



A-LEVEL

Environmental Studies

ENVS2: The Physical Environment

Mark scheme

2440

June 2016

Version/Stage: 1.0 Final Mark Scheme

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

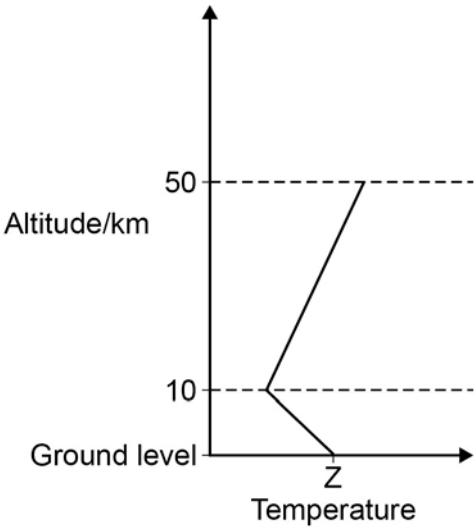
Environmental Studies

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ENVS2

Instructions: ; = 1 mark / = alternative response A = accept R = reject

AO = Assessment Objective

Question	Answers	Mark	AO / Spec. Ref.
1(a)(i)	in descending height order: Stratopause Stratosphere Tropopause Troposphere 2 correct; 4 correct;;	max 2	AO1 3.2.1
1(a)(ii)	 <p>line must start at Z and be continuous, accept curved around tropopause temperature declines with altitude in troposphere, increases in stratosphere [A no temperature change around tropopause]</p>	1	AO1 3.2.1
1(b)	<u>absorption</u> of UV/short wave from above/from Sun/in stratosphere/ in ozonosphere; <u>absorption</u> of IR/long wave from below/from Earth/in troposphere; [R heat]	2	AO2 3.2.1
Total		5	

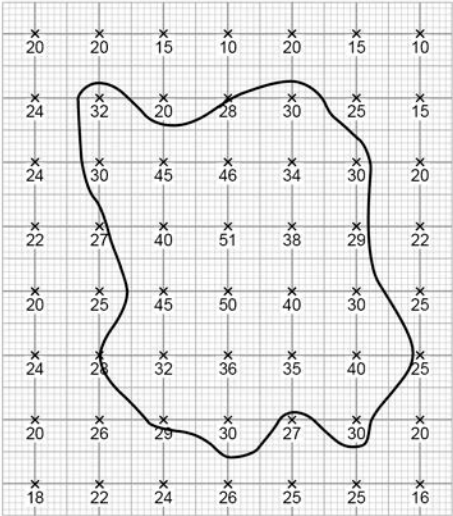
Question	Answers	Mark	AO / Spec. Ref.
2(a)	breakdown (of CFCs) due to UV releases chlorine/ $\text{CFC} + \text{UV} \rightarrow \text{Cl}^{\cdot} + \text{remaining CFC/FC};$ reaction (of Cl) with monatomic O/reaction (of Cl) with ozone/ $\text{Cl}^{\cdot} + \text{O} \rightarrow \text{ClO}/$ $\text{ClO} + \text{O} \rightarrow \text{ClO}_2/$ $\text{Cl}^{\cdot} + \text{O}_3 \rightarrow \text{ClO} + \text{O}_2;$	2	AO1 3.2.1
2(b)	UVB/increased UV/reaches humans; mutation/DNA damage/ <u>skin</u> cancer/cataracts/retina damage;	2	AO2 3.2.1
2(c)(i)	named alternative material for named use;; eg HCFCs, HFCs refrigerants CO ₂ , N ₂ , HCFCs, HCs foam plastics butane, propane, hydrocarbons, HFC, HFA aerosol propellants propanol, alcohol solvent gel, solvent deodorant (credit each use once only)	2	AO1/2 3.2.1
2(c)(ii)	named alternative process for named use;; eg trigger packs, pump action spray stick/roll on deodorant application	2	AO1/2 3.2.1

