AQA

A-LEVEL
Environmental Studies

ENVS2: The Physical Environment
Mark scheme

2440
June 2015

Version: 1.0 Final

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

June 2015 **ENVS2**

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

AO = Assessment Objective

Question	Answers			Mark	AO / Spec. Ref.
1	**Name of treatment process**	**Purpose**	**Principle of operation**	5	AO1 3.2.2
	Screening	Removal of floating objects such as branches and plastic items	Metal grills trap floating objects		
	Sedimentation	Removal of suspended solids	**Water static/left to stand still;**		
	Distillation;	Collection of pure water	Steam produced by boiling is collected and condensed		
	Flocculation	Removal of suspended fine clay particles	**Neutralises (surface electrical) charges;**		
	Fluoridation	Improvement of dental health	The addition of fluorides		
	Activated carbon filtration	**Removal of organic chemicals/ pesticides/odours/ taste/colour/named organic chemical;** **[R organic matter]**	Contaminants are adsorbed onto carbon granules		
	Ozonation	Sterilisation/ kill microorganisms	Gas is bubbled into the water		
	Reverse osmosis	Removal of salt	**Water is forced/under high pressure through a fine filter/ semi-permeable membrane/ partially permeable membrane;**		
Total				**5**	

Question	Answers	Mark	AO / Spec. Ref.
2(a)	processes cancel out/create balance**;** **named** opposing processes(associated with same reservoir)**;**	2	AO2 3.2.3
2(b)(i)	formation of amino acids/proteins/enzymes/cell membranes/ hormones/ATP/DNA/RNA/nucleic acids/chlorophyll**;**	1	AO2 3.2.3
2(b)(ii) i	formation of calcium phosphate/bones/teeth/ (phosphorylated)proteins/ATP/DNA/RNA/nucleic acids/ phospholipids/cell membranes/named structure containing keratin**;**	1	AO2 3.2.3
2(c)	named/description of processes involving microorganisms**;;;;** named taxon linked to correct process**;;** eg denitrification eg *Pseudomonas* nitrogen fixation (by free living bacteria) eg *Azotobacter/Anabaena/Nostoc* nitrogen fixation (by symbiotic/root nodule bacteria) eg *Rhizobium/Spirillum* ammonification/decomposition/breakdown fungi/bacteria conversion of ammonium to nitrite eg *Nitrosomonas* conversion of nitrite to nitrate eg *Nitrobacter* credit nitrogen fixation for 1 process mark if detail of location not given credit nitrification for 1 process mark if detail of stages not given	max 4	AO1 3.2.3
2(d)	aerobic conditions/increased oxygen/aeration**;** nitrogen fixation/nitrification**;** reduced denitrification**;** increase decomposition of dead organic matter**;** [**A** description of process]	max 2	AO2 3.2.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
3(a)(i)	(reserves) increase**/**more deposits become accessible/exploitable**;** reduced production costs/lower energy inputs**;** bioleaching/phytomining/electrolysis/named low grade ore extraction technique**;**	max 2	AO2 3.2.3
3(a)(ii)	(reserves) increase**;** previously uneconomic deposits become economic/cut-off ore grade decreased**/**can afford to spend more on extraction**;**	2	AO2 3.2.3
3(a)(iii)	(reserves) decrease**;** previously exploitable/lower grade deposits no longer economic**;**	2	AO2 3.2.3
3(b)(i)	frequent enough/monthly or more frequently**;** to detect fluctuations**;**	2	AO3 3.2.4
3(b)(ii)	time-related factor that may affect results**;;** eg fluctuation in rainfall/runoff snow melt fluctuation in evaporation changes in pumping/discharge from mine/mine activity intermittent addition of lime	2	AO3 3.2.4
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
4(a)	removed or not removed**;** correct link to abstractive and non-abstractive**;**	2	AO2 3.2.2
4(b)(i)	barrier to migration/named habitat change that affects survival**;** eg changed temperature/oxygen/turbidity/flow rate (outside range of tolerance)	1	AO2 3.2.2
4(b)(ii)	reduced due to sedimentation in reservoir**;** reduced turbidity/due to reduced flow rate/reduced energy reduces erosion/sediment pick up**;** [**A** converse]	max 1	AO2 3.2.2
4(c)	low permeability to reduce losses**;** [**A** converse]	1	AO2 3.2.2
4(d)	**Advantages (of aquifers);;;** named pollutant that is less likely (natural) filtration (by rock)/lower turbidity less rapid flow fluctuations no evaporation named treatment process not needed eg screens sedimentation **Disadvantages (of aquifers);;;** energy use/cost of borehole/pumping slower recharge/slower recovery following over-exploitation/pollution subsidence named consequence of lower water table increased hardness only possible with porous permeable rock named suitable rock eg sandstone chalk limestone [**R** unqualified cost]	max 5	AO2 3.2.2
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
5(a)	mineral dissolved in hot water**;** movement away from batholith/along fissures**;** cooling**;** reduced solubility**;** crystallisation**;** order of deposition/separation of different minerals(by solubility)**;** in veins/lodes**;**	max 3	AO1 3.2.3
5(b)	clay/shale/mudstone/tuff/marl**;** metamorphosis under high pressure**;** [**R** melting]	2	AO1 3.2.3
5(c)	dry/crush/grind/separate particles/peds**;** sieving with different mesh sizes**;** reference to correct positions of sand/silt/clay/particle sizes**;** weigh each portion**;** percentage calculation**;** **or** add water (to soil) and shake**;** allow to settle**;** reference to correct positions of sand/silt/clay/particle sizes**;** measure layers**;** percentage calculation**;** [**A** sieving for sand and sedimentation for silt/clay] [**R** hand texturing]	max 3	AO3 3.2.3
5(d)	named soil textural class (eg sand,silt,clay)/description of particle size linked to effects on properties**;;** eg porosity/water retention/permeability/drainage heat/thermal capacity aeration/oxygen content temperature root penetration plant support nutrient leaching nutrient adsorption	2	AO2 3.2.3
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
6(a)(i)	named process involving change in state and function for living organisms**;;** eg evaporative cooling transpiration transport in plants evaporation for distribution of water condensation for cooling(clouds) melting ice ensures river flow in dry season	2	AO2 3.2.2
6(a)(ii)	slow temperature change/large amount of energy needed to change temperature**/**reduced temperature extremes/stable temperature**;** enzyme function/stated benefit for living organisms**;**	2	AO2 3.2.2
6(a)(iii)	reduced density of water on cooling/below 4^{o}C**;** convection stops/ice protects water below from freezing/water below ice is warmer**;** albedo for temperature control**;**	max 2	AO2 3.2.2
6(b)	Greenland/Iceland/land ice melts and (freshwater) flows into sea**;** reduces salinity of seawater**;** (less saline) water does not sink/is less dense**;** current slows**;**	4	AO2 3.2.1
Total		**10**	

