

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the June 2005 question paper

0620 CHEMISTRY

0620/02

Paper 2 (Core Theory), maximum mark 80

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

- CIE will not enter into discussion or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the June 2005 question papers for most IGCSE and GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Grade thresholds for Syllabus 0620 (Chemistry) in the June 2005 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 2	80	N/A	57	42	31

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.

June 2005

IGCSE

MARK SCHEME
MAXIMUM MARK: 80
SYLLABUS/COMPONENT: 0620/02 CHEMISTRY (Core Theory)

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- 1 (a) (i) A [1]
(ii) B + E [1]
(iii) A + C [1]
(iv) B [1]
(v) B + E [1]
- (b) (i) graphite [1]
NOT: charcoal
- (ii) diamond/buckminsterfullerene [1]
NOT: graphite (but ALLOW: ecf from part (i))
- (c) NaI [1]
ALLOW: Na⁺I⁻
NOT: Na⁺ + I⁻
- (d) compound (no mark) [1]
because two different (types of) atoms joined/bonded etc.
ALLOW: two different elements bonded
NOT: atoms together
- Total = 9**
- 2 (a) filtering/filtration [1]
NOT: distillation, NOT: decanting
- (b) litmus turns pink/red [1]
NOT: orange
- (c) (i) steel [1]
(ii) water [1]
NOT: steam
- (iii) copper/iron [1]
(iv) natural gas [1]
NOT: methane
- (d) methane [1]
- (e) 100° C (100 = 0) [1]
- (f) (i) calcium/Ca²⁺ [1]
(ii) e⁻ [1]
ALLOW: e
NOT: electron
- (g) (i) carbon dioxide + water [1]
ACCEPT: correct formulae

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	(ii) carbon monoxide NOT: CO		
			Total
3	(a) random arrangement; far apart.		[2]
	(b) pH9		[1]
	(c) (i) NH ₃ /H ₃ N		[1]
	(ii) covalent		[1]
	(iii) weak forces <u>between</u> particles OR molecules/weak intermolecular forces		[1]
	(d) (i) H ₂ SO ₄		[1]
	(ii) nitrogen; soil		[2]
	(e) Any 3 from: ammonia <u>evaporates</u> from (ammonia) solution; diffusion; <u>particles/molecules</u> of ammonia/gases are in constant movement/ move freely; ALLOW: move fast NOT: particles of ammonia solution move freely NOT: move from high to low concentration movement of <u>particles/molecules</u> is random. NOT: ammonia spreads out;		[3]
	(f) (i) the air ALLOW: atmosphere		[1]
	(ii) 2 (NO ₂)		[1]
	(iii) reversible reaction ALLOW: equilibrium		[1]
	(iv) exothermic/heat given out		[1]
			Total = 16
4	(a) monomers		[1]
	(b) does not have a double bond/only contains single bonds/has a single C – C bond NOT: has a single bond NOT: it is saturated NOT: no spare bonds		[1]
	(c) displayed/graphical formula correct ALLOW: correct dot and cross diagrams		[1]
	(d) (i) breaking down of long-chained hydrocarbons/formation of smaller hydrocarbons from larger		[1]

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- (ii) high temperature
ALLOW: heat
(catalyst alone = 0)
- (iii) C₈H₁₈
ALLOW: other sensible combinations 2(C₂H₄) + C₆H₁₄
- (e) (i) H₂ [1]
- (ii) any 2 of:
temperature gradient in fractionation column;
smaller/lighter molecules (rise) higher in column OR smaller/lighter molecules
more easily vaporised
OR e.g. referring to larger/heavier molecules
ALLOW: hydrocarbons in place of molecules
NOT: lighter/heavier fractions
different fractions condense at particular heights in column/fractions
condense when temperature falls below their boiling points [2]
ALLOW: different fractions have different boiling points/condense at different
temperatures
- (iii) petrol: fuel (for cars)/other suitable use [1]
NOT: for cars etc.
lubricating fraction: lubricating oils/waxes/polishes/other suitable use [1]
NOT: for planes etc.
- Total = 11**
- 5 (a) (i) molecule containing 2 atoms [1]
ALLOW: element containing 2 atoms
- (ii) whether it is solid, liquid or gas (all 3 needed) [1]
- (b) (i) gas; liquid; solid [2]
(all 3 = 2 marks; 2 correct = 1 mark)
- (ii) red/brown/orange or combination of these [1]
- (iii) 130-210 (°C) (actual = +184 °C) [1]
- (c) iodine + potassium chloride (1 each) [2]
- (d) (i) 8 electrons in each shell + atoms joined [2]
no bonding electrons = 1
IGNORE: inner shell electrons if correct
(incorrect inner shell electrons = 1 max)
- (ii) water purification OR treatment/killing bacteria etc./bleaching agent (for paper)/
making refrigerants/making organic chlorine compounds (named)/making
solvents/extracting titanium/detinning scrap tinplate/making hydrochloric
acid/extraction of bromine from seawater/other suitable use [1]

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(e) (i)	A	[1]
(ii)	C	[1]
(iii)	it contains ions; which can <u>move</u> /are free to <u>move</u> (OWTTE) reference to electrons = 0	[1]
(f) (i)	Period 6	[1]
(ii)	85	[1]
(iii)	<u>atoms</u> with (same number of protons and) different number of neutrons/ different mass number/different nucleon number NOT: molecules with... ALLOW: elements with....	[1]
(iv)	125	[1]
		Total = 19
6 (a) (i)	iron + sulphuric acid → iron sulphate + hydrogen -1 per error/omission NOT: iron(III) sulphate NOT: hydrogen sulphate	[2]
(ii)	lighted splint; pop/small explosion etc. (consequential marking)	[2]
(b) (i)	cathode	[1]
(ii)	allows conduction (of electricity)/allows charges or ions to flow through the solution	[1]
(iii)	<u>gains</u> layer of <u>copper</u> /coated with copper NOT: gets bigger decreases in size/gets smaller/loses copper etc. ALLOW: the copper dissolves NOT: breaks up/flakes off	[1] [1]
(iv)	aqueous sodium hydroxide; light blue ppt; insoluble in excess OR aqueous ammonia; light blue ppt; soluble in excess/forming dark blue solution (consequential marking)	[3]
(c)	to make them attractive/makes them shiny/protects the iron so it does not rust/does not corrode OR oxidise <u>easily</u> /less reactive than iron NOT: chromium is unreactive etc. NOT: other properties of chromium e.g. hard NOT: corrosive	[1]
(d)	iron > chromium > copper	[1]
		Total = 13