Version 1.0

General Certificate of Education (A-level)
June 2013

Environmental Studies ENVS2

(Specification 2440)

Unit 2: The Physical Environment

Final

Mark Scheme

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 events which all examiners 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 examiner understands and applies it in the same correct way. As preparation for standardisation each examiner 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, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

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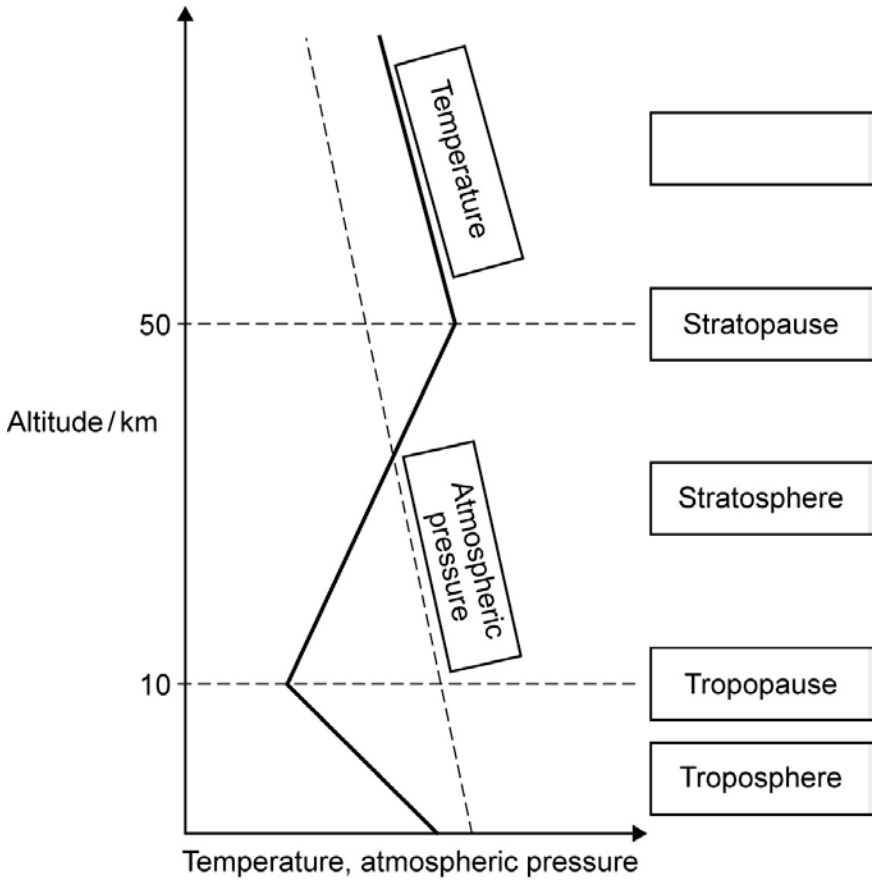
Environmental Studies

June 2013 **ENVS2**

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

Question 1

	Answers	Mark
1(a)	 2 correct for each mark**;;;** [**R** just pressure]	3
1(b)	Nuclear/(hydrogen) nuclei**;** fusion/joining**;** hydrogen/deuterium/tritium**;** $E = mc^2$**;** [**R** hydrogen if related to chemical bonds/reacting/fission] [**R** fussion]	MAX 2
Total		**5**

Question 2

	Answers	Mark
2(a)(i)	(**X** =) 382**;** (**Y** =) 72**;** [**A** correct value for **Y** based on <u>calculated</u> value for **X**]	2
2(a)(ii)	3190.5**;** [**A** 3190 – 3191] [**A** correct answer based on incorrect value for **X** in **(a)(i)**]	1
2(b)(i)	Infiltration – (water) flow into ground**;** [**A** absorbed by] percolation – flow through ground/between rock/soil particles**;**	2
2(b)(ii)	Porosity – space volume/amount of water that can be held**;** permeability – rate of flow of fluids through**;** [**R** ability]	2
2(c)(i)	Reservoirs/dam**;** irrigation**;** power station/cooling towers/water cooling in named industry**;** hydrocarbon/fossil fuel/hydrogen/biofuel combustion**;** afforestation**;** named activity that results in global warming**;**	MAX 2
2(c)(ii)	Condensation/precipitation/short residence time**;**	1
Total		**10**

