

**CAMBRIDGE**  
INTERNATIONAL EXAMINATIONS

**June 2003**

**INTERNATIONAL GCSE**

**MARKING SCHEME**

**MAXIMUM MARK: 80**

**SYLLABUS/COMPONENT: 0620/03**

**CHEMISTRY**

**(Extended Paper 3)**



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In the mark scheme if a word or phrase is underlined it (or an equivalent) is required for the award of the mark.

(.....) is used to denote material that is not specifically required.

**OR** designates alternative and independent ways of gaining the marks for the question.

**or** indicates different ways of gaining the same mark.

**COND** indicates that the award of this mark is conditional upon a previous mark being gained.

- Unusual responses which include correct Chemistry that answers the question should always be rewarded-even if they are not mentioned in the marking scheme.
- All the candidate's work must show evidence of being marked by the examiner.

- 1 (a) A correct equation either CO or CO<sub>2</sub> as product  
If not balanced but otherwise correct [1] ONLY [2]
- (b) (i) C + O<sub>2</sub> → CO<sub>2</sub> NOT word equation [1]  
(ii) (higher in furnace) no oxygen left [1]  
carbon dioxide reacts with carbon (to give carbon monoxide) [1]
- OR** incomplete combustion of carbon [2]
- OR** either equation gains both marks  
CO<sub>2</sub> + C = 2CO or 2C + O<sub>2</sub> = 2CO
- OR** carbon dioxide reacts [1]  
with carbon [1]
- (c) limestone + sand → slag [2]  
**OR** calcium carbonate + silicon (IV) oxide → calcium silicate (+ carbon dioxide)
- For knowing that impurity is sand [1] ONLY
- Accept calcium oxide and silicon oxide  
Accept lime
- (d) (i) Cutlery **or** chemical plant **or** watches **or** utensils **or** surgical instruments **or**  
cars **or** sinks **or** aircraft **or** garden tools [1]  
(ii) nickel **or** chromium **or** molybdenum **or** niobium **or** titanium [1]  
(iii) blow air/oxygen through  
carbon becomes carbon dioxide  
carbon dioxide escapes as gas  
silicon and phosphorus become oxides  
calcium oxide or calcium carbonate  
forms slag  
Any FOUR NOT blast furnace [4]
- (e) anode tin NOT impure time [1]  
cathode iron or steel [1]  
tin salt **or** tin ions as electrolyte [1]  
NOT oxide or hydroxide or carbonate

**TOTAL = 16**

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- 2 (a) (i) 3 ignore any charges [1]  
(ii) high melting **or** boiling point  
hard  
poor conductor of electricity **or** heat  
brittle  
Any TWO [2]  
NOT insoluble, dull, or malleable
- (iii) carbon, graphite diamond silicon, germanium [1]  
silicon (IV) oxide **or** silica **or** silicon dioxide **or** silicon oxide  
**or** sand **or** silicon carbide **or** named polymer [1]
- (iv) four around one [1]  
**cond** looks tetrahedral **or** shows continuation [1]  
For graphite layers [1] weak bonds between layers [1]  
Accept any macromolecule, no link with (iii)  
For polymer repeat unit [1] continuation [1]
- (b) (i) white precipitate [1]  
**COND** upon a precipitate  
dissolves in excess or forms solution [1]
- (ii) blue precipitate [1]  
**COND** upon a precipitate  
does not dissolve in excess [1]
- (c) (i) number of moles  $\text{CO}_2 = 0.24/24 = 0.01$   
**conseq** number of moles of  $\text{CaCO}_3$  and  $\text{MgCO}_3 = 0.01$   
**conseq** number of moles of  $\text{CaCO}_3 = 0.005$  [3]
- (ii) Calculate the volume of hydrochloric acid,  $1.0 \text{ mole/dm}^3$ , needed to react with one tablet.  
number of moles of  $\text{CaCO}_3$  and  $\text{MgCO}_3$  in one tablet = 0.01  
Expect same as answer to (c)(i). NO marks to be awarded. Just mark consequentially to this response  
**conseq** number of moles of  $\text{HCl}$  needed to react with one tablet = 0.02 [1]
- conseq** volume of hydrochloric acid,  $1.0 \text{ mole/dm}^3$ , needed to react with one tablet =  $0.02 \text{ dm}^3$  or  $20 \text{ cm}^3$  [1]
- TOTAL = 16**
- 3 (a) (i) Correct equation [2]  
For giving correct formula of alkane and alkene [1] only  
Accept alkene and hydrogen
- (ii) chlorine [1]  
**COND** light **or**  $200^\circ\text{C}$  **or** heat **or** lead tetraethyl  
**or** high temperature MAX  $1000^\circ\text{C}$  [1]  
ignore comment 'catalyst'
- (b) (i) same molecular formula [1]  
different structures **or** structural formulae [1]
- (ii) but-2-ene or cyclobutane [1]  
corresponding structural formula [1]  
NOT 2-butene
- (c) butanol ignore numbers [1]  
butane ignore numbers [1]  
dibromobutane ignore numbers [1]

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- (d) (i) propene [1]  
 $\text{CH}_3\text{—CH}=\text{CH}_2$  [1]
- (ii) Correct structure of repeat unit [1]  
 ignore point of attachment of ester group  
 COND upon repeat unit [1]  
 shows continuation [1]  
 If chain through ester group [0] out of [2]
- (iii) do not decay or non-biodegradable  
 shortage of sites or amount of waste per year  
 visual pollution  
 forms methane  
 Any TWO [2]
- (iv) form poisonous or toxic gases or named gas CO, HCl HCN [1]  
 NOT carbon dioxide, harmful, sulphur dioxide

**TOTAL = 18**

- 4 (a) (i) Correct equation [2]  
 not balanced [1] ONLY  
 $2\text{Pb}(\text{NO}_3)_2 = 2\text{PbO} + 4\text{NO}_2 + \text{O}_2$   
 $\text{Pb}(\text{NO}_3)_2 = \text{PO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$
- (ii) potassium nitrate → potassium nitrite + oxygen [1]
- (b) (i) close or tightly packed [1]  
 ordered or lattice [1]  
 vibrational [1]  
 NOT forces
- (ii) melting or freezing or fusion or solidification [1]
- (c) (i) oxygen and nitrogen (in air) [1]  
 react at high temperatures (and high pressure) [1]  
 If nitrogen in fuel [0] out of [2]
- (ii) catalytic converter  
 react with carbon monoxide or hydrocarbons  
 form nitrogen  
 ANY TWO [2]
- (d) Add excess lead oxide to nitric acid [1]  
 can imply excess  
 filter NOT if residue is lead nitrate [1]  
 evaporate or heat solution [1]

**TOTAL = 14**

- 5 (a) protons 2  
 electrons 2  
 neutrons 4 [3]
- (b) (i)  $\text{La}^{3+} + 3\text{e}^- = \text{La}$  [1]  
 (ii) hydrogen [1]  
 bromine NOT Bromide [1]  
 caesium hydroxide [1]  
 ignore any comments about electrodes

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- (c) metal hydroxide or hydroxide ions [1]  
hydrogen [1]
- (d) correct formula  $1Ba$  to  $2Cl$   
charges correct  
8e around the anion  
All three points [2]  
Two points ONLY [1]  
If covalent [0] out [2]
- (e) alternating (positive and negative) [1]  
pattern [1]
- (f) (i) barium - oxygen or ionic [1]  
(ii) bond forming energy released/exothermic [1]  
bond breaking energy taken in/endothermic [1]  
more energy released [1]

**TOTAL = 17**

**Total for Paper: 80**