Cambridge Assessment International Education

Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/12**

Paper 1 **October/November 2021**

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 2021 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)(i)	over time temperatures are increasingly higher than averages; 1940–1980 equal numbers of years above and below average temperature; late 1970s, all temps above average; before 1940, all temps below average; 1940–late 1970s, temps fluctuate above and below average;	**2**
1(a)(ii)	high levels of carbon dioxide acts as a greenhouse gas; incoming solar radiation travels through atmosphere to earth's surface; radiant heat emitted from earth's surface to space is absorbed by carbon dioxide; carbon dioxide molecules vibrate and trap the heat energy; heat energy released from carbon dioxide molecules back to earth to cause enhanced warming;	**4**
1(a)(iii)	exploration of new fossil fuel sites in previously undeveloped areas; loss of habitat during construction of new plants; increased noise in areas where mining and transportation occurs; mining / extraction may cause instability in nearby slopes causing landslides; unsustainable exploitation of fossil fuels causes further new sites to be used; migration patterns of animals disturbed by installing new infrastructure; transport and access to new extraction sites causes deforestation / habitat loss; water contamination due to fracking; increased seismic activity due to fracking; oil spills;	**4**
1(b)(i)	$(11 / 28) \times 100$ 39.3;	**1**
1(b)(ii)	a fuel / something that can produce heat; that does not run out / is not finite;	**2**
1(b)(iii)	countries at different starting points in 2004; countries have different types of industry to rely on for GDP; different natural resources which make renewable more favourable; higher populations / greater energy demand; different economic status; (better) negotiations by politicians;	**3**

Question	Answer	Marks
1(c)	high initial cost of building plant; high risk of danger to health if accidents occur; challenges storing waste; public opinion; abundance / availability of other forms of energy;	**4**

Question	Answer	Marks
2(a)(i)	1024 (mb);	**1**
2(a)(ii)	X – depression;	**1**
2(a)(iii)	satellite data; tracking weather systems over the whole world; visual photography; identifies where thicker cloud is; infrared photography; used to identify height of clouds; can be used to forecast at night; radar; provides detail on rainfall; land surface measurements; measurements made with instruments, temperature, pressure, windspeed; climatology - review weather statistics over past years and calculate an average; look at past trends; numerical - use of computer models using data;	**4**
2(a)(iv)	high-pressure systems bring dry conditions; winds are weak; high-pressure areas are large and result in settled weather for long timescales; in summer temperatures are very high; in summer high pressures may cause thunderstorms; in winter cloudless skies; low temperatures, fog and frost in winter;	**4**

Question	Answer	Marks
2(b)(i)	high winds; causes damage to building / infrastructure; tidal surges; evacuation of coastal areas; flooding from rainfall; loss of crops; landslides triggered by rainfall; damage to tourist facilities; damage to fishing industry;	**4**
2(b)(ii)	early warning system; reinforced buildings / secure building / board up windows; protect infrastructure from strong winds; evacuation routes planned; protect population from storm surges by moving to higher ground; slope stabilisation methods; slopes made secure to prevent landslides; afforestation of slopes / improved drainage of slopes; soils bound together to improve stability; AVP;	**6**

Question	Answer	Marks
3(a)	Animal based diet range in area of land required, minimum eggs 15ha to beef 140ha, all plant based low land area, 5–10ha, much less land required for plant-based diet compared to animal based. Overall plant-based takes less land. Eggs, fish and poultry have moderate environmental impact, dairy and beef have the most significant environmental impact. Results of increased land use e.g. habitat destruction / loss of biodiversity / deforestation. **please use level descriptors 1**	**10**

Question	Answer	Marks
3(b)	*The question requirements are:* • impact of urban sprawl • strategies which can be used to manage urban sprawl • limitations of strategies • examples. *Indicative content:* Discuss the range of impacts of increased urbanisation, loss of habitats, increased runoff due to reduced infiltration, increased pollution, air, water, noise etc. Strategies to maintain a balance of natural habitats and built environment, planning restrictions, green belt, managing public transportation. Limitations may include pressure to redevelop due to increased population, increased car ownership, building economy by increasing production. Balance between managing air pollution and increasing production. Supported by range of local examples contrasted with other case studies. **please use level descriptors 2**	**30**

Question	Answer	Marks
4(a)	Communication methods. Sensors at sea, sensors send information to satellite, information received by information receiving system. This information is shared rapidly to simultaneously broadcasting system. This information is broadcasted to mobile phones, pagers, internet, alarms, road signage, radio. Alert allows flood gates to close on river channel, flood gates to close at the beach. Tsunami warning centre located away from the shore. Time from alert being shared allow people a chance to move to higher ground. Allow some industrial processes / nuclear plants to shut down, trains / transport systems can be shut down. **please use level descriptors 1**	**10**

