SPECIMEN MATERIAL

A-level
ENVIRONMENTAL SCIENCE
PAPER 1

Mark scheme

Series

V1.0

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

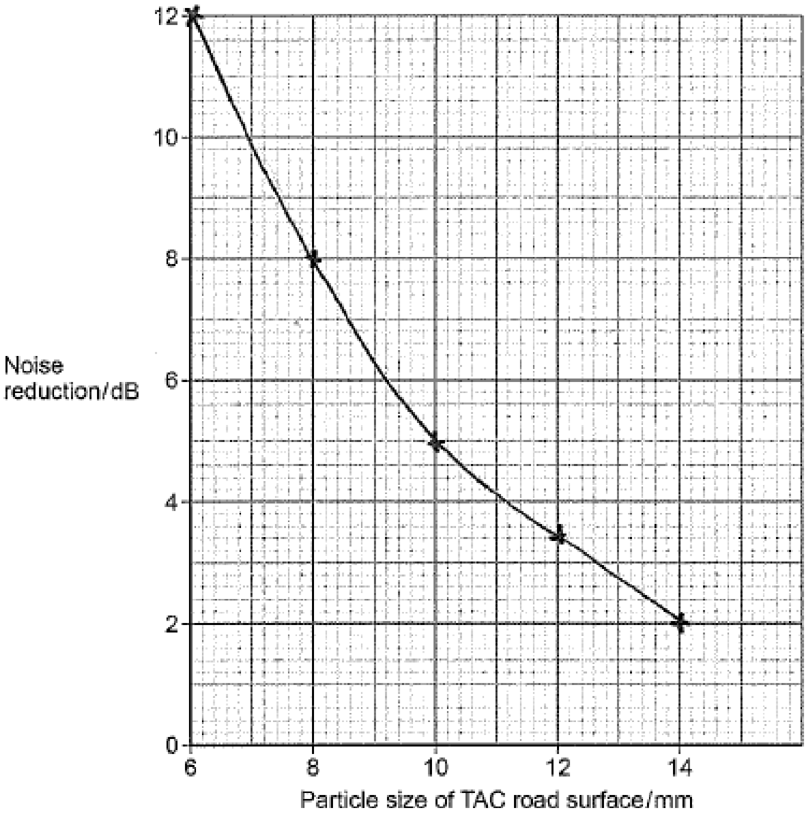
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Examiners are required to assign each of the students' responses to the most appropriate level according to its overall quality, then allocate a single mark within the level. When deciding upon a mark in a level examiners should bear in mind the relative weightings of the assessment objectives (see page 31) and be careful not to over/under credit a particular skill. For example, in question 10.3 more weight should be given to AO1 than to AO2 and AO3. This will be exemplified and reinforced as part of examiner training.

Qu	Part	Marking guidance	Comments	Total marks	AOs
01		Biomass HEP Instream tidal power Solar Hydrogen		5	AO1
02	1	First mark for: • PA and TAC are both better than concrete **AND** • PA better than TAC Second mark for: • Reference to data from Figure 1 to illustrate either point from first mark: particle size **and** dB reduction/difference	Students need to compare the noise-reduction effectiveness of the two surfaces with each other and with concrete. Reference must be made to data from the table.	2	AO3

02	2	1 mark for correctly plotted points 1 mark for correctly drawn line		2	AO2



02	3	80 dB	Students need to understand the logarithmic nature of the decibel scale.	1	AO2

<table>
<tr>
<td>02</td>
<td>4</td>
<td>One mark for:
Data collected before and after resurfacing to allow a comparison
Any two methods of arranging transect to produce reliable results, from:
appropriate transect length (100 – 500m)
appropriate number of data recording locations (8 – 20)
appropriate intervals between recording locations (10 – 25m)
One mark for reference to the standardisation of the position of the transect/recording aspect.
Any one from:
no anomalous objects to absorb/reflect noise/vegetation/buildings
same topography/even gradient
recordings made at same height from ground/meter facing same direction
One mark for reference to how timing of the study should be standardised.
Any one from:
same wind velocity
same road surface wetness
same traffic flow
same traffic speed
no temperature inversion (to reflect sound)</td>
<td>Students must apply their knowledge of the principles of scientific methodology in producing an appropriate plan. The key features are the details of the transect, standardisation of the technique and the control of external variables.</td>
<td>5</td>
<td>AO2 = 5</td>
</tr>
</table>

