant growth through grazing; M5 provide food source for predators; M6 AVP e.g. ecotourism; *negative effects:* M7 may not be adapted to conditions; M8 displacement of other species; M9 changes to the food chain / not enough food; M10 overgrazing / damage agriculture / eat trees or crops; M11 may become an invasive species or non-native species; M12 disease (to native species or deer); M13 risk of hunting (in new location);	**4**

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Question	Answer	Marks
3(a)(i)	254.3 (years);	**1**
3(a)(ii)	*any three from:* M1 large amount of, non-renewable resources / coal / oil / (natural) gas/ fossil fuels, in the country; M2 infrastructure for existing resources already in place; M3 cost (of investing in renewables); M4 lack of expertise or knowledge (of workers) / lack of technology or machinery; M5 idea of lack of natural resources to support renewables e.g. not enough sunshine hours / low wind speed; M6 country has other priorities e.g. drought / famine / disease / education; M7 stated environmental concern from use of renewables e.g. habitat loss with wind farms; M8 concern that renewables will not meet energy needs; M9 exporting existing energy resources increases GDP / oil extraction is main economic activity / idea of fossil fuels employ a lot of people;	**3**
3(a)(iii)	*any three from:* M1 greenhouse gas; M2 contributes to global warming / (enhanced) greenhouse effect; M3 causes climate change; M4 stated effect of climate change e.g. sea level rise;	**3**
3(b)(i)	13(%);	**1**
3(b)(ii)	*any three from:* M1 stated example of how to reduce use e.g. switch off lights / turn off equipment when not in use / turn water or heating thermostat down / avoid very hot water / do not use 'standby'; M2 insulation / double glazing / loft insulation / filling cavity walls; M3 increase number of windows to replace lighting / decrease number of windows to reduce heat loss; M4 open windows to replace air conditioning; M5 use of more efficient appliances or stated example e.g. use LED lightbulbs / heat pumps; M6 education / raise awareness; M7 stated **government** strategy e.g. making electricity more expensive / increased tax on electricity / limits on energy use / rationing / load shedding;	**3**

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Question	Answer	Marks
3(b)(iii)	*any two from:* M1 MEDC population can afford or more people own, **electric** cars or EVs / MEDCs have invested more in EV infrastructure; M2 MEDC has a larger **electric** public transport system; M3 MEDCs, **employment** may not be local / people travel to **work**; M4 MEDCs have, consistent supply / more supply; M5 MEDCs, use more technology / technology is more advanced;	**2**

Question	Answer	Marks
4(a)(i)	29 (˚C);	**1**
4(a)(ii)	July **AND** Aug **AND** Sept ;	**1**
4(a)(iii)	*any two from:* M1 plants die; M2 less roots to hold or bind the soil; M3 less water in the soil / soil dries out; M4 soil (particles), become lighter / easier to blow in wind / risk of wind erosion; M5 less infiltration;	**2**
4(b)(i)	*one from each component of soil:* M1 *mineral particles:* sand / silt / clay; M2 *mineral ions:* nitrate / phosphate / potassium; M3 *organic content:* (living) plants / (living) animals / microorganisms / dead remains;	**3**
4(b)(ii)	*any two from:* M1 increases water-holding capacity (of the soil); M2 reduces the risk of soil erosion; M3 increases the nutrient or mineral content of the soil / acts as a fertiliser; M4 improve soil structure / increase air spaces; M5 adds microbes / microorganisms; M6 increases oxygen;	**2**

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Question	Answer	Marks
4(b)(iii)	M1 respiration; M2 combustion;	**2**
4(b)(iv)	*any two from for one mark:* nitrogen / oxygen / water (vapour) / argon;	**1**
4(b)(v)	M1 carbon, capture / storage; M2 plant trees / afforestation / reforestation; M3 reduce combustion or burning of fossil fuels / increase use of renewables;	**2**
4(c)	*any three from:* M1 available for future generations; M2 prevents extinction / preserves biodiversity / prevents genetic depletion; M3 prevents disruption of, food webs / chains; M4 prevents loss of habitats or stated example of habitat destruction e.g. deforestation / soil erosion; M5 reduce risk of relevant natural disaster e.g. flooding or mass movement or land slides / reduce impact of drought or crop diseases;	**3**

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