CAMBRIDGE
INTERNATIONAL EXAMINATIONS

June 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0620/01

CHEMISTRY

(Multiple Choice)

UNIVERSITY of CAMBRIDGE
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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)

UNIVERSITY of CAMBRIDGE
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1 **(a)** **(i)** Fe/Cu ALLOW Zn [1]
(ii) C/N/S/F/C*l*/Br [1]
(iii) O/S [1]
(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 [1]
NOT: Brownian motion

(ii) ammonium chloride [1]
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 water

(c) different atoms/elements
(chemically) joined/bonded/combined (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

June 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0620/03

CHEMISTRY

(Extended Paper 3)

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

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 [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 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 [1]

$CH_3—CH==CH_2$ [1]

(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 [1]
hydrogen [1]

(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

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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MARKING SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0620/05

CHEMISTRY

(Practical)

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

Experiment 2 Initial and final readings recorded [1]
to 1 decimal place [1]

Results comparable to Supervisor's results $\pm$ 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) $\triangle$ 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

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

June 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0620/06

CHEMISTRY

(Alternative to Practical)

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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 $1^{st}/2^{nd}$ 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)/34.4cm^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 [1]

(ii) result at 5 minutes (1)
not on curve (1)/gas escapes, gone down [2]

(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.