Question	Answers	Mark	AO / Spec. Ref.
2(d)	<p>ODSs – simpler cause/fewer feedback mechanisms than climate change/fewer gases;</p> <p>more evidence/greater public awareness;</p> <p>greater political agreement/all major countries signed up (Montreal)/ some countries exempt from Kyoto;</p> <p>alternatives to CFCs available/fossil fuels difficult to replace/ fossil fuel combustion basis for development/industrial economies;</p> <p>Montreal ban on (most) ODSs and Kyoto sets targets for reduction of GHGs;</p>	max 2	AO1 3.2.1
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
3(a)	<p>Forest plantations (evapo)transpiration losses/increased interception so reduced water volume; reduced soil erosion so less sedimentation/reduced turbidity; slower/less flow reduces nutrient/pollutant inflow to reservoir; water retained by soil so more even inflow; conifers increase acidity so pH reduced; dead organic matter from forest causes deoxygenation;</p> <p>Urban areas impermeable surfaces/reduced infiltration/drainage systems so increased runoff/increased volume of inflow; more rapid runoff so greater fluctuations in water level; named urban pollutant carried into reservoir;</p>	<p>max 2</p> <p>max 2</p>	<p>AO1 3.2.2</p>
3(b)	barrier to migration/dispersal/colonisation;	1	AO1 3.2.2
3(c)(i)	<p>two correct for one mark; chalk limestone sandstone</p> <p>[A sand] [A gravel]</p>	1	AO1 3.2.2
3(c)(ii)	<p>porosity storage volume; high porosity more suitable;</p> <p>permeability rate of water flow; high permeability more suitable;</p>	4	AO2 3.2.2
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
4(a)	suitable time intervals to detect trend; multiple samples within year/daily/weekly/monthly; annual reading (for) long term trend; timing to avoid other trends e.g. same time of day related to 24 hr cycle;	max 2	AO3 3.2.4
4(b)	named greenhouse gas;; named processes that change concentrations of named gas;; eg methane named human activity eg padi fields/landfill sites/livestock farming coal mine ventilation/leaks from oil/gas fields/pipelines oxides of nitrogen/NO _x /named NO _x (hot) reactions in air by named human activity/named activity that burns fossil fuel/burning vegetation/from fertilisers CFCs/chlorofluorocarbons aerosol propellants/fire extinguishers/leakage of refrigerants/ solvents/expanded foam disposal tropospheric ozone secondary pollutant from reactions involving NO _x released by hot) reactions in air by named human activity/named activity that burns fossil fuel/burning vegetation/denitrification from fertilisers [A release of greenhouse gas by positive feedback mechanisms]	2 + 2	AO1/2 3.2.1
4(c)	inaccurate/incomplete (historic climate) data; inaccuracy of proxy data; changes in/unpredictability of emissions/control (in future); incomplete understanding of natural climate; natural fluctuations; natural long-term trends; interconnected systems; different rates of change; delay between cause and effect; feedback mechanisms; regional variations;	max 4	AO3 3.2.4
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
5(a)	(1400000/434 =) 3225.8/3226;	1	AO3 3.2.2
5(b)	processes that cancel each other out; named processes that balance/selected data to illustrate; eg river runoff = wind transport/36 = 36 evaporation + transpiration = precipitation/ 434+71/505 = 398+107/505	2	AO2/3 3.2.2
5(c)	initial change involving change in state of water;; details of positive feedback mechanism;; eg increased temperature causes increased evaporation water vapour (acts as GHG) increased temperature causes ice to melt reduced albedo/reflection increased temperature causes permafrost/soil ice/methane hydrate to melt release of methane increased evaporation of soil water more CO ₂ from vegetation fires/decomposition reduced temperature causes ice to freeze increased albedo/reflection [R cause without impact] [R impact without cause]	2+2	AO2 3.2.2
5(d)(i)	density increases then reduces; change at 4°C; or density increases to 4°C; density decreases below 4°C;	2	AO3 3.2.1
5(d)(ii)	ice floats, liquid water beneath; [R answers based on insulation]	1	AO2 3.2.2
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
<p>6(a)(i)</p>	 <p>[A any line that passes through both 28s, outside all >28 and inside all < 28]</p>	<p>1</p>	<p>AO3 3.2.4</p>
<p>6(a)(ii)</p>	<p>increases;</p>	<p>1</p>	<p>AO3 3.2.3</p>