Question	Answer	Marks
4(b)	*The question requirements are:* • plate tectonics improving understanding of volcanoes • plate tectonics improving understanding of earthquakes • limitations in preparing for tectonic hazards. *Indicative content:* Knowledge of plate boundary type and location helps to predict areas at risk of volcanic activity. Destructive plate boundaries where subduction zones occur, volcanoes occur on overlying plate. Understanding of the process of the melting subducting plate improves understanding of eruption style. If the overlying plate is continental the magma produced is likely to be high in silica and cause explosive eruptions, however at ocean-ocean subduction magma is more basaltic and therefore eruptions are less explosive. Volcanoes can be associated with rifting either at the continent (east African rift valley) or oceanic rifts (mid Atlantic ridge). Oceanic rifting causes effusive / basaltic eruptions, on a continental rift the eruption style can vary. Knowledge of the plate tectonic setting can help predict the style of volcano which may erupt. Earthquakes frequently occur at all types of plate boundary, therefore knowledge on location of plate boundary helps to prepare for earthquakes. Use of understanding about rate of plate movement may help predictions of when earthquakes may happen. Elastic rebound theory can be used to use evidence from when last earthquake occurred to predict amount of strain that has built up. Limitations, volcanoes can involve complex magma processes making it very difficult to predict events, predictions can suggest likeliness of an eruption but timescales may not be helpful for evacuations. Volcanoes can erupt in unpredictable ways, for example the direction of eruption my not be straight up, may be a lateral blast. Earthquake predictions may not give time for evacuation to sufficiently far from affected area, surface may behave in unexpected ways following land reclamation, buildings cause greatest risk and if built since previous earthquake may behave in unexpected way. **please use level descriptors 2**	**30**

Question	Answer	Marks
5(a)	Agricultural sector, no significant contribution to nitrogen oxide, small contribution to overall but no change from 1990–2016, constant approx. 500AU. Nitrogen oxide reduced from 2000-500 AU, improved management of emissions, use of scrubbers and clean fuels in household stoves. Nitrogen oxides fairly constant for sector, over this time period the treatment of waste may not have changed significantly. Nitrous oxides 6000-3000 improved use of catalysts in industry to convert to nitrogen. Nitrogen oxides significant decrease from road transport from approx. 8000-3000, introduction of catalytic converters, now built into vehicles, remains some emissions from older vehicles. **please use level descriptors 1**	**10**

Question	Answer	Marks
5(b)	*The question requirements are:* • international strategies to reducing acid rain • challenges in working internationally • local strategies • evaluation. *Indicative content:* Candidates should discuss the idea that sulfur dioxide and nitrogen oxides can be produced in a particular location by the combustion of fossil fuels in power stations, industry, transport, these acidic particles can then be transported in the air currents to a location which was not producing them. The impact on the environment may be felt far from the source, difficult for one country to accept responsibility and therefore a united international effort is required. Case studies may include lakes or forests in Scandinavia damaged by the emissions formed in western Europe. Agreements between groups of countries to all follow guidelines would allow global success. Examples of technology to share would be low sulfur coal, scrubbers, catalytic converters, methods to reduce fossil fuel demand by alternative technology and improved efficiency. Summits and agreements which many / all countries commit to. Challenges may include funding available by some countries to invest in cleaner technologies, change in priorities, concerned on how economy may be reduced by reduction in fossil fuel use. The country where the damage may be felt could be LEDC and not use so much fuel in transportation etc., less industrialised, livelihood may be based on farming or fishing which could be damaged. This country may feel the damage but not be responsible for cause so should not have to fund strategies to reduce. Local strategies include Clean Air Act, low sulfur coal or washed coal to reduce the impurities, scrubbers, catalytic converters, low emission zones. The wide range of local strategies would reduce the acidic particles produced and therefore reduce acid deposition locally and further away. Evaluation may conclude that strategies must be applied locally to have global success, some collaboration would support all countries to instate and use measures to reduce emissions. **please use level descriptors 2**	**30**

Question	Answer	Marks

Section B descriptor levels:

Descriptor	Award Mark
Consistently meets the level criteria	Mark at top of level
Meets the criteria, but with some inconsistency	Middle, mark to just below top mark
Meets most of level criteria, but not all convincingly	Just below middle, mark to just above bottom mark
On the borderline of this level and the one below	Mark at bottom of level

Section B (part a),

Level descriptors 1

8–10 marks
The response:
- contains few errors
- shows a very good understanding of the question
- shows a good use of data or the information provided, where appropriate
- provides a balanced answer

5–7 marks
The response:
- may contain some errors
- shows an adequate understanding of the question
- shows some use of data or the information provided, where appropriate
- may lack balance

1–4 marks
The response:
- may contains errors
- shows limited understanding of the question
- shows little or no use of data or the information, where appropriate
- lacks balance

Question	Answer	Marks
	Section B (part b), **Level descriptors 2** Responses: **Level one, 25–30 marks** • fulfil all the requirements of the question • contain a very good understanding of the content required • contain a very good balance of content • contain substantial critical and supportive evaluations • make accurate use of relevant vocabulary **Level two, 19–24 marks** • fulfil most of the requirements of the question • contain a good understanding of the content required • contain a good balance of content • contain some critical and supportive evaluations • make good use of relevant vocabulary **Level three, 13–18 marks** • fulfil some requirements of the question • contain some understanding of the content required • may contain some limited balance of content • may contain brief evaluations • make some use of relevant vocabulary **Level four, 6–12 marks** • fulfil limited requirements of the question • contain limited understanding of the content required • may contain poorly balanced of content • may not contain evaluations • make limited use of relevant vocabulary	

Question	Answer	Marks
	Level five, 1–5 marks • fulfil a few of the requirements of the question • contain a very limited understanding of the content required • are likely to be unbalanced and undeveloped • evaluative statements are likely to be missing • make no use of relevant vocabulary	