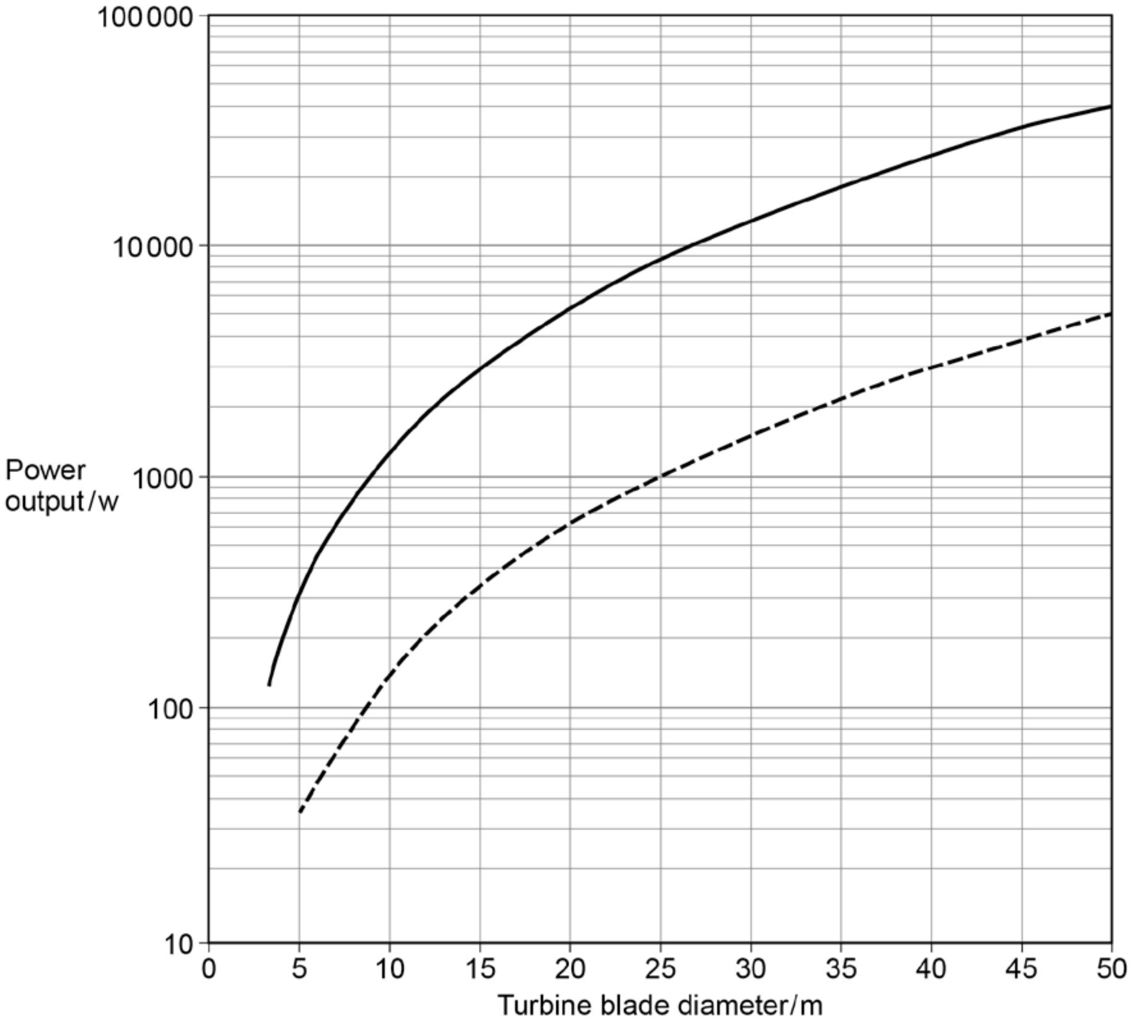
Qu	Part	Marking guidance	Comments	Total marks	AOs
03	1	Any **two** from: • Hot mineral solutions flow along veins/fissures/away from batholith • Different minerals have different solubilities • Mineral solutions cool with movement away from source One mark for: Minerals separated by precipitation/deposition /fractional crystalisation at different positions	Students must show understanding of how the properties of different minerals and physical conditions cause the separation and deposition of local concentrations, which is a pre-requisite of economic exploitation.	3	AO2
03	2	32 Accept correct reading from the logarithmic y-axis using the line of best fit they have drawn	Students must show an understanding that logarithmic scales have cycles with a 10-fold change in values with each cycle.	1	AO2
03	3	Less money available for extraction/processing Increased Cut off ore grade (COOG)	Students must show understanding of the relationship between extraction costs, ore purity and economic viability.	2	AO2
03	4	Calculation details Energy used for extraction of 0.6% tin = 80 $MJkg^{-1}$ Energy used for extraction of 0.2% tin = 120 $MJkg^{-1}$ 120 – 80 = 40 40/80 x 100 = 50% One mark for: 50		1	AO2

