

**Subject: ...Environmental Chemistry .....**  
**..... Code: 2815/03.....**

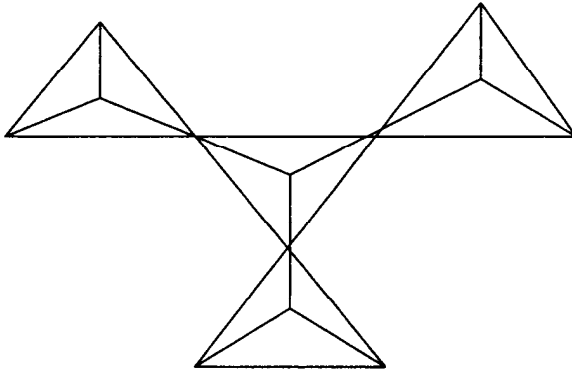
**Session: June..... Year: ...2004.....**

**Mark Scheme**  
**Post Qpec 16/1/03 Postcoord 9/7/04**

<b>MAXIMUM MARK</b>	<b>45</b>
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1. (a)	<p>High temperature ✓ combination of <u>nitrogen and oxygen</u> from air ✓. Give second mark for a balanced equation <math>N_2 + O_2 \rightarrow 2NO</math></p>	2
(b)(i)	<p>Catalyst- speeds up reaction by lowering activation energy/without being used up itself ✓ AW Photo – uses light as the energy source ✓</p>	2
(ii)	<p>✓ for <u>one</u> unpaired electron. ✓ for rest</p>	
	<div style="text-align: center;"> </div>	2
(iii)	<p>Each has an odd number of electrons/unpaired electron ✓</p>	1
(iv)	<p>Washed off by rain AW ✓</p>	1
(v)	<p>A cause of photochemical smog/ ozone formation/acid rain ✓ ( <u>not</u> greenhouse gas)</p>	1
(c)(i)	<p>NO is regenerated ✓/is a catalyst ✓</p>	1
(ii)	<p><math>O_3 + O \rightarrow 2O_2</math> ✓</p>	1
	<p><b>Question total</b></p>	11
		<p><b>Total:</b></p>

Mark Scheme	Unit Code	Session	Year	Version
Page 2 of				
<b>Abbreviations, annotations and conventions used in the Mark Scheme</b>	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit <u>      </u> = (underlining) key words which <b>must</b> be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument			
Question	Expected Answers	Marks		
2 (a)	<p>Look for 9 points from the following:  Max 7 for two gases; max 5 for one</p> <p>Oxygen <u>and</u> carbon dioxide dissolve from air ✓  Oxygen formed in water by photosynthesis, carbon dioxide by respiration of <u>aquatic organisms</u>. ✓  ( Find one mark for both bits on one of the gases if they have not presented it like this).  Oxygen used for respiration by aquatic life ✓  Equation ✓ (accept CH<sub>2</sub>O version)  Decomposition of organic waste ✓  Carbon dioxide used for photosynthesis by aquatic plants/algae ✓ Equation ✓ if respiration one not given.  Makes the water slightly acidic/mention of carbonic acid/ equation for making or dissociating carbonic acid ✓  Causes hard water ✓ by weathering carbonate rocks / equation ✓  Sulphur dioxide from burning fossil fuels ✓  dissolves in water and <u>is oxidised</u> to sulphuric acid ✓.  This lowers pH of natural waters/ erodes limestone/ releases cations from clay soils ✓ (<u>not</u> acid rain)  AW throughout</p>	9		
(b)	<p>QWC. Look for three complete sentences and no more than three spelling mistakes. ✓  It contains few/no bacteria ✓ and no colloids ✓ AW</p>	1	2	
		<b>Total: 12</b>		

3.(a)(i)	<p>Look for three points from:            A diagram should show polar water molecules with <math>\delta^+</math> and <math>\delta^-</math> ✓ clustered appropriately around a cation/anion ✓ . One water molecule will do it.</p>	2
(ii)	<p>Lattice energy is supplied ( to form gas ions) ✓            By exothermic hydration of ions ✓ AW</p>	2
(b)	<p>With soap it is hard to get a lather. ✓            Calcium sulphate does not decompose at this temperature/produce an insoluble product. AW ✓</p>	2
(c)(i)	<p>Layers contain two silicate sheets to one aluminate sheet/ two tetrahedral:one octahedral ✓.</p>	3
(ii)	<p>Silicate tetrahedra ✓ are linked in sheets by sharing three corners/oxygens each ✓</p>	
	<p>eg</p> 	
	<p>Or similar</p>	
	<p>A diagram should show, at least, three tetrahedra clustered round a central one for both marks.</p>	
(iii)	<p>Because some silicon(IV) atoms ✓ have been replaced by aluminium(III) ✓ in the silicate layers .            And/or Mg(II) can replace Al(III)/There is one extra negative charge per swap. ✓            Clay-OH ✓ at the surface can lose H+ at high pH ✓ leaving the clay negatively charged.            Any three marks</p>	2
		3
		Total: 12

4 (a)(i)	Increased use for packaging ✓ AW	1
(ii)	66.7% ✓	1
(iii)	It can cause air pollution. Two specific examples are needed to score the marks. Any three marks from Acidic HCl ✓ from PVC ✓  Toxic dioxins ✓ if plastic burnt at too low a temperature ✓ Etc AW	3
(b)(i)	Squeezes air/oxygen out AW ✓	1
(ii)	Reduces bulk/discourages rodents/prevents it being blown away ✓	1
(iii)	Absorbs a lot of water ✓ minimising leachate provides cation exchange to remove, eg, lead ions from leachate ✓ AW	2
(iv)	Burning to provide energy for heating/electricity production. ✓ Accept fuel ✓.	1
	Total	10
	PAPER TOTAL	45