

Subject: Environmental chemistry.Code:2815/03.....

Session: January.... Year: ...2003.....

**Mark Scheme
post exam**

MAXIMUM MARK	45
---------------------	-----------

1 (a) (i)	Magnesium carbonate reacts with carbonic acid/dissolved CO ₂ ✓ to make soluble magnesium hydrogen carbonate MgCO ₃ (s) + H ₂ CO ₃ (aq) = Mg(HCO ₃) ₂ (aq) eqn ✓ State symbols ✓	3
(ii)	Temperature ✓ Speed of trickling through rocks/ depth of rocks/% of MgCO ₃ in rocks /equation ✓ AW (not pressure, pH, or amount of CO ₂ dissolved.)	2
(b)(i)	Calcium hydrogen carbonate solution decomposes ✓ on heating to make solid/insoluble ✓ calcium carbonate. Accept magnesium carbonate.	2
(ii)	Calcium/magnesium carbonate is an insulator/absorbs some heat ✓. More (electrical) energy ✓ required to boil the water.	2
(c)	Aqueous calcium ions swap ✓ with cations, eg sodium ions, held on the cation exchange resin by ionic attraction (opposite charges) ✓ / recharged with concentrated NaCl solution ✓	3
	Question total	12

5.

Look for seven of the following points, several of which can be scored using diagrams. AW throughout.

2:1 TetOctTet ..TetOct Tet (probably vertically) ✓ allows water in between the weakly attracted Tet...Tet layers ; water will hydrogen bond to the silicate layers ✓

causing clay to expand ✓

On drying water leaves here easily and clay shrinks ✓

and cracks

1:1 TetOct...TetOct ✓ strong hydrogen bonding ✓ between Oct...Tet layers makes it hard for water to get in ✓
clay does not expand much on wetting and therefore does not shrink on drying. ✓

Si is in the tetrahedral sheets,Al in the octohedral ✓

7

QWC mark is for use of at least twowhole sentences with no more than three different SPG errors.

1

Question total

8

2. (a)	Addition of Al^{3+} ions/ aluminium sulphate ✓ Neutralises charges ✓ on colloidal/small particles ✓, allowing them to clump together ✓ or gelatinous ppt ✓ of $\text{Al}(\text{OH})_3$ ✓ produced which absorbs the particles ✓.AW	4
(b)	Filter is cleaned by pumping fresh water through it backwards ✓	1
(c)	Zero to -1 ✓ and zero to +1 ✓ It must be clear which is which.	2
	Question total	7
4.(a)	Any two points from: ✓ High enough temperature to avoid dioxin formation Avoidance of spread of viable viruses in smoke ✓ Stress for local population ✓ Or other specific valid points. Not vague references to harmful/greenhouse gases.	2
(b)(i)	Leaching of soluble pollutants by rainwater etc ✓ (ii) Line pits with impermeable clay/plastic ✓	2
	Methane ✓ inflammable/explosive Hydrogen sulphide ✓ toxic Allow carbon dioxide as gas but not for hazard. Allow correct formulae. Two gases, one hazard ✓	3
3. (a)	Question total	7
(b)(i)	(ii) Describes a chemical process that uses light as an energy source AW ✓ The first for bond breaking ✓	1
	✓	1
(iii)	It has an unpaired electron ✓ Nitrogen oxides are reduced ✓ to nitrogen using <u>rhodium</u> catalysts ✓ Large surface area of catalyst ✓. Equation ✓ eg Mark Scheme	2
(c)	$2\text{NO} + 2\text{CO} \rightarrow \text{N}_2 + 2\text{CO}_2$ (state symbols not required)	3

(d) (i)	Reacts with/breaks $C=C$ ✓ breaking polymer chain ✓	2
(ii)	The rubber cracks/crumbles ✓	1
	Question total	11
	PAPER TOTAL	45