03	5	Any **one** from: • Increased amount of ore must be mined/processed • Increased amount of overburden must be removed • Reduced efficiency of extraction – (residual mineral is greater proportion of the mineral present)		1	AO1

03	6	One mark for property AND named mineral resource/mineral group One mark for named geophysical technique/description of how the technique works eg Magnetism of iron ore/magnetite Magnetometry OR High density of igneous deposits/galena/cassiterite Gravimetry OR High electrical resistance of igneous deposits Resistivity OR Any two named minerals, different infra red emissions Infra red spectroscopy	Students should demonstrate their understanding that the physical properties of different mineral resources allows their detection by particular geophysical techniques.	2	AO1

Qu	Part	Marking guidance	Comments	Total marks	AOs
04	1	A-B Zero power output because the wind is not strong enough to turn the turbine C-D No increase in power output because the generator/turbine working at maximum power	Students must interpret the graph and apply their understanding of the limitations of windpower to explain the selected data	2	AO3
04	2	1 mark for selection and use of correct values: 3.142 x 625 x 8000 x 1.2 = 18.84 x 10^6 1 mark for use of 0.5, calculation of 45% and conversion to MW 18.84 x 106 x 0.5 /100 x 45 = 4241700 W = 4.24 MW Accept 4.242 MW ecf Award 1 mark for correct calculations with a single error Award 2 marks for correct answer with no working		2	AO2

04	3	240000 – 300 = 23700 Accept answers based on 22000 + 1000 and 300 – 380 Ie 22700 – 20620		1	AO2



04	4	1 mark for correctly plotted points 1 mark for line drawn through plotted points	Students must demonstrate their understanding of logarithmic scales.	2	AO2

04	5	4 × increase	Students must select values on the x axis to calculate the proportional increase in power output.	1	AO3

04	6	Any two locational problems causing windiest sites not to be selected. Named land use conflicts eg • Urban area/nearby residents • Designated area for landscape conservation • Designated area for wildlife conservation • Radar interference • Aircraft flight paths Site problems eg • Access difficulty for construction • Access difficult for maintenance • Lack of grid connection/length of cables required • Lack of stable geology		2	AO3 = 2

Qu	Part	Marking guidance	Comments	Total marks	AOs
05	1	**One** mark for each stage: CFCs absorb UV causing release of chlorine free radicals Chlorine reacts with monatomic oxygen Lack of monatomic oxygen to form ozone, ozone concentration drops	Students must demonstrate that they understand how the individual processes are linked.	3	AO1
05	2	Very low temperatures allow formation of stratospheric clouds/ice crystals Ice crystals provide catalytic surfaces for reactions releasing chlorine	Students must demonstrate an understanding that the unique physical conditions in the stratosphere over Antarctica make ozone depletion more severe.	2	AO2

