CAMBRIDGE
INTERNATIONAL EXAMINATIONS

**June 2003**

**INTERNATIONAL GCSE**

MARKING SCHEME

MAXIMUM MARK: 40

**SYLLABUS/COMPONENT: 0620/01**

**CHEMISTRY**

**(Multiple Choice)**

| *Question Number* | *Key* | *Question Number* | *Key* |
| --- | --- | --- | --- |
| 1 | **C** | 21 | **B** |
| 2 | **B** | 22 | **D** |
| 3 | **A** | 23 | **A** |
| 4 | **D** | 24 | **B** |
| 5 | **A** | 25 | **D** |
| 6 | **C** | 26 | **B** |
| 7 | **A** | 27 | **D** |
| 8 | **A** | 28 | **D** |
| 9 | **B** | 29 | **D** |
| 10 | **C** | 30 | **B** |
| 11 | **B** | 31 | **D** |
| 12 | **D** | 32 | **D** |
| 13 | **C** | 33 | **A** |
| 14 | **D** | 34 | **A** |
| 15 | **B** | 35 | **B** |
| 16 | **C** | 36 | **A** |
| 17 | **A** | 37 | **A** |
| 18 | **C** | 38 | **B** |
| 19 | **A** | 39 | **C** |
| 20 | **C** | 40 | **C** |

**TOTAL 40**

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

**June 2003**

**INTERNATIONAL GCSE**

MARKING SCHEME

MAXIMUM MARK: 80

**SYLLABUS/COMPONENT: 0620/02**

**CHEMISTRY**

**(Core Paper 2)**

**1 (a) (i)** Fe/Cu ALLOW Zn
**(ii)** C/N/S/F/C*l*/Br
**(iii)** O/S
**(iv)** C [1]
**(v)** Li/Na/K ALLOW F [1]
**(vi)** CU/Zn/Br/Kr [1]

**(b)** argon - light bulbs;
chlorine - kills bacteria;
carbon - as lubricant;
helium - in balloons [4]

**(c) (i)** covalent [1]
**(ii)** $BrF_5$ ALLOW $F_5Br$ [1]
**(iii)** ions/charged particles;
NOT: particles
not free to move in solid/free to move in molten/liquid state [2]

**2 (a)** drop small tube in acid/loosen string/idea of mixing zinc and acid/let go of cotton
ALLOW: cut the string [1]
NOT: heat (the acid)
NOT: pull the string

**(b) (i)** correct plotting including 0-0 point (–1 per omission or error) [2]
**(ii)** best curve drawn and to go through origin [1]
**(iii)** no more gas produced/reaction finished;
all zinc reacted/used up [2]

**(c)** graph drawn with faster initial rate and starting at 0-0;
ALLOW: straight line as initial rate
ends up at 55 $cm^3$ [2]

**(d) (i)** 2 (HC*l*) [1]
**(ii)** zinc chloride [1]
**(iii)** 136 [1]
IGNORE units

**(e)** substance containing only one type of atom/substance which cannot be broken down to any other substance by chemical means [1]
NOT 'can't be split' alone
NOT is a pure substance

**3 (a) (i)** evaporation/vaporisation/boiling [1]
**(ii)** freezing/solidification [1]
NOT: fusion
**(iii)** condensing/condensation/liquefaction [1]

**(b)** 2nd box ticked [1]

**(c)** A;
energy needed to overcome forces between molecules/idea of energy input/taking in heat [2]

**(d) (i)** chlorine [1]
**(ii)** bromine [1]
**(iii)** sodium chloride [1]

**(e)** **(i)** diffusion
NOT: Brownian motion

**(ii)** ammonium chloride
NOT: ammonia chloride

**(iii)** ammonia diffuses or moves faster/HC*l* diffuses or moves slower/ammonia has lower mass/HC*l* higher mass/molecules of HC*l* and ammonia move at different speeds [1]
NOT: ammonia evaporates faster/HC*l* evaporates more slowly