Question	Answers	Mark	AO / Spec. Ref.
6(b)	<p>named method; details of method;; eg gravimetry variations in density igneous rocks</p> <p>magnetometry variations in magnetism iron/magnetite/named magnetic metal/mineral</p> <p>seismic surveys/ground penetrating radar /sonar/ultrasound shock waves/echoes/reflection depth/density/angle/3D image</p> <p>IR sensors differences in IR emissions detect different rocks/minerals/vegetation</p> <p>side looking radar/ultrasound topography alluvial deposits</p> <p>resistivity/conductivity ease of electricity flow metal-bearing rock</p> <p>aerial photography topography salt dome/fault line/valleys/variations in rock erosion/folding</p>	max 3	AO2 3.2.3
6(c)	<p>greater area mined/more habitat loss; more overburden/spoil; more rock/ore extracted; more energy used; more waste produced/pollution caused;</p>	max 3	AO2 3.2.3
6(d)	<p>resource theoretical maximum exploitable amounts;</p> <p>reserves exploitable with existing technology at current prices;</p>	2	AO1 3.2.3
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
7(a)(i)	clay loam;	1	AO3 3.2.4
7(a)(ii)	20;	1	AO3 3.2.4
7(b)	sieve dry soil; range of mesh sizes; measure volume/mass of each portion/sand, silt, clay/ calculate percentage of each portion; or shake soil in water in measuring cylinder/container; time to settle; measure quantity of each layer/sand, silt, clay/calculate percent of each layer;	3	AO3 3.2.3
7(c)	sand particle size larger/clay smaller; sand pore space size larger/clay smaller; linked qualified effect on named properties;;;; eg (sandy soil means) less particle adhesion less surface adsorption more drainage (due to pore size) less water retention (by surface tension) low thermal capacity less capillary action high aeration low nutrient levels easy root penetration qualified reference to pH qualified reference to biota	max 5	AO2 3.2.3
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
8(a)(i)	(adds oxygen to aid) removal/destruction of named substance; eg hydrogen sulfide organic matter pathogens/microorganisms dissolved/toxic metals odour/taste	1	AO1 3.2.2
8(a)(ii)	adsorption/removal of pesticides/organic materials/microorganisms/ chlorine;	1	AO1 3.2.2
8(b)	ozonation/ozone/UV/ultra violet/boiling/distillation;	1	AO1 3.2.2
8(c)	flocculation/addition of flocculant/ addition of coagulant/alum/ polyelectrolytes/named flocculant/named coagulant; neutralisation of (surface) charges; coagulation/particles join together; clarification/sedimentation/settling/microscreens/filters;	max 3	AO1 3.2.2
8(d)	electronic meter/pH meter/pH probe; calibrated; or pH paper/universal indicator (solution/paper); comparison with colour chart; [R if only two colours] [R litmus]	2	AO3 3.2.4
8(e)	high pressure; partially permeable membrane/polyamide tubes; [A semi-permeable membrane/selectively permeable membrane]	2	AO1 3.2.2
Total		10	

Question	Answers	Mark	AO / Spec. Ref.
9(a)	<p>named process linked to N-containing materials/named taxon;; eg denitrification – nitrate to nitrogen/<i>Pseudomonas/Clostridium/Bacillus</i></p> <p>decomposition – DOM to ammonium/<i>Staphylococcus/Clostridium</i></p> <p>nitrification/oxidation – ammonium to nitrite/nitrite to nitrate/<i>Nitrosomonas/Nitrobacter</i></p> <p>free living nitrogen fixation – nitrogen to ammonium/<i>Azotobacter/Cyanobacteria/Desulfovibrio/Klebsiella/Nostoc</i></p> <p>symbiotic nitrogen fixation/in roots/legumes– nitrogen to N in plants/ <i>Rhizobium/Frankia</i>/root nodule bacteria</p> <p>(credit nitrogen fixation once only unless free living/symbiotic distinction is made)</p>	2	AO2 3.2.4
9(b)	no gaseous compound; low solubility;	2	AO2 3.2.3

9(c)	named human activity;;; how activity affects processes in nitrogen cycle;;;;;; eg combustion of fossil fuels/crop waste/wood nitrogen and oxygen react/production of NO _x livestock/manure ammonia from proteins conversion/oxidation to nitrate/NO _x /N ₂ O denitrification release of nitrogen gas rice/padi fields/landfill sites anaerobic conditions denitrification [credit once only] release of nitrogen gas Haber process to ammonia/nitrates agricultural fertiliser ploughing/drainage aerobic conditions rapid decomposition release of ammonium/nutrients leaching eutrophication catalytic converters NO _x and O ₂	max 9	AO1 3.2.3
	Quality of Written Communication		2
	Mark	Descriptor	
	2	All material is logically presented in clear, scientific English and continuous prose. Spelling, punctuation and grammar are almost always correct. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.	
	1	Account is logical and generally presented in clear, scientific English and continuous prose. Minor errors occur in spelling, punctuation and grammar. Technical terminology has been used effectively, and is usually accurate. At least half a page of material is presented.	
0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas. Spelling, punctuation and grammar contain many errors.		
Total		15	