Qu	Part	Marking guidance	Comments	Total marks	AOs
06	1	**One** mark for the named process **Two** marks for details of the process Reverse osmosis/desalination High pressure Water can pass through partially permeable membrane but salt can't OR Distillation Water is heated or pressure is reduced or both Water boils, then steam is condensed	Students must use the information in the table to deduce the process that must have been used to purify the water, then give details of how the process operates.	3	AO1 = 2 AO3 = 1
06	2	1 mark for detail of how the method measures nitrate concentration. Accept specific named method Colourimetric methods/ measurement of wavelength absorbed • Colour comparison with indicator solution/strip/paper • Addition of indicator solution, comparison by colourimeter • UV spectrophotometry • Cadmium reduction with colourimetry • Ion chromatography OR Measurement of ion electrode potential • Ion selective electrode		1	AO1
06	3	Any **two** from: No serious surface land use conflicts Low levels of named pollutant eg		2	AO1

		sewage Low equipment/construction costs No rapid shortages/droughts			

06	4	Any four impacts due to stated change caused by unsustainable exploitation Eg Reduced availability to downstream users caused by reduced flow volume Loss of fish breeding grounds caused by sedimentation Reduced spawning sites caused by sedimentation Reduced aquifer recharge rates caused by reduced river flow volume Changed survival of named taxon caused by increased temperature Changed survival of named taxon caused by sedimentation Increased concentration of named pollutant caused by reduced flow volume No credit is given for a change with no linked problem. No credit is given for a problem with no linked cause. More than one mark may be awarded for different consequences of the same change.	Students must demonstrate an understanding of how changes to rivers caused by unsustainable exploitation cause environmental problems.	4	AO1 = 2 AO2 = 2

Qu	Part	Marking guidance	Comments	Total marks	AOs
07		Any **five** from: • Lack of dilution/dispersal as bay is enclosed • Liposolubility allows storage in fat • Bioaccumulation as concentration in organisms increases • Biomagnification as concentration increases along food chains • Persistence as compounds do not degrade • Neurotoxic as mercury inhibits nerve cell enzymes • Teratogen as gene interference causes birth abnormalities • Adsorption onto sediment particles increases concentration in sediments • Change from inorganic to organic caused by anaerobic bacteria • Higher absorption rate of organic/methyl mercury across cell membranes.	Students must demonstrate their understanding of the processes by making linked statements between properties and their consequences.	5	AO3

Qu	Part	Marking guidance	Comments	Total marks	AOs
08	1	Any **four** factors **and** detail from: • Traffic levels vary over different timescales: weekday/weekend/ rush hour • During temperature inversion smoke is trapped in cold, dense air • Rainfall washes smoke out of atmosphere • Changes in wind velocity and direction affect dispersal • Smoke production by heating fuel fluctuates with seasons and weather.	Students must demonstrate their understanding that climatic and human factors vary temporally and apply this to smoke levels	4	AO1 = 2 AO2 = 2
8	02	Any **three** variables from: • same size/particle size of filter paper • same volume of air drawn through filter paper • (pre use) calibration of each filter paper to 100% reflectivity • same photometer used/multiple meters calibrated • same wavelength of light used • pump operated for same length of time • used under same weather conditions • sufficiently frequent sampling/large number of samples, to minimise effect of variability • direct light sources excluded.	Students must consider the method for an unfamiliar technique and use their knowledge of smogs and albedo to conclude which variables may affect the results.	3	AO3

<table>
<tr><td>08</td><td>3</td><td>
Any three named features with differences between smoke smogs and photochemical smogs from:

<table>
<tr><td>Feature</td><td>Smoke smogs</td><td>Photochemical smogs</td></tr>
<tr><td>Type of electromagnetic radiation</td><td>Visible light</td><td>Ultraviolet</td></tr>
<tr><td>Behaviour of electromagnetic radiation</td><td>Reflected</td><td>Absorbed</td></tr>
<tr><td>Primary pollutants</td><td>Particulate matter</td><td>NOx, hydrocarbons</td></tr>
<tr><td>Secondary pollutants</td><td>None</td><td>Tropospheric ozone, PANs</td></tr>
<tr><td>Presence of fog</td><td>Present</td><td>Not present</td></tr>
<tr><td>Temperatures</td><td>Cold</td><td>Warm</td></tr>
</table>
</td><td>3</td><td>AO1</td></tr>
</table>

Qu	Part	Marking guidance	Comments	Total marks	AOs
09	1	Three possible variations of the order of calculations. **Method 1** Replace contour ploughing with contour ploughing and strip cropping $\frac{4.67}{0.75} \times 0.25 = 1.56$ or 1.556 Replace salad crops with fruit $\frac{1.56}{0.50} \times 0.10 = 0.31$ ecf **OR** **Method 2** Replace salad crops with fruit $\frac{4.67}{0.50} \times 0.10 = 0.934$ Replace contour ploughing with contour ploughing and strip cropping $\frac{0.934}{0.75} \times 0.25 = 0.31$ **Method 3** Stages combined $\frac{4.67 \times 0.10 \times 0.25}{0.75 \times 0.50} = \frac{0.1168}{0.375} = 0.31$ ecf Award both marks for correct answer with no working.	Students should show their ability to rearrange the data used in the USLE formula to alter the results for different farming practices.	2	AO2 = 1 AO3 = 1
09	2	Soil ridges/furrows reduce kinetic energy/flow rate Soil deposited behind ridges/in furrows		2	AO1
09	3	(Significant at) 0.01/1%/ confident at 99%		1	AO3
09	4	Less than 1%		1	AO3

09	5	**One** mark for • Samples collected upstream of field **and** next to/at lowest point of field Any **three** marks for standardisation of the method • Samples collected before and during cultivation activities • Sample during range of precipitation conditions or standardised same conditions • Replicates (at one sampling time) • Standardised position of sampling sites in river • Measurement of flow rate/dilution	Students must apply their knowledge of scientific methodology to sample location. They must also consider the information given to conclude which factors would need to be standardised to produce reliable data.	4	AO2 = 1 AO3 = 3

09	6	Any **two** of: • Readings are subjective and vary between individuals • Water may not be deep enough to obscure sections • Readings are affected by light intensity		2	AO1

09	7	Any **three** of: • Reduced light levels for photosynthesis • Sediments damage polyp guts • Sediments clog cilia • Particles reduce nematocyst effectiveness		3	AO2

Qu	Part	Marking guidance	Comments	Total marks	AOs
10	1	First mark for calculating rates for both periods Second mark for calculation of difference Rate 1980 -1996 7.2 – 6.7/16 = 0.03 Rate 1996 - 2012 6.7 – 3.8/16 = 0.18 Difference = 0.18 – 0.03 = 0.15 Accept correct calculations based on values from graph ± 0.1 of values shown above. Maximum possible range 0.126 to 0.172 Award both marks for correct answer with no working.		2	AO2

10	2	Any **two** details of satellite or sensor operation (related to ice mass surveys): eg Features of satellite orbits • Polar orbit • Low altitude orbit • Short orbital period • Multiple orbits/composite image Any **two** details of data collected or named sensor/satellite: Data collected by sensors • Gravity measurement • Change in orbit height/velocity • Change in distance between satellites (for GRACE) • Radar altitude measurement • Radar altitude measurement to surface of sea/ice surface • Estimate ice height above sea level allows ice mass estimate Named satellite/sensors Satellites that monitor ice mass • GRACE • Gravity field and steady-state Ocean Circulation Explorer (GOCE) Sensors that monitor ice mass • Electrostatic Gravity Gradiometer (EGG) • Gravimeter		4	AO1 = 2 AO2 = 2