Question	Answers	Mark	AO / Spec. Ref.
7(a)	1998**;**	1	AO3 3.2.3
7(b)	repeat sampling with different sample sizes**;** find smallest sample that gives same result as larger sample**;**	2	AO3 3.2.4
7(c)	releases nutrients/named nutrient/minerals during decay**;** retains water**;**	max 1	AO3 3.2.4
7(d)	remove stones/coarse material/litter**;** method to dry soil/heat around 100^{o}C [**A** 85 – 120^{o}C]**;** to constant mass/weigh dry soil**;** heat to 500^{o}C [**A** 150 – 825^{o}C] /Bunsen burner**;** (reweigh) to constant mass**;** calculate mass of OM drop/(dry) mass – final mass = mass drop**;** [accept as part of equation] mass drop divided by mass before burning x 100**;**	max 6	AO3 3.2.4
Total		**10**	

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>8(a)</td><td>
<table>
<tr><th>Description</th><th>Letter from Figure 6</th></tr>
<tr><td>Absorption by CO_2</td><td>H</td></tr>
<tr><td>Absorption of UV light by ozone</td><td>C</td></tr>
<tr><td>Conversion of visible light to heat</td><td>F</td></tr>
<tr><td>Emission of infra red</td><td>G</td></tr>
<tr><td>Reflection of visible light by clouds</td><td>D</td></tr>
</table>
</td><td>5</td><td>AO2
3.2.1</td></tr>
<tr><td>8(b)</td><td>natural processes also cause change/difficult to separate human and natural changes;
named natural process;

positive feedback mechanisms;
example of positive feedback;

negative feedback mechanisms;
example of negative feedback;

changes in human activities;
example of changing activity;

local/regional/global differences;
example of factor with spatial difference;

time between cause and effect;
named activity with time gap;

lack of/high cost of required technology;
inaccessibility of sampling location;
lack/inaccuracy of historic data/lack of data sharing;
unreliability of proxy data;</td><td>max 5</td><td>AO2+AO3
3.2.1</td></tr>
<tr><td>Total</td><td></td><td>10</td><td></td></tr>
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Question	Answers	Mark	AO / Spec. Ref.
9(a)	positive correlation**;**	1	AO3 3.2.3
9(b)(i)	absorption of infra-red/longwave**;** [**R** heat]	1	AO1 3.2.1
9(b)(ii)	increased rate of process involving CO_2**;** eg respiration decomposition forest fires coming out of solution exolving of CO_2 from oceans photosynthesis	1	AO1 3.2.1
9(c)(i)	absorb IR/greenhouse gas**;**	1	AO1 3.2.1
9(c)(ii)	(release) <u>chlorine</u> which reacts with ozone/monatomic oxygen**;** [**A** equation]	1	AO1 3.2.1

Question	Answers	Mark	AO / Spec. Ref.	ID
9(d)	named greenhouse gas**;;;** [**R** carbon dioxide, CFCs (given elsewhere in the paper)] methods to reduce concentrations/emissions**;;;;;;** max 3 per gas Carbon dioxide energy conservation/change in transport system to reduce fossil fuel use use of one named non-carbon energy resource named carbon sequestration method legislation e.g. Kyoto Protocol, UK Climate Change Act Methane reduced use of landfill for waste/more recycling named alternative livestock production/meat consumption changed livestock diet to reduce methane release coal mine and petroleum/natural gas ventilation collection CFCs named alternative material/HFCs/HCFCs/alcohols/HCs named alternative process/pump action sprays/stick deodorants named disposal method/incineration Montreal protocol NO_x energy conservation use of named non-combustion energy resource (only credit each resource once) catalytic converter urea sprays low temperature combustion Tropospheric ozone prevent release of NO_x credit each different method but not multiple examples of same method methods <u>must</u> be linked with a particular gas, except for legislation	max 8	AO1 3.2.1	**E**

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<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th><th>ID</th></tr>
<tr><td>9(d) cont…</td><td colspan="2">Quality of Written Communication</td><td>2</td><td></td><td></td></tr>
<tr><td></td><td>Mark</td><td>Descriptor</td><td></td><td></td><td></td></tr>
<tr><td></td><td>2</td><td>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.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>1</td><td>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.</td><td></td><td></td><td></td></tr>
<tr><td></td><td>0</td><td>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.</td><td></td><td></td><td></td></tr>
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<tr><td>Total</td><td colspan="2"></td><td>15</td><td></td><td></td></tr>
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