**(f)** neutralisation/acid base [1]
NOT: exothermic
NOT: addition

**(g)** **(i)** thermometer [1]

**(ii)** reference to the solid or melting point of the solid is needed for the mark. boiling point of water too low to get solid to melt/boiling water cannot get to 155°C [1]
NOT: boiling point of water is only 100°C/boiling point of water too low.
NOT: water boils off first

**(iii)** so that the liquid is the same temperature throughout/no hot or cold spots/so the tube is the same temperature as the thermometer/so heat can circulate in all places [1]
ALLOW: so that temperature of liquid is balanced
NOT: to keep temperature constant

**4** **(a)** **(i)** <u>breaking down</u> of molecules substances using <u>heat</u> [1]

**(ii)** substance which speeds up a reaction [1]
NOT: alters/changes rate of reaction
NOT: speeds up and slows down rate

**(b)** ethene/ethylene [1]
NOT: formula

**(c)** **(i)** paraffin [1]

**(ii)** 4000g/4kg [1]
(correct unit needed)

**(iii)** $C_2H_4$; $H_2$ [2]

**(d)** **(i)** two units polymerised with continuation bonds at either end and hydrogen atoms drawn [1]
ALLOW: $-CH_2CH_2CH_2CH_2-$
ALLOW: $-[-CH_2CH_2-]-_n$
ALLOW: $-[-CH_2-]-_n$

**(ii)** addition (polymerisation) [1]

**5** **(a)**

| | | | |
|---|---|---|---|
| (sodium) hydroxide/ammonia; | → | green/grey green; | [2] |
| silver nitrate; | → | yellow; | [2] |
| ALLOW: lead nitrate NOT: cream | | | |
| ALLOW: bubble chlorine | → | grey/black (precipitate) | |
| silver nitrate; | → | white: | [2] |
| barium chloride/nitrate; | → | white; | [2] |
| ALLOW: lead acetate | | | |

**(b)** filtration/filtering or diagram of correct apparatus for filtration (filter paper must be present on diagram)
NOT: decanting
sodium chloride through filter paper/shown on diagram;
NOT: filtrate through filter paper
evaporate off water from sodium chloride/suitable diagram [3]
ALLOW: distilling off <u>water</u>

**(c)** <u>different atoms</u>/<u>elements</u>
(chemically) <u>joined/bonded/combined</u> (both points needed)
(reference to mixtures = 0 unless qualified enough in time frame e.g. a mixture of elements which are then chemically combined) [1]

**(d)** **(i)** chlorine/$Cl_2$ [1]
**(ii)** sodium/Na [1]

**6** **(a)** potassium/magnesium/aluminium [1]

**(b)** they did not have electricity/did not know about electrolysis/did not know the metal existed [1]
NOT: did not have the right technology

**(c)** **(i)** indication that bubbles produced rapidly or quickly/slower than magnesium but faster than zinc
OR number of bubbles produced intermediate between magnesium and zinc; [1]
uranium dissolved slower than magnesium but faster than zinc/dissolves at medium rate etc. [1]
**(ii)** atoms of same element with different mass number/different number of neutrons/different nucleon number [1]
NOT: compounds/molecules with different mass number
**(iii)** indication of use for energy – nuclear power stations/nuclear energy [1]
ALLOW: atomic/nuclear bombs
NOT: curing cancer/medical uses
NOT: 'for fuel'

**(d)** magnesium oxide
ALLOW: MgO [1]

**(e)** **(i)** idea of mixture of (different) metals [1]
**(ii)** alloys harder/stronger/decreased malleability/increased toughness/increased corrosion resistance/heat or electrical resistance increased [1]
NOT: increase in melting point
NOT: cheaper
NOT: improving properties

**(f)** removes oxygen from zinc oxide [1]
ALLOW: definition of reduction involving oxidation numbers/electron transfer

**(g)** **(i)** reversible reaction [1]
ALLOW: equilibrium
**(ii)** 76-80% [1]

**(h)** **(i)** correct electronic structure of Mg (2.8.2) on diagram [1]
**(ii)** loses two electrons/loses its valence electrons = 2
forms $Mg^{2+}$ ion = 1
loses electron(s) = 1 [2]
forms $Mg^{2+}$ ion by losing electrons = 2