10	3	9 mark levels of response question Lack of accurate data on past trends • ice core data not available in all areas Impact of negative feedback mechanisms • ice cover – albedo • low-level cloud cover - albedo • natural carbon sequestration Impact of positive feedback mechanisms • melting permafrost • low albedo of exposed ground/water • methane hydrate • increased forest/peat fires • increased DOM decay Lack of understanding of natural processes affecting: • temperature • precipitation • wind direction • wind velocity Lack of understanding of interconnections of natural processes Time delay between cause and effect Different timescales of effects Future changes in human activities (that affect climate change) • greenhouse gas emissions • carbon sequestration/CCS • geoengineering		9	AO1 = 4 AO2 = 3 AO3 = 2

Examiners are reminded that AO1, AO2 and AO3 are regarded as interdependent. When deciding on a mark all should be considered together using the best fit approach. In doing so, examiners should bear in mind the relative weightings of the assessment objectives. More weight should therefore be given to AO1 than AO2 and AO3.

Level	Marks	Descriptor
3	7 - 9	A comprehensive response to the question, with the focus sustained. A conclusion is presented in a logical and coherent way, fully supported by relevant judgements. A wide range of knowledge and understanding of natural processes/systems is applied. The answer clearly identifies relationships between environmental issues. Relevant environmental terminology is used consistently and accurately throughout, with no more than minor omissions and errors.
2	4 - 6	A response to the question which is focussed in parts but lacking appropriate depth. A conclusion may be present, supported by some judgements, but it is likely not all will be relevant. A range of knowledge and understanding of natural processes/systems is shown. There is an attempt to apply this to the question, but there may be a few inconsistencies, errors and/or omissions. The answer attempts to identify relationships between environmental issues, with some success. Environmental terminology is used, but not always consistently.
1	1-3	A response to the question which is unbalanced and lacking focus. It is likely to consist of fragmented points that are unrelated. A conclusion may be stated, but it is not supported by any judgments and is likely to be irrelevant. A limited range of knowledge and understanding of natural processes/systems is shown. There is an attempt to apply this to the question, but there are fundamental errors and/or omissions. The answer may attempt to identify relationship between environmental issues, but is rarely successful. Limited environmental terminology is used, and a lack of understanding is evident.
	0	Nothing written worthy of credit.

11.1

AO1 = 10, AO2 = 10 and AO3 = 5

Topic areas	Energy resources/new technologies	Details	Spec ref
Conservation of biodiversity: habitat damage	Tidal power Instream tidal power Tidal lagoons Acoustic deterrence	 No change to tidal flow, turbidity, pollutant movements No obstacle to movement Protect marine mammals	3.1.2
	Windfarms Use of radar Ultrasound/UV emission	 Bird detection and turbine shut down Bat deterrence	
	HEP Fish ladders Helical turbines	 Passage of migratory fish eg salmon Fish not harmed by turbine	
The atmosphere	Fossil fuel use Carbon Capture and storage	 Reduced CO_2 emissions/climate change	3.2.1
	Low carbon energy resources Nuclear power Fission/fusion Renewable energy resources		
Mineral resources	Low-energy metal extraction Bioleaching Phytomining	Reduced use of fossil fuels	3.2.3
Efficiency of harnessing energy	Multi-junction photovoltaic panels Anti-reflective surfaces on photovoltaic panels	Higher output so reduced material use, pollution generation	3.3 + 3.4
	Coal gasification/liquifaction	Reduced need for mining/less spoil disposal	
	Directional drilling	Fewer oil wells needed	
	Low energy techniques	Polymer ion adsorption for uranium extraction from seawater instead of mining	
Energy conservation	Low embodied energy materials	Limecrete/rammed earth	
	Transport management systems	Smooth traffic flow reduces fuel use and pollution generation	
	Vehicle designs Low mass materials High strength steel Carbon fibre/composites	Less fuel used	
	Management of energy use - smart control – automatic switch off	Reduced demand peaks avoid short-term use of standby power stations	
Energy storage	Pumped-storage HEP Batteries Fuel cells Molten salt	Increased availability of intermittent non-carbon fuels. Reduced emissions of CO_2, NOx, smoke/PM10.	
Pollution	Gearboxless aerogenerators	Quieter	3.1.2