Question 3

	Answers	Mark
3(a)	Many sample locations**;** many samples at each location**;** samples from most of the field**;** regular spacing/equal distances/systematic sampling/not clustered**;** named soil characteristic altered in atypical areas**;** eg nutrient content, pH, water content, organic matter content representative sub-sample/mixed soil**;** study area has one soil type/recent farming style**;**	MAX 4
3(b)	Precaution**;;** linked reason that increases comparability**;;** [**A** suitable reason that increases comparability even if precaution is incorrect/too vague] eg large size of sample minimize effect of variable composition same sample size same composition/variability sample to the same depth sample same layers same time since rain allow for addition of water/drainage same temperature/wind conditions same evaporation [**R** unqualified reference to weather] core sampler/auger/named sampling equipment standardise sample storage to prevent change to prevent water gain/water loss/decay	4
3(c)(i)	60**;**	1
3(c)(ii)	45 – 70/70 – 45**;** [**A** 45 ± 0.5 – 70] [**A** 24.5 – 25.5]	1
Total		**10**

Question 4

	Answers	Mark
4(a)	Sandstone/limestone/chalk**;** [**A** sand/gravel]	1
4(b)	High porosity**;** high permeability**;** [**R** description of base/cap rock]	2
4(c)	Lowered water table/level/cone of depression/reduced pressure**;** inflow of seawater/salt water incursion/recharged with salt water**;**	2
4(d)	Less energy/pressure/cost (of exploiting aquifer water)**;** [**A** converse relating to desalination]	1
4(e)	(Aquifer/cap rock) acts as a filter**;** aquifer water composition changes slowly so easier to monitor/predict**;** river water changes quickly so precautionary treatment needed**;** named contaminant more likely in river**;;;** eg soil/turbidity/suspended solids floating solids/plastics/named debris bacteria/pathogens/sewage pesticides fertilisers heavy metals/named toxin	MAX 4
Total		**10**

Question 5

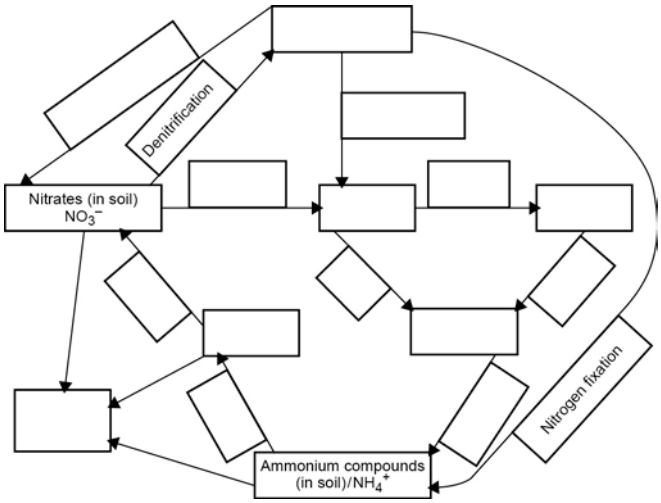
	Answers	Mark
5(a)(i)	Acoustic insulation (of machinery)**;** absorption**;** baffle mounds/embankments/walls/vegetation; buffer zone**;** reflection/deflection**;** operations at less annoying times/time zoning**;** maintenance/lubrication of machinery**;** transport routes away from sensitive areas**;**	MAX 2
5(a)(ii)	Water sprays**/**sprinklers/bowsers/road washing**;** settling/collection; compaction**;** vegetation/trees**;** covered loads**;** filters/face masks/electrostatic precipitator/cyclone separator**;**	MAX 2
5(b)	Cause**;;** linked damage**;;** [**A** suitable damage example even if cause incorrect] [**A** two examples of linked damage to one cause] eg proximity to sensitive areas aesthetics mobility of pollutants more overburden removed waste disposal greater surface disturbance habitat loss turbid drainage water reduced light/photosynthesis/smothering organisms (spoil) leachate named toxic material more/larger spoil heaps stability/landslides	MAX 4

Question 5 continues on the next page . . .

Question 5 continued . . .

	Answers	Mark
5(c)	Large sample numbers/long time period/regular samples/sample location**;** **method detail** pH meter/probe**;** calibration**;** **OR** pH papers/pH solution/universal indicator**;** colour comparison**;** barium sulphate/sediment removal**;** [**R** litmus papers]	MAX 2
Total		**10**

Question 6

	Answers	Mark
6(a)	 [**A** (chemical) reduction in place of Denitrification] [**A** ammonium ions/ammonia/NH_3 in place of Ammonium compounds]	4
6(b)(i)	Aeration/aerobic conditions**;** reduced denitrification**;** increase nitrification**;** increased nitrogen fixation**;** increased decomposition**;** release ammonia/ammonium**;** increased leaching/drainage of named nitrogen ion/compound/nitrogen fertiliser**;** increased eutrophication**;**	MAX 2
6(b)(ii)	Root nodule bacteria/Rhizobium**;** (increased) nitrogen fixation**;**	2
6(b)(iii)	Reduced DOM/decomposition**;** fewer decomposers/detritivores/named taxon**;** less ammonia/ammonium/nitrate/nutrient release**;** increased outflow (to rivers/sea from sewage)**;**	MAX 2
Total		**10**

