Cambridge Assessment International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/21**

Paper 2 Management in Context **October/November 2023**

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.

Cambridge International is publishing the mark schemes for the October/November 2023 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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 descriptors 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.

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.

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.

Question	Answer	Marks
1(a)	*any three comparisons from:* overall HICs increased **and** LICs decreased; 2005 LICs and HICs equal / HICs overtake LICs at crossover point; after 2005, LICs decreasing **and** HICs increasing / before 2005, HICs always lower than LICs; before 2005, both fluctuate; quote comparative (quantitative or qualitative) data e.g. in 2015 there were 84 HICs compared to 28 LICs or in 1987 LICs were higher than HICs;	**3**
1(b)(i)	*any two from:* shows Chad is a developing country / less developed; low level of education / low number of years of schooling / low literacy; low income / Chad is a LIC; low life expectancy / life expectancy only 54; high birth rate;	**2**
1(b)(ii)	*any one from:* China: World Bank classification is MIC but HDI score is high; HDI shows how close the country is to a boundary whereas the World Bank classification does not allow this / HDI more specific (e.g. Japan and China only 0.158 difference but classes an HIC and MIC); World Bank classification only measures income / HDI measures more factors / how developed a country is;	**1**
1(c)	*any two from:* less use of (natural) resources / reduces depletion of resources; e.g. fossil fuels / food / land / water; so conserved for future generations / idea of sustainability / preserved better; improved food / water / energy security;	**2**
1(d)	38;	**1**

Question	Answer	Marks
1(e)	*any three from:* reduced economic growth / economy decreases; lower numbers in the work place / high number of job vacancies; lower tax revenues; greater spending on pensions; greater spending on health care; less experience in the workplace; less innovation;	**4**

Question	Answer	Marks
2(a)(i)	(air) temperature;	**1**
2(a)(ii)	*any one from:* volume / amount of water; collect water, in same way / at same depth; time of day / time of collection; location e.g. side of lake / position of sampling;	**1**
2(a)(iii)	*any two from:* results can be compared; anomalous results exclude / identifies anomalous results or outliers / identify mistakes; average/mean found; averaging/identifying anomalies increases accuracy; averaging reduces effect of random errors / reduces margin of error; confirm results / proves or disproves results;	**2**
2(b)(i)	answer to one decimal place: 3.2; unrounded answer: 3.16;	**2**
2(b)(ii)	16;	**1**

Question	Answer	Marks
2(b)(iii)	no; **AND** *any one from:* valid evidence e.g. highest temperature and lowest concentration or correctly quoted data; no correlation (between air temperature and concentration of nitrate ions);	**1**
2(b)(iv)	systematic sampling described e.g. every nth distance across lake selected;	**1**
2(b)(v)	*any one from:* data only gives information on nitrate; only five samples / not representative; may contain other pollutants / named pollutant;	**1**
2(c)(i)	*any three from:* nitrate concentrations (in wells) greatest in centre of state / towards middle / increases close to the state capital; cluster in southwest corner > 10.0 (mg / L); between 3.0–10.0 (mg / L) in south east corner / between Wisconsin and Iowa; low concentrations along border with Lake Superior / in North / border with Canada; low concentrations around the state capital;	**3**
2(c)(ii)	leaching;	**1**
2(d)	*any two from:* piped / from taps; aquifer; borehole; gravity-fed; reservoirs / dams;	**2**

Question	Answer	Marks
2(e)(i)	*any two from:* people spend hours collecting water; cannot work / cannot earn money; cannot attend school / get an education; people drink contaminated water; people become ill (dehydrated / water-borne disease) so cannot work; less crops grown so less income for farmers / higher prices so cannot afford;	**2**
2(e)(ii)	*any two from:* limited or no irrigation; unreliable water supply / water available at wrong time for crop growth; water needed for plant growth / for photosynthesis / grow crops; less feed grown for livestock / livestock don't survive so less meat or dairy production;	**2**

