Version : 18/02/2010

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Education

Environmental Studies 1441

ENVS2 The Physical Environment

Mark Scheme

2010 examination – January series

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of candidates' 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.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX *Dr Michael Cresswell Director General*

Environmental Studies

January 2010 **ENVS2**

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

Question 1

	Answers	Mark
1	Sedimentation/settlement/filtration/lagoon/reservoir/static water**;** [**A** flocculation] dust/atmospheric particles/particulates**;** erosion/subsidence/landslide/unstable ground/heap collapse**;** (addition of) lime/named alkali/phytoremediation**;** [**R** reed beds] aesthetics/scarring of landscape/safety/erosion risk/landslides/subsidence/noise pollution**;**	5
Total		**5**

Question 2

	Answers	Mark
2(a)	Low/unreliable rainfall**;** justified temperature/justified evaporation rate**;** problems of water storage/supply**;** [**A** no major reservoirs] high population**;** level of industrialisation (including irrigation)**;** type of industry/agricultural practice**;** level of affluence**;**	MAX 2
2(b)	(Aquifer rock is) porous**;** (aquifer rock is) permeable**;** impermeable underlying rock/aquiclude**;** permeable rock above**;** named structure/syncline**;** named aquifer rock/aquiclude/cap rock**;**	MAX 3
2(c)	Reduced (future) supplies**;** lowered water table/reduced volume (in aquifer)**;** surface features dry up/reduced spring flow**;** details of ecological change/named taxon affected**;** salt water incursion**;** subsidence/collapse**;**	MAX 3
2(d)	Reduce evaporation losses**;** higher cost/environmental impact of construction of dam**;** land use conflict (of reservoir)/named conflict/habitat loss/dam barrier**;** reduced problem of named contaminant**;** reduced need for/cost of water treatment/named process not needed**;**	MAX 2
Total		**10**

Question 3

	Answers	Mark
3(a)(i)	Sedimentation**;** (water allowed to) stand/time (for settling)**;** **OR** flocculation**;** named flocculant/charges neutralised/allows clay particles to aggregate**;** **OR** clarification**;** floc/aggregated clay particles removal/settling/filtration**;** [**R** process without explanation]	2
3(a)(ii)	Sterilisation**;** named sterilising agent/chlorine/ozone/UV/iodine**;** **OR** flocculation**;** named flocculant/alum/aluminium sulfate/iron sulfate/polyelectrolytes/potato starch/aggregation/coagulation/sedimentation**;** **OR** aeration**;** oxygen toxic (to anaerobic bacteria)**;** [**R** process without explanation]	2
3(a)(iii)	Activated carbon treatment/filter**;** adsorption/stick on the surface**;** [**R** process without explanation]	2
3(b)	Poor public health**;** named health issue/disease eg cholera, typhoid, dysentery**;** mortality rate/life expectancy**;** ability to work/fewer workers**;** agricultural demand for water**;** named agricultural use/crop eg irrigation water**;** impact on food supply**;** time spent collecting water**;** quantity for named industrial activity**;** quality for named industrial activity**;** stated impact on development eg economic, infrastructure, trade, education, research**;**	MAX 4
Total		**10**

Question 4

	Answers	Mark
4(a)	Temperature atmospheric pressure**;** stratopause tropopause**;** stratosphere troposphere**;** both points needed for 1 mark	 1 1 1
4(b)(i)	Ozone**;** Absorption (by ozone)/conversion to chemical heat energy/stated chemical reaction**;**	 2
4(b)(ii)	Greenhouse gases/named greenhouse gas**;** infrared/longwave**;**	 2
4(c)	Fusion**;** joining of nuclei**;** small atoms/hydrogen**;** helium produced**;** $E = mc^2$/mass lost**;** electromagnetic radiation released**;**	 MAX 3
Total		**10**

Question 5

	Answers	Mark
5(a)	Hydrothermal/hot solutions**;** cooling/freezing out/coming out of solution/crystallisation/separation**;** in vein**;** magmatic segregation**;** crystal/mineral density/melting point**;** contact metasomatism**;** mineral/rock replacement**;** named mineral/ore**;** [**R** metal unless elemental mineral]	MAX 2
5(b)	Named technique**;;** description of how it works**;;** eg remote sensing monitoring from a distance/aerial/satellite surveys gravimetry density/force of gravity/igneous ores/named dense mineral scintillometry/Geiger counter radioactivity/named radioactive material magnetometry magnetic materials/magnetite/pyrrhotite/ilmenite/other named example resistivity ease of passage of electricity/metal ores/named ore seismic/sonar reflected/vibrations core sampling chemical/physical analysis IR emission analysis of different wave lengths geobotany plants associated with minerals	MAX 2