Question 7

	Answers	Mark
7(a)	Drying/removal of water**;**	1
7(b)	**Storage 1** to reduce decomposition/breakdown (of DOM)/enzyme action**;** **Storage 2** to prevent gain of water**;**	2
7(c)	500**;** [**A** 150 – 825]	1
7(d)	28 – 12 = 16**;** (16/28 x 100) = 57/57.1/57.14**;** [**A** correct value based on calculated value for MP1] ***2** marks for correct final answer with no working*	2
7(e)	Detritivores**;** named detritivore taxon**;** (detritivores) produce smaller pieces/increase surface area**;** decomposers**;** named decomposer taxon**;** digestion/enzyme action**;** nutrient release/excretion**;**	MAX 4
Total		**10**

Question 8

	Answers	Mark
8(a)	Positive correlation/direct relationship**;** scatter/outliers/anomalies**;**	2
8(b)	**Economic factor** affecting water use**;;;** eg ability to afford water for named personal use/hygiene/recreation ability to afford to buy water-using appliances/named water-using appliance income affects industrial/agricultural demand for water ability to afford water supply infrastructure **Non-economic factor** affecting water use**;;;** eg hot climate increases irrigation need for agriculture ease of access to water affects volume used conservation ethos type/level of industry	MAX 4

Question 8 continues on the next page . . .

Question 8 continued . . .

	Answers	Mark
8(c)	**Changed behaviour;;** eg shower instead of bath shorter showers/smaller baths/turn off taps full wash in washing machine/dishwasher water meter/conservation encouraged by pricing use of bans - hosepipe bans **water saving equipment;;** eg low water use dishwasher/washing machine hippo bags automatic sensor/timed/manual pump taps/flush/dual flush spray taps push taps low water-requirement plants **reduced losses;;** eg domestic appliance maintenance pipe leak reduction mulching **low quality uses of untreated water;;** eg dual supply rainwater collection grey water reuse	MAX 4
Total		**10**

Question 9

<table>
<tr><th></th><th>Answers</th><th>Mark</th></tr>
<tr><td>9(a)(i)</td><td><table><tr><th>Ozone Depletion</th><th>GCC</th></tr><tr><td>UV/short wave</td><td>IR/long wave</td></tr></table> ;</td><td>1</td></tr>
<tr><td>9(a)(ii)</td><td><table><tr><th>Ozone Depletion</th><th>GCC</th></tr><tr><td>stratosphere/ ozonosphere
[A ozone layer]</td><td>troposphere</td></tr></table> ;</td><td>1</td></tr>
<tr><td>9(a)(iii)</td><td><table><tr><th>Ozone Depletion</th><th>GCC</th></tr><tr><td>downwards/incoming/ from Sun</td><td>upwards/outgoing/ from Earth</td></tr></table> ;</td><td>1</td></tr>
<tr><td>9(a)(iv)</td><td><table><tr><th>Ozone Depletion</th><th>GCC</th></tr><tr><td>source of chlorine</td><td>absorbs IR/ greenhouse gas</td></tr></table> ;</td><td>1</td></tr>
<tr><td>9(a)(v)</td><td><table><tr><th>Ozone Depletion</th><th>GCC</th></tr><tr><td>Montreal Protocol</td><td>Kyoto Protocol</td></tr></table> ;</td><td>1</td></tr>
</table>

Question 9 continues on the next page . . .

Question 9 continued . . .

	Answers	Mark
9(b)	**Positive feedback mechanisms** increase the magnitude of an initial event**;** initial event of positive feedback mechanism**;;** how increased global climate change is caused**;;;;** eg raised temperature increases rate of decay more carbon dioxide released raised temperature melts permafrost methane released raised temperature melts ice lowered albedo/more energy absorbed hotter/drier climate more forest/peat fires carbon dioxide released warmer oceans melt methane hydrate methane released **Negative feedback mechanisms** reduce the magnitude of an initial event/re-establish equilibrium**;** Initial event of negative feedback mechanism**;;** how reduced global climate change/Gaia/equilibrium is caused**;;;;** eg raised temperature increases evaporation/cloud cover increased albedo/reflection increased carbon dioxide more plant growth/photosynthesis plants absorb more carbon dioxide Credit each marking point max once only for **positive** and once only for **negative** feedback mechanisms	MAX 8

Question 9 continues on the next page . . .

Question 9 continued . . .

<table>
<tr><th></th><th>Answers</th><th>Mark</th></tr>
<tr><td></td><td>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 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></tr><tr><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></tr></table></td><td>2</td></tr>
<tr><td>Total</td><td></td><td>15</td></tr>
</table>

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