	More aerodynamic blades Sawtooth blade trailing edge	Increased efficiency, fewer needed	3.4
	Wind assisted ships	Reduced fuel use and pollution generation	
	Diesel particulate filters	Less smoke/PM10	
	Catalytic converters	Reduced HCs/CO/NOx	
	Convection/fan assisted cooling towers	Reduced thermal pollution/ deoxygenation	
	Oil pollution Ship tanker design/operation	Double hull/engines/rudders, inert gas system, GPS navigation, offshore routes.	
	Nuclear fission	Ionising radiation: treatment/storage of low/intermediate/high level waste.	
	Nuclear fusion	Low waste generation. No high level waste	
Issues that may be developed The extent to which the technology has been successful Difficulties in using the technology/reasons for lack of success New developments being made/that need to be made			

Students may take alternative approaches – eg structuring the essay by energy resource.

11.2

AO1 = 10, AO2 = 10 and AO3 = 5

Topic areas	New technologies/pollutants	Details of technology/impact reduction	Spec ref
Conservation of biodiversity Hydrosphere Pollution	Dry/fan assisted cooling towers	Reduced thermal pollution/deoxygenation of rivers/lakes. Sensitive taxa not killed, eg trout, mayflies	3.1.2 3.2.2 3.4
	Oil pollution prevention/control AIS ship tracking Inert gas systems Bioremediation Double hull Twin rudders/engines Inflatable booms	 Improved navigation, fewer collisions Reduced explosion/fire risk Bacterial degradation of oil Reduced risk of leakage Redundancy in case of mechanical failure Containment of oil spill Reduced consequences of oil pollution	
	Organic waste treatment technologies: Anaerobic digestion Aerobic digestion Oxygen injection Microstraining Iron (III) sulphate treatment	 Reduced deoxygenation, Named aquatic taxa not killed Bacterial removal Removal of phosphates, prevention of eutrophication	
	Mine drainage Acid leachate: lime neutralisation Heavy metals: precipitation at increased pH Dissolved iron: ion substitution/aerated precipitation	 Reduced impacts on pH-sensitive taxa eg crayfish Reduced impacts of toxic metal/bioaccumulation/biomagnification Reduced deoxygenation	
Atmosphere	Smoke: electrostatic precipitators/cyclone separators	Reduced respiratory impacts Fewer smogs	3.1.2 3.2.1 3.2.4 3.4
	Sulfur dioxide: Wet and dry FGD (flue gas desulfurisation)	Reduced acid rain. Impact on sensitive taxa/tissues: root hairs, stomata, fish eggs/gills, organisms with exoskeletons.	
	Oxides of nitrogen: catalytic converters, urea injection, fluidised bed combustion	Reduced respiratory impacts. Fewer photochemical smogs. Reduced acid rain.	
	Hydrocarbon vapours: catalytic converters, activated carbon filters	Reduced toxic/respiratory effects. Reduced greenhouse gas emissions.	
	Carbon monoxide: catalytic converters	Reduced respiratory impact: inhibition of haemoglobin.	
	Carbon dioxide: carbon capture and storage	Reduced climate change.	
Energy	Radioactive waste: ion adsorption, vitrification	Reduced acute/chronic effects of ionising radiation.	3.1.2 3.3 3.4
	Noise: Aircraft engines	Reduced impacts of noise: Disturbance of wildlife/livestock/humans.	

	High bypass ratio engines/chevron nozzles Reverse scarf angles Improved aerodynamics – wings/undercarriage Railways Aerodynamic pantograph Composite brake materials Road transport Low noise road surfaces	Hearing damage/stress/behavioural changes Acoustic fatigue/structural damage.	
Issues that may be developed The extent to which the technology has been successful Difficulties in using the technology/reasons for lack of success New developments being made/that need to be made			

Examiners are reminded that AO1, AO2 and AO3 are regarded as interdependent. When deciding on a mark all should be considered together using the best fit approach. In doing so, examiners should bear in mind the relative weightings of the assessment objectives. More weight should therefore be given to AO1 and AO2 than AO3.