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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**INTERNATIONAL GCSE**

MARKING SCHEME

MAXIMUM MARK: 80

**SYLLABUS/COMPONENT: 0620/03**

**CHEMISTRY**

**(Extended Paper 3)**

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 $CO_2$ as product
If not balanced but otherwise correct [1] ONLY [2]

**(b) (i)** $C + O_2 \rightarrow CO_2$ 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
$CO_2 + C = 2CO$ or $2C + O_2 = 2CO$

**OR** carbon dioxide reacts [1]
with carbon [1]

**(c)** limestone + sand $\rightarrow$ slag [2]
**OR** calcium carbonate + silicon (IV) oxide $\rightarrow$ 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**

**2 (a) (i)** 3 ignore any charges

**(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 $CO_2$ = 0.24/24 = 0.01
**conseq** number of moles of $CaCO_3$ and $MgCO_3$ = 0.01
**conseq** number of moles of $CaCO_3$ = 0.005 [3]

**(ii)** Calculate the volume of hydrochloric acid, 1.0 mole/$dm^3$, needed to react with one tablet.
number of moles of $CaCO_3$ and $MgCO_3$ 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 HCl needed
to react with one tablet = 0.02 [1]

**conseq** volume of hydrochloric acid, 1.0 mole/$dm^3$, needed to react with one tablet = 0.02 $dm^3$ or 20 $cm^3$ [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°C **or** heat **or** lead tetraethyl
**or** high temperature MAX 1000°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]

**(d) (i)** propene

$CH_3—CH==CH_2$

**(ii)** Correct structure of repeat unit [1]
ignore point of attachment of ester group
COND upon repeat unit
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, HC*l* HCN [1]
NOT carbon dioxide, harmful, sulphur dioxide

**TOTAL = 18**

**4 (a) (i)** Correct equation [2]
not balanced [1] ONLY
$2Pb(NO_3)_2 = 2PbO + 4NO_2 + O_2$

$Pb(NO_3)_2 = PO + 2\ NO_2 + \frac{1}{2}\ O_2$

**(ii)** potassium nitrate $\rightarrow$ 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)** <u>catalytic converter</u>
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)** $La^{3+} + 3e- = La$ [1]

**(ii)** hydrogen [1]
bromine NOT Bromide [1]
caesium hydroxide [1]
ignore any comments about electrodes

**(c)** metal hydroxide or hydroxide ions
hydrogen

**(d)** correct formula 1Ba to 2C$l$
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**

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MARKING SCHEME

MAXIMUM MARK: 40

**SYLLABUS/COMPONENT: 0620/05**

**CHEMISTRY**

**(Practical)**

**1** Table of results
Experiment 1 Initial and final readings recorded to 1 decimal place
Experiment 2 Initial and final readings recorded to 1 decimal place [1]

Results comparable to Supervisor's results ± 1cm$^3$ [2]

**(a)** red/burgundy/brown [1]

**(b)** yellow (1) to blue/black (1) see Supervisor [2]
IGNORE green

**(c)** **(i)** Experiment 1 [1]
**(ii)** △ 2 x, double volume (1) in Experiment 1 (1) not just more [2]
**(iii)** potassium iodate less concentrated solution **C** than **B** or vice versa [1]
not different concentrations
**(iv)** 2 x volume from table for Experiment 1 (1) unit (1) [2]
2 x iodine formed [1]

**(d)** Indicator (1) reference to accuracy (1)/end-point/see more clearly [2]
not test for $I_2/I^-$

**[Question total: 18]**

**2** **(a)** bubbles/condensation/goes black max 2 [2]

**(b)** filtrate - colourless not clear [1]
residue - green [1]

**(c)** **(i)** effervescence/fizz/bubbles [1]
limewater → milky [1]
solution is blue [1]
**(ii)** blue (1) precipitate (1) [2]
royal/deep blue (1) solution (1) [2]

