



**General Certificate of Education (A-level)
January 2012**

Environmental Studies

ENVS2

(Specification 2440)

Unit 2: The Physical Environment

Mark Scheme

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

Question 1

	Answers			Mark
1	Mineral resource	Formation process	Major uses	5
	Iron oxide	Igneous and sedimentary	Building construction	
	Limestone	Sedimentation/ sedimentary/precipitation/ biological;	Roadstone/ aggregate/cement/ mortar/glass/ building construction/ pH controls/aquifer/steel production;	
	Sand	Sedimentary placer deposit	(Building) mortar/ concrete/named construction use/glass/ water filtration/aquifer;	
	Granite	Igneous/intrusion/ batholith/crystallisation;	Road surfaces	
	Halite (sodium chloride salt)	Sedimentary/ sedimentation/evaporite/ evaporation/precipitation/ crystallisation;	Chlorine for the chemical industry	
	[A specific details of processes]			
Total				5

Question 2

	Answers	Mark
2(a)	Payment per volume used/knowledge of volume used; encourages conservation/usage reduced/wastage reduced; [A named method of reducing usage/leakage] [R meter restricts the amount of water available]	2
2(b)(i)	Dual flush; avoids unnecessary use/option to use less; OR low volume (cistern) more streamlined water flow design//brick/hippo bag; uses less water; OR composting toilet/water repelling (no flush) urinal/chemical toilet; no flush/no water use;	2
2(b)(ii)	Recycling (of used water); [R rainwater] to reduce use of more purified water//for low quality use/example of use; [A correct use of rainwater]	2
2(c)	Abstraction damage reservoir site flooding/habitat loss; dam site/treatment works construction/habitat loss/land take; water table lowered (by aquifer exploitation); named surface feature affected/water features dry up; change in biota due to drying; subsidence; salinisation; changes in river velocity/flow rate; change in sedimentation/erosion; treatment impacts energy use; saline waste water; use of chemicals; waste water reduced waste volume; treat wastes instead of discharge; use of chemicals;	MAX 4
Total		10

Question 3

	Answers	Mark
3(a)(i)	(Absorption of) IR/long wave; emitted by/from Earth/ground; [R reflect] maximum absorption nearest Earth/ground/ absorption decreases with distance from (surface of) Earth/ground;	MAX 2
3(a)(ii)	(Absorption of) UV/short wave; [R heat] from above/Sun; absorption decreases with distance down from stratopause; [R downwards from sun] [R closer to the Sun]	2
3(b)	(Upper troposphere) too cold (to hold water vapour); (water vapour) condenses/freezes/precipitates (before reaching stratosphere);	MAX 1
3(c)(i)	Splitting of diatomic oxygen/ $O_2 \rightarrow O + O$ /reverse reaction; ozone to diatomic and monatomic oxygen/ $O_3 \rightarrow O_2 + O$; [A reverse reaction if appropriate] reverse reaction/ $O_2 + O \rightarrow O_3$; 2 marks if reversible reaction shown in formula ($O_2 + O \rightleftharpoons O_3$)	MAX 2
3(c)(ii)	CFCs; named use of CFCs; eg aerosol propellants refrigerant solvent CFCs absorb UV; chlorine (released from CFCs); (chlorine) reaction with ozone/monatomic oxygen/chemical reaction equations;; $Cl + O \rightarrow ClO$ $ClO + O \rightarrow ClO_2$ $Cl + O_3 \rightarrow ClO + O_2$ [A details for other ODSs bromine, iodine, stratospheric oxides of nitrogen]	MAX 3
Total		10

Question 4

	Answers	Mark
4(a)	Thermal expansion; melting of land ice/ice <u>caps</u> /glaciers/ice from land enters sea;	2
4(b)	Increased (coastal) erosion; saltwater incursion/intrusion; [A colonisation by displaced populations/isolation of populations (in high areas) by flooding]	MAX 1
4(c)	No suitable habitat exists/not able to adapt to new environment/(outside) range of tolerance/named habitat problem; no suitable habitat close/isolation; no biological corridor; rate of change too fast/colonisation too slow; interdependence problems; over population/more (intraspecies) competition; named example/taxon to illustrate difficulty;	MAX 3
4(d)	Initial change results in further/additional change of same factor; explanation of change;;; faster soil decomposition increased CO ₂ emissions more IR absorbed OR reduced CO ₂ solubility increased CO ₂ in atmosphere more IR absorbed OR melting permafrost/warming sea increased CH ₄ emissions more IR absorbed OR melting land/sea ice reduced albedo more sunlight absorbed OR drier forest fires CO ₂ released more IR absorbed [A different points from more than one explanation] [A converse explanation for cooling]	4
Total		10

Question 5

	Answers	Mark
5(a)	Positive correlation (description of changing values/direct relationship); increasing gradient/non-linear increase/exponential;	2
5(b)(i)	Air cooled (by cold current); lower evaporation/water vapour condenses and falls over the sea/does not reach land/low humidity;	2
5(b)(ii)	(Warm) air retains/picks up water vapour/more evaporation/more humid; (more moisture) carried to the land (causing more rain);	2
5(c)	Melting land ice; (freshwater) flows into sea; (seawater becomes) less saline; less dense; does not sink/sinks more slowly(due to lower density); obstructs surface current; [R changes in wind velocity]	MAX 4
Total		10

