Version 1.0

General Certificate of Education (A-level)
June 2011

Environmental Studies ENVS2

(Specification 2440)

Unit 2: The Physical Environment

Mark Scheme

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Environmental Studies

June 2011 **ENVS2**

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

Question 1

	Answers	Mark
1	Sedimentary biological**;** sedimentary evaporite**;** metamorphic**;** igneous**;** sedimentary alluvial/placer**;**	5
Total		**5**

Question 2

	Answers	Mark
2(a)	Balancing processes**;** named processes**;** eg percolation and groundwater/basal flow [**A** human activities]	2
2(b)	Sandstone**;** limestone**;** chalk**;** [**A** gravel/sand]	MAX 2
2(c)	Reference to pore space**;** high porosity/high water storage volume**;** reference to flow (rate)**;** high permeability/rapid flow (through aquifer) for recharge/abstraction**;** [**R** references to rocks above and below aquifer for marking points 2 and 4]	4
2(d)	Lowered water table/volume drops/cone of depression**;** lowered (water) pressure**;** inflow of seawater/salt water incursion**;** [**A** evaporation of surface water] [**A** salt left behind]	MAX 2
Total		**10**

Question 3

	Answers	Mark
3(a)	Nitrogen gas/N_2 to ammonia/ammonium**/** soil living nitrogen fixing bacteria/*Nostoc/Azotobacter*; [**R** root nodules, legumes, Rhizobium] [**R** unqualified N fixation] ammonium to nitrite**/**nitrification/*Nitrosomonas*; nitrite to nitrate/nitrification**/***Nitrobacter*; credit nitrification only once nitrate to nitrogen gas/N_2**/**denitrification/*Pseudomonas*; nitrates to amino acids/protein; protein to ammonium**/**decomposition; [**A** processes that combine sequence eg ammonium to nitrate]	MAX 2
3(b)	Proteins; amino acids; enzymes; hormones; named use eg cell membranes; nucleic acids/DNA/RNA;	MAX 1
3(c)	(Large) number of samples; standardised collection method eg use of auger/same depth/ sealed/cool storage; reduce effect of variability; allows use of statistics test; similar size/large enough size of samples; location/spacing of samples/random/systematic/stratified; representation of whole field/eliminate bias/choice; [**R** transect] detail of timing of sampling; remove effect of weather/seasons;	MAX 5
3(d)	no gaseous/atmospheric reservoir; low solubility/slow weathering (therefore slow release from geological reservoir); [**R** (totally) insoluble]	2
Total		**10**

Question 4

	Answers	Mark
4(a)(i)	(Coal)mine ventilation during fossil fuel extraction/ pipeline leakage/incomplete combustion (of methane)**;** [**A** methane from melting permafrost/seabed due to GCC (caused by fossil fuel use)]	1
4(a)(ii)	Anaerobic decomposition/respiration/digestion/fermentation**;** organic matter**/**bacteria**;**	2
4(b)	Landfill tax/reduced use of landfill**;** named alternative method eg composting/recycling/incineration**;** methane collection at landfill sites**;** combustion/use of methane**;** collection of mine/oil well ventilation gases**;** change in diet of livestock**;** [**R** reduce livestock numbers]	MAX 4
4(c)	Depletion of (stratospheric) ozone**;** [**A** damage to ozone layer/creation of ozone hole] chlorine released (from CFC)**;** specific chemical reaction**;** increased UV reaches Earth/less UV absorbed by ozone**;** mutations/cancer/skin damage/eye damage**;**	MAX 3
Total		**10**

Question 5

	Answers	Mark
5(a)(i)	Carbonate rocks/fossil fuels/named example eg limestone, chalk, carbonaceous sandstone, marble, oolite, coal, peat**;**	1
5(a)(ii)	Hydrogen carbonate ions/(dissolved) CO_2/carbonic acid**;**	1
5(a)(iii)	Lipid/carbohydrate/protein**;** [**A** named major example eg cellulose/lignin/starch/sugars]	1
5(b)	3**;**	1
5(c)	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**;** constant mass**;** mass drop/dry mass – final mass**;** [accept as part of equation] correct percentage calculation/mass drop divided by dry mass X 100**;**	MAX 6
Total		**10**