**(d)** **(i)** white (1) precipitate (1) dissolves in excess (1) [3]
**(ii)** white (1) precipitate (1) dissolves (1) [3]
**(iii)** white precipitate (1) [1]

**(e)** zinc (1) sulphate (1) reversed = 0 [2]

**(f)** copper (1) carbonate (1) reversed = 0 [2]
hydrated (1) max 2

**[Question total: 22]**

**[Total for paper: 40]**

Results obtained for Question 1/cm$^3$

| | 1st | 2nd |
|---|---|---|
| Experiment 1 | 16.5 | 16.3 |
| Experiment 2 | 8.3 | 8.2 |

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**INTERNATIONAL GCSE**

MARKING SCHEME

MAXIMUM MARK: 60

**SYLLABUS/COMPONENT: 0620/06**

**CHEMISTRY**

**(Alternative to Practical)**

**1** **(a)** **A** = mortar (1)
**B** = stirrer/stirring rod (1) not thermometer
**C** = tripod (1)
**D** = Bunsen Burner (1) [4]

**(b)** filtration [1]

**(c)** **D** or description [1]

**2** **(a)** because precipitate formed/goes cloudy (1)
sulphur (1)/turbid [2]

**(b)** reference to fair test/comparison/same depth [1]

**(c)** sodium thiosulphate/water 1st/2nd acid, last [1]

**(d)** **(i)** all points correct (3), -1 for any incorrect
smooth line (1)
label (1) [5]

**(ii)** line lower down (1)
does not touch other line (1) [2]

**(e)** times would be longer (1) because solution more spread out/reference to surface area/depth (1) [2]

**3** Table of results
correct burette readings in table (3) or 17.2, 18.9, 26.5
i.e. 16.8, 17.1 and 25.5
Differences correctly completed (1) Difference 7.6
i.e. 8.4 [4]

**(a)** **(i)** Experiment 1 [1]

**(ii)** twice volume/more than twice as much [1]

**(iii)** Solution **B** was 2x (1) concentration of **C** (1) or similar [2]
**B** more concentrated than **C** (1 only)

**(iv)** volume **A** = 33.6 (1) $cm^3$ (1)/34.4$cm^3$
2x iodine produced (1) [3]

**(b)** reference to accuracy (1) indicator (1)/easier to see [2]
not test for $I_2$ max 2

**4** **(c)** effervescence/fizz/bubbles (1)
limewater milky (1)/blue solution [2]

**(d)** **(ii)** blue (1) precipitate (1)
royal/dark blue (1) solution (1) [4]

**(e)** **(i)** white (1) precipitate (1)
dissolves (1) [3]

**(ii)** white (1) precipitate (1)
dissolves (1) [3]

**(f)** Solid **D** is a sulphate (1) hydrated (1) [2]

**(g)** copper (1)/$Cu^{2+}$ (2) [2]

**5** **(a)** **(i)** Smooth line graph

**(ii)** result at 5 minutes (1)
not on curve (1)/gas escapes, gone down

**(b)** 0.8 g [1]

**(c)** reference to leak/loss of gas (1)
∴ volumes lower (1) [2]

**6** Known mass of beach sand (1)
add excess (1) dilute hydrochloric acid (1)
filter (1) wash (1) dry (1) residue
and weigh sand (1) working out result (1)
max 6 of 8 [6]

**[Total: 60]**

**Grade thresholds** taken for Syllabus 0620 (Chemistry) in the June 2003 examination

| | maximum mark available | minimum mark required for grade: | | | |
|---|---|---|---|---|---|
| | | A | C | E | F |
| Component 1 | 40 | - | 26 | 20 | 17 |
| Component 2 | 80 | - | 52 | 36 | 27 |
| Component 3 | 80 | 53 | 31 | - | - |
| Component 5 | 40 | 31 | 24 | 18 | 14 |
| Component 6 | 60 | 42 | 32 | 21 | 15 |

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.