Question 6

	Answers	Mark
6(a)(i)	(Measure of) range/scatter/spread/variation of values (around the mean); [R highest and lowest] gives indication of overlap/no overlap/little overlap – likely to be significantly different;	2
6(a)(ii)	No yes;	1
6(b)	Texture affects infiltration/permeability; degree of earthworm irritation/contact; amount needed for saturation; proportion of earthworms coming to surface; correct reference to effect of sand/silt/clay on one factor; [R reference to structure]	MAX 3
6(c)(i)	0.8;	1
6(c)(ii)	0.2;	1
6(c)(iii)	More food/DOM/leaves nearer the surface/ no food source deep down; [R humus] too dry at surface; waterlogged deeper; too compact to burrow deep down; predators/birds at surface; different earthworm species; younger earthworms near surface; less oxygen/aeration at depth; too hot/cold at surface; toxicity/irritability/range of tolerance due to pH/chemical composition at specified depths; [R reference to light]	MAX 2
Total		10

Question 7

	Answers	Mark
7(a)(i)	<p>Water filtered (by chalk)/percolates through; low turbidity/suspended solids/suspended clay; more constant flow; low pesticide pollution; low fertiliser pollution; lower overall treatment (costs); [A converse for river A not being used]</p>	MAX 3
7(a)(ii)	<p>Sedimentation/(sand) filtration; remove suspended solids/reduce turbidity; flocculation/named flocculant/clarification; remove clay; <u>activated</u> carbon treatment; pesticide removal/organic chemical removal; ion exchange/reverse osmosis; nitrate removal; tertiary treatment/iron sulfate addition; phosphate stripping; pH adjustment; addition of lime;</p>	MAX 4
7(b)	<p>Quality feature; [A with incorrect use or without use] uses linked to quality feature;; reason for suitability/non-suitability/problem caused; eg hardness/calcium ion content textile industry scum formation OR heavy metal content crop irrigation toxicity OR turbidity cooling water/HEP clogging/blocking pipes/surface erosion OR salinity crop irrigation osmotic dehydration</p>	MAX 3
Total		10

Question 8

	Answers	Mark
8(a)(i)	<p>Tüllgren funnel; light/heat; soil sample below; organisms repelled/move down/pass through mesh; collected (in container);</p> <p>OR</p> <p>sieving/filtration/flotation; hand sort; pooter;</p>	MAX 3
8(a)(ii)	<p>Organisms are not mobile/too slow; organisms are not repelled by/are attracted to light/heat; too large/big to pass through holes/grill/mesh/filter; [R too large to enter funnel] desiccation/die;</p> <p>OR</p> <p>organisms not seen; organisms too large/too small (for extraction method); organisms adhere to soil; damage to organisms;</p>	MAX 2
8(b)(i)	<p>Justified link between named factor and detritivore number;;</p> <p>eg lower trampling link to a high detritivore number lower pH link to a low detritivore number low <u>and</u> high water content link to a low detritivore number low <u>and</u> high organic matter link to a low detritivore number low oxygen level link to a low detritivore number slow infiltration link to a low detritivore number</p> <p>[A converse]</p>	2
8(b)(ii)	<p>Trampling causes compaction; lower oxygen level/aeration/air spaces; fewer living organisms/slower decomposition/trampling reduces vegetation;</p> <p>[A converse]</p>	3
Total		10

Question 9

	Answers	Mark								
9(a)	<p>Fixation in soil/conversion of gas to ammonium; (<i>Azotobacter/Nostoc</i>)</p> <p><u>fixation</u> in root nodules/legumes; (<i>Rhizobium</i>)</p> <p>nitrification/oxidation/ammonium to nitrite/nitrite to nitrate/ammonium to nitrate; (<i>Nitrobacter/Nitrosomonas</i>)</p> <p>dentrification/reduction/nitrate to nitrogen gas; (<i>Pseudomonas/Clostridium</i>)</p> <p>breakdown of DOM/ammonification/protein to ammonium; (decomposers/fungi/named bacterium)</p> <p>named taxon linked to named process;;;</p>	MAX 3								
9(b)(i)	<p>Atmosphere;</p> <p>[A (ammonium ions in) lithosphere/<i>rocks/igneous rocks/sedimentary rocks/sediment (nfp)</i>]</p>	1								
9(b)(ii)	<p>(Phosphates in) lithosphere;</p> <p>[A rocks/sediment]</p>	1								
9(c)	<p>Named human activity that affects a cycle;;;;</p> <p>named benefit;;;;</p> <p>named problem;;;;</p> <p>Energy supplies chemical industry food production forestry changed land use pollution</p> <p><i>Quality of Written Communication</i></p> <table border="1"> <thead> <tr> <th>Mark</th> <th>Descriptor</th> </tr> </thead> <tbody> <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> </tbody> </table>	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. 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.	0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.	MAX 8
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Total		15								

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