



**General Certificate of Education**

**Environmental Studies 1441**

**ENVS2      The Physical Environment**

**Mark Scheme**

*2010 examination – January series*

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**Environmental Studies****January 2010****ENVS2****Instructions: ; = 1 mark / = alternative response A = accept R = reject****Question 1**

	<b>Answers</b>	<b>Mark</b>
<b>1</b>	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
<b>Total</b>		<b>5</b>

**Question 2**

	<b>Answers</b>	<b>Mark</b>
<b>2(a)</b>	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
<b>2(b)</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
<b>2(c)</b>	Reduced (future) supplies; lowered water table/reduced volume (in aquifer); surface features dry up/reduced spring flow; <u>details</u> of ecological change/named taxon affected; salt water incursion; subsidence/collapse;	MAX 3
<b>2(d)</b>	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 <u>named</u> contaminant; reduced need for/cost of water treatment/named process not needed;	MAX 2
<b>Total</b>		<b>10</b>

**Question 3**

	<b>Answers</b>	<b>Mark</b>
<b>3(a)(i)</b>	Sedimentation; (water allowed to) stand/time (for settling); <b>OR</b> flocculation; named flocculant/charges neutralised/allows clay particles to aggregate; <b>OR</b> clarification; floc/aggregated clay particles removal/settling/filtration; [ <b>R</b> process without explanation]	2
<b>3(a)(ii)</b>	Sterilisation; named sterilising agent/chlorine/ozone/UV/iodine; <b>OR</b> flocculation; named flocculant/alum/aluminium sulfate/iron sulfate/polyelectrolytes/potato starch/aggregation/coagulation/sedimentation; <b>OR</b> aeration; oxygen toxic (to anaerobic bacteria); [ <b>R</b> process without explanation]	2
<b>3(a)(iii)</b>	Activated carbon treatment/filter; adsorption/stick on the surface; [ <b>R</b> process without explanation]	2
<b>3(b)</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
<b>Total</b>		<b>10</b>

**Question 4**

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

**Question 5**

	<b>Answers</b>	Mark
5(a)	<p>Hydrothermal/hot solutions; cooling/freezing out/coming out of solution/crystallisation/separation; in vein;</p> <p>magmatic segregation; crystal/mineral density/melting point;</p> <p>contact metasomatism; mineral/rock replacement;</p> <p>named mineral/ore; [R metal unless elemental mineral]</p>	MAX 2
5(b)	<p>Named technique;; description of how it works;; eg remote sensing monitoring from a distance/aerial/satellite surveys</p> <p>gravimetry density/force of gravity/igneous ores/named dense mineral</p> <p>scintillometry/Geiger counter radioactivity/named radioactive material</p> <p>magnetometry magnetic materials/magnetite/pyrrhotite/ilmenite/other named example</p> <p>resistivity ease of passage of electricity/metal ores/named ore</p> <p>seismic/sonar reflected/vibrations</p> <p>core sampling chemical/physical analysis</p> <p>IR emission analysis of different wave lengths</p> <p>geobotany plants associated with minerals</p>	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
<b>Total</b>		<b>10</b>



**Question 6**

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

**Question 7**

	<b>Answers</b>	<b>Mark</b>
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; denitrification; 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
<b>Total</b>		<b>10</b>

**Question 8**

	<b>Answers</b>	<b>Mark</b>
<b>8(a)</b>	Balanced processes; two named processes; effect of both processes; use of values/times;	MAX 3
<b>8(b)</b>	Named activity;; stated effect;;  eg fossil fuel combustion released CO <sub>2</sub> /increased atmospheric CO <sub>2</sub> concentration  deforestation released CO <sub>2</sub> /increased atmospheric CO <sub>2</sub> concentration  reforestation/afforestation absorbed CO <sub>2</sub> /reduced atmospheric CO <sub>2</sub> concentration  ploughing increased respiration/released CO <sub>2</sub> /increased atmospheric CO <sub>2</sub> concentration	2+2
<b>8(c)</b>	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
<b>Total</b>		<b>10</b>

**Question 9**

	<b>Answers</b>	<b>Mark</b>
<b>9(a)</b>	<p>Specific altitude range, stated change;;;</p> <p>10 to 23km reduced  14 to 20km reduced to (near) zero  up to 10km/ in the troposphere little change  23 to 30km 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]</p>	MAX 3
<b>9(b)</b>	<p>Increased UV;  named effect of UV/DNA damage/cancer/eye damage/plant tissue damage/  sunburn/skin damage/mutations;</p>	2

**Question 9 continued**

<p><b>9(c)</b></p>	<p>Legislation/law/agreement/eg Montreal Protocol;</p> <p>ban manufacture (of ODS); ban/reduce use;</p> <p>named use of ODS/ozone depleting substance ; named ODS;</p> <p>named eg of alternative material;;</p> <p>named eg of alternative process/activity;; description of why alternative doesn't deplete ozone;</p> <p>better disposal of named waste;</p> <p>description of named disposal process;</p> <p>education; sunscreen; hat/clothing; named country (using method);</p> <p style="text-align: right;">MAX 8</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. 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> </tbody> </table>	Mark	Descriptor	2	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.	1	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.	0	The account is generally poorly constructed and often fails to use an appropriate scientific style to express ideas.	<p style="text-align: right;">8 + 2</p>
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<p><b>Total</b></p>		<p style="text-align: right;"><b>15</b></p>								