Question	Answer	Marks
3(a)(i)	mesosphere;	**1**
3(a)(ii)	white surfaces / snow and ice reflect (incoming) solar radiation / sunlight;	**1**
3(a)(iii)	*any two from:* (IR radiation) absorbed / trapped; by greenhouse gases / named gas e.g. carbon dioxide / methane / water; reflected by clouds / reflected back to surface;	**2**
3(a)(iv)	*any two from:* <u>incoming</u> solar radiation rays; reflect / bounce back; before it reaches Earth's surface / before it gets trapped in atmosphere /; reduce temperature (of Earth's surface);	**2**

Question	Answer	Marks
3(b)	*any two from:* cattle/livestock produce methane; (produce methane which is a) greenhouse gas; livestock rearing requires more energy than growing crops;	**2**
3(c)	nitrogen; oxygen; carbon dioxide;	**3**
3(d)	*any two from:* air pollution knows no boundaries; carried by wind/air currents; pollution in one country effects pollution in others; reference to global issues e.g. ozone 'hole'/climate change /acid deposition; needs co-operation between countries / countries need to work together;	**2**

Question	Answer	Marks
4(a)(i)	reliable availability of energy (sources) / enough energy; at an affordable price; with consideration of the environmental impacts;	**3**
4(a)(ii)	*any three from:* disrupted supply / power cuts / less workable hours; increasing prices for energy resources; increasing costs for industry; job losses or unemployment / recession or economy decreases / lower income; poverty / low standard of living; reliance on imported energy; civil disruption /conflict;	**3**

Question	Answer	Marks
4(b)(i)	*any five from:* wind/solar panels provide renewable energy supply; so reduces use of /fossil fuels; which are finite / non-renewable; reduction in mining e.g. coal; rain water collection eases water insecurity / provides source of water for irrigation / recycles water; water recycling reduces water wastage; composting reduces waste; provides source of nutrients for soil; less artificial fertilisers needed / reduces fertiliser production; low energy appliances/lights reduce use of resources/fossil fuels; reduce emissions of carbon dioxide; reduces, climate change / global warming; insulated walls/windows reduces heat transfer / loss / gain;	**5**
4(b)(ii)	*any one from:* more insulation; increase photosynthesis / absorbs carbon dioxide; traps particulates; improves biodiversity; reduces, storm water / run-off; increases infiltration;	**1**
4(b)(iii)	Sun;	**1**

Question	Answer	Marks
5(a)	axis labels: y-axis number of (species of) beetles **AND** x-axis location; sensible linear scale to cover at least half of grid; bars equal width **and** not touching; 4–5 correct plots;	**4**
5(b)(i)	50;	**1**

Question	Answer	Marks
5(b)(ii)	the area sample / quadrat is representative (of whole area); scale up from quadrat to whole area / multiple by number of quadrats;	**2**
5(b)(iii)	*any one inconsistency in:* counting individual beetles on the edge of the quadrat / different counting methods (between two people); ability to 'see' the beetles; misclassification e.g. between woodlouse and beetle;	**1**
5(b)(iv)	sweep net / pitfall trap; tree/bush shaking with sheet / beating tray under the tree to collect beetles;	**1**
5(c)	too large / larger / big; fast moving / move around a lot / constantly moving;	**2**
5(d)	*any two from:* biased / subjective / not accurate; qualitative method / non-quantitative; over-estimations of conspicuous plants or plants in flower / underestimation of inconspicuous plants; some species can be confused with others;	**2**
5(e)	higher percentage of population loss for A; comparative quoted data: A = 10% / B = 5%	**2**
5(f)	*any two from:* maintains resources / named resources e.g. food, wood, medicines; diversity in genes; cultural value; recreational / tourism values; pollination; idea that it prevents extinction;	**2**
5(g)(i)	eats producer / in the second trophic level;	**1**

Question	Answer	Marks
5(g)(ii)	reduced population; as less food;	**2**
5(h)	10;	**1**