Question 5 continued

5(c)	Resource amount present/that can theoretically be exploited**;** reserve amount that can be exploited economically now/with existing technology**;**	2
5(d)	Named ore/mineral/metal**;** qualified ease of (chemical) separation/bond breaking**;** ref to reactivity**;**	MAX 2
5(e)	Named technique**;** detail of method**;** acid added dissolves bacteria/Thiobacillus acid produced bioconcentration hyperaccumulators/named taxon eg brassicas precipitation/displacement named chemical added eg Fe to displace Cu electrolysis ion deposition/electrode ion substitution named (ion) exchange material eg resin open-cast mining economies of scale	MAX 2
Total		**10**

Question 6

	Answers	Mark
6(a)	Lowest grade**;** that can be economically exploited**;**	2
6(b)	Increased amount**;** deeper mining**;** less labour intensive**;** lower production/extraction costs/increased profit/more can be spent on mining**;**	MAX 2
6(c)	Increased demand**;** higher (market) price/reduced cut-off ore grade**;** increased viability**;** **OR** increased supply**;** reduced price/increased cut off ore grade**;** reduced viability/shuts**;**	MAX 3
6(d)	Large sample numbers/long time period/regular samples/sample location**;** pH meter**;** calibration**;** **OR** pH papers/solution/universal indicator/ref to pH/values**;** colour comparison**;** barium sulfate/sediment removal**;** [**R** litmus papers]	MAX 3
Total		**10**

Question 7

	Answers	Mark
7(a)	20 ($\pm$ 1)**;**	1
7(b)	35 ($\pm$ 1)**;**	1
7(c)	Dry soil**;** weigh sample (of dry soil afterwards)**;** heat to approx 500 °C/with Bunsen burner**;** burn off/oxidise organic matter**;** re-weigh (burnt soil)**;** constant mass**;** mass difference = OM content (dry – burnt)**;** calculate OM as a percent of dry soil**;**	MAX 4
7(d)	Nitrogen fixation**;** root nodules**;** nitrification**;** dentrification**;** decomposition**;** nutrients released**;** named nutrient (released)**;;** humification**;** weathering**;** respiration**;** pH change/organic acids produced**;** toxin production**;** named bacterial taxa eg Rhizobium, Nitrobacter, Nitrosomonas, Azotobacter, Pseudomonas, Nostoc**;;**	MAX 4
Total		**10**

Question 8

	Answers	Mark
8(a)	Balanced processes**;** two named processes**;** effect of both processes**;** use of values/times**;**	MAX 3
8(b)	Named activity**;;** stated effect**;;** eg fossil fuel combustion released CO_2/increased atmospheric CO_2 concentration deforestation released CO_2/increased atmospheric CO_2 concentration reforestation/afforestation absorbed CO_2/reduced atmospheric CO_2 concentration ploughing increased respiration/released CO_2/increased atmospheric CO_2 concentration	2+2
8(c)	Named precaution with effect on reliability**;;;** eg sample locations for representative data number of samples reduces anomalies/calculate mean timing of sampling to allow for fluctuations sample size to give representative data standardised method for comparability/control other variables equipment calibration for accuracy use of control for comparison	MAX 3
Total		**10**

Question 9

	Answers	Mark
9(a)	Specific altitude range, stated change**;;;** 10 to 23 km reduced 14 to 20 km reduced to (near) zero up to 10 km/ in the troposphere little change 23 to 30 km little change [**A** verbal description eg lower, middle, higher altitude, including ref to single altitudes within these ranges] reference to ozone concentration (from graph)**;** [**R** explanations]	MAX 3
9(b)	Increased UV**;** named effect of UV/DNA damage/cancer/eye damage/plant tissue damage/ sunburn/skin damage/mutations**;**	2

Question 9 continued

<table>
<tr>
<td>**9**(c)</td>
<td>
Legislation/law/agreement/eg Montreal Protocol**;**

ban manufacture (of ODS)**;**
ban/reduce use**;**

named use of ODS/ozone depleting substance **;**
named ODS**;**

named eg of alternative material**;;**

named eg of alternative process/activity**;;**
description of why alternative doesn't deplete ozone**;**

better disposal of named waste**;**

description of named disposal process**;**

education**;**
sunscreen**;**
hat/clothing**;**
named country (using method)**;** MAX 8

Quality of Written Communication
<table>
<tr><th>Mark</th><th>Descriptor</th></tr>
<tr><td>2</td><td>All material is logically presented in clear, scientific English and continuous prose. Technical terminology has been used effectively and accurately throughout. At least half a page of material is presented.</td></tr>
<tr><td>1</td><td>Account is logical and generally presented in clear, scientific English. Technical terminology has been used effectively and is usually accurate.
Some minor errors. At least half a page of material is presented.</td></tr>
<tr><td>0</td><td>The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.</td></tr>
</table>
</td>
<td>8 + 2</td>
</tr>
<tr>
<td>**Total**</td>
<td></td>
<td>**15**</td>
</tr>
</table>