Question 6

	Answers	Mark
6(a)	Sealed airtight container/refrigeration/cool/weighed immediately**;**	1
6(b)	Soil weight number 5**;** [**A** 21 (grams)]	1
6(c)	21–12**;** 9**;** award both marks if only figure 9 given	2
6(d)(i)	100^{o}C**;** [**A** any value in range 85 – 120^{o}C]	1
6(d)(ii)	500^{o}C**;** [**A** any value in range 150 – 825^{o}C]	1
6(e)	Addition of OM (linked to water content): amount of biota**;** that produce OM**;** breakdown of OM (linked to water content): low O_2**;** low pH**;** number of decomposers**;** rate of decay [**A** no decay]**;**	MAX 4
Total		**10**

Question 7

	Answers	Mark
7(a)	Named process affected by vegetation, named reservoir affected**;;** [**A** two reservoirs affected by 1 process] eg transpiration - in soil/atmosphere interception - in soil/atmosphere root absorption - in soil/biosphere soil OM water retention - soil/groundwater/rivers reduced runoff - soil/rivers/atmosphere	2
7(b)	Less dense (below 4^{o}C)**;** floats**;** prevents water below from freezing**;**	MAX 2
7(c)	Rate of decay**;** water for named function**;** effect on aerobic/anaerobic conditions**;** named (aerobic) soil biota activity**;** named (anaerobic) soil biota activity**;** thermal capacity**;** pH**;** effect on root penetration**;** (dissolved) nutrients available**;** effect on leaching**;**	MAX 2
7(d)	Range of particle sizes/named textural class**;** named properties**;;** eg percolation rate/permeability porosity aeration water retention [**R** waterlogging] ease of root penetration thermal capacity/rate of temperature change effect of textural class on named property**;** eg sandy soils have high permeability/low water retention/easy root penetration clay soils have high water retention/high thermal capacity/low aeration [**R** reference to structure/peds]	4
Total		**10**

Question 8

	Answers	Mark
8(a)(i)	(Total) amount that could be theoretically exploited**;** using possible future technology/at possible future prices**;**	2
8(a)(ii)	The amount (of the resource) that can be exploited now**;** using current technology/at current market prices/economically viable**;**	2
8(b)	Drops**;**	1
8(c)	Technique**;** descriptive comment/example**;** **eg** production of acid solution dissolve metal/copper biorecovery/bacterial action/*Thiobacillus* metal solubility/copper/platinum hyperaccumulators/plant absorption absorb/increase concentration/later extraction/heavy metals electrolysis production of solution/precipitation/deposition/copper [**R** aluminium] chemical precipitation control of pH/oxidation level/addition of chemical/copper/iron ion absorption named absorber eg ion exchange resin, zeolite sands/uranium increased mechanisation economies of scale/reduced unit costs [**R** unqualified reference to cheaper] [**R** reference to exploratory techniques]	2
8(d)	Multiple samples**;** pH meter**;** calibration**;** **OR** pH papers/<u>universal</u> indicator/ref to pH values**;** colour comparison**;** barium sulfate/sediment removal/filter**;** [**R** litmus paper/two colours only]	MAX 3
Total		**10**

Question 9

	Answers	Mark
9(a)	Increase albedo/increased reflectivity/pale coloured surfaces/named surface**;** less light absorbed/less heat generated**;** [**A** solar radiation]	2
9(b)	Increase surface permeability**;** named change eg less concrete/more soil, less compaction, more drains**;** consequence of change**;;** eg infiltration/percolation reduced runoff volume/more water retention flood prevention	MAX 3

Question 9 continued

<table>
<tr>
<td>9(c)</td>
<td>
Stated change in weather pattern/ocean current;;;;
<u>linked</u> description of cause of change (in weather/current);;;;
<u>linked</u> description of consequence of change (for weather/current);;;;
credit named example of <u>one</u> ocean current, <u>one</u> wind pattern;;
eg El Niño, La Niña, North Atlantic Conveyor, monsoons, hurricanes, tornadoes

eg

details of changes in:
temperature
warmer/colder
precipitation
type
amount
seasonality
storms
winds
direction
velocity
seasonal changes
cloud cover
albedo/reflection
light levels
temperature
ocean currents
direction
velocity
temperature
precipitation/humidity
salinity
density

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. 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></tr>
<tr><td>1</td><td>Account is logical and generally presented in clear, scientific English. Minor errors occur in spelling, punctuation and grammar. 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>
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<td>MAX 8

2</td>
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<td>Total</td>
<td></td>
<td>15</td>
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