Level	Marks	Descriptors
5	21-25	A comprehensive response with a clear and sustained focus. Content is accurate and detailed. Relationships are identified, reflecting the holistic nature of environmental science and the answer as a whole is coherent. A wide range of relevant natural processes/systems and environmental issues are described and articulated clearly. These are applied systematically to the question, with clear relevance to the context. Where conclusions are made, these are fully supported by judgements and presented in a logical and coherent way. Relevant environmental terminology is used consistently and accurately throughout. If there are errors, these are very minor indeed and not sufficient to detract from the answer.
4	16-20	A response in which the focus is largely sustained, with content that is mainly accurate and detailed. Relationships are identified and the answer is largely coherent. A range of natural processes/systems and environmental issues are described and articulated clearly. In most cases, these are applied appropriately to the question but, in some, it is less clear why they are relevant. Where conclusions are made, these are supported by judgements which are mostly coherent and relevant. Relevant environmental terminology is used consistently and throughout, with no more than minor errors.
3	11-15	A partial response which is focused in parts. The content is mostly accurate but not always detailed. There is an attempt at identifying relationships, but the answer as a whole is not fully coherent. A range of natural processes/systems and environmental issues are described, most are articulated clearly. In some cases, these are applied appropriately to the context but, in most, it is less clear why they are relevant. Where conclusions are made, it is not always clear how they relate to the judgments given and are likely to contain errors. Relevant environmental terminology is used, but not consistently and there may be errors.
2	6-10	An unbalanced response, lacking in focus. The content may be inaccurate and lacking detail. There is some attempt at identifying relationships, but the answer is not coherent. A limited range of natural processes/systems and environmental issues are described but not articulated clearly and likely to contain errors and/or omissions. There is a limited attempt to apply them to the context. Any conclusions are likely to be asserted, with no supporting judgements and fundamental errors. Environmental terminology is used, but not always appropriately and sometimes

		with clear errors.
1	1-5	Fragmented points, whose relevance to the question and relationships to each other are unclear. A few natural processes/systems and environmental issues are listed, but unlikely to be described and many may be irrelevant. There is no clear attempt to apply them to the context. It is unlikely that a conclusion will be present. There is an attempt to use environmental terminology, but seldom appropriately.
	0	Nothing written worthy of credit.

Assessment Objective Grid

	AO1	AO2	AO3	Total
01	5 (knowledge)			**5**
02.1			2	**2**
02.2		2 (maths)		**2**
02.3		1 (maths/practical)		**1**
02.4		5 (practical)		**5**
03.1		3		**3**
03.2		1 (maths)		**1**
03.3		2		**2**
03.4		1		**1**
03.5	1			**1**
03.6	2			**2**
04.1			2	**2**
04.2		2 (maths)		**2**
04.3		1 (maths)		**1**
04.4		2 (maths)		**2**
04.5			1 (maths)	**1**
04.6			2	**2**
05.1	3			**3**
05.2		2		**2**
06.1	2		1	**3**
06.2	1 (knowledge/ practical)			**1**
06.3	2 (knowledge)			**2**
06.4	2	2		**4**
07			5	**5**
08.1	2	2		**4**
08.2			3 (practical)	**3**
08.3	3			**3**
09.1		1 (maths)	1 (maths)	**2**
09.2	2			**2**
09.3			1 (maths)	**1**
09.4			1 (maths)	**1**
09.5		1 (practical)	3 (practical)	**4**
09.6	2 (practical)			**2**
09.7		3		**3**
10.1		2 (maths)		**2**
10.2	2	2		**4**
10.3	4	3	2	**9**
11.1	10	10	5	**25**
Or				
11.2	10	10	5	**25**

Paper Total	**43**	**48**	**29**	**120**

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