CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the November 2003 question papers

0653 COMBINED SCIENCE

0653/01	**Paper 1 (Multiple Choice), maximum raw mark 40**
0653/02	**Paper 2 (Core), maximum raw mark 60**
0653/03	**Paper 3 (Extended), maximum raw mark 80**
0653/05	**Paper 5 (Practical), maximum raw mark 30**
0653/06	**Paper 6 (Alternative to Practical), maximum raw mark 60**

These mark schemes are published as an aid to teachers and students, to indicate the requirements of the examination. They show the basis on which Examiners were initially instructed to award marks. They do 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 discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the November 2003 question papers for most IGCSE and GCE Advanced Level syllabuses.

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Grade thresholds taken for Syllabus 0653 (Combined Science) in the November 2003 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 1	40	-	27	22	19
Component 2	60	-	34	24	20
Component 3	80	58	36	-	-
Component 5	30	21	14	9	7
Component 6	60	44	35	25	20

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.

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

November 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 40

SYLLABUS/COMPONENT: 0653/01

COMBINED SCIENCE
Paper 1 (Multiple Choice)

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

TOTAL 40

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INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0653/02

COMBINED SCIENCE
Paper 2 (Core)

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1 (a)(i) kinetic/movement → electrical; 1

(ii) chemical (potential);
electrical; 2

(b) can be used again/replaced/will not run out/
replicated if qualified e.g. wood; 1

(c) fission means nuclei break (into smaller pieces);
(accept atom splits into daughter nuclei)
fusion means nuclei join together; 2

2 (a)(i) carry oxygen; 1

(ii) not enough oxygen (in blood/for cells);
cells cannot respire (enough)/reduced respiration rate;
so cannot release energy (from food); 2max

(b)(i) iron is needed for making haemoglobin;
red blood cells contain haemoglobin; 2

[e.g. iron important part of haemoglobin in red blood cells would get both]

(ii) red meat/liver;
green vegetables/named green vegetable;
foods cooked in iron utensils;
egg; (not egg white)
chocolate;
cereals;
nuts; 2max

3 (a)(i) (each molecule contains) two chlorine atoms bonded together; 1
[it is a molecule of two chlorine atoms would be acceptable]

(ii) (17) protons;
18 (neutrons);
(ignore any figure)electron(s); 3

(b) kills micro-organisms/bacteria/pathogens/sterilises the water;
to make the water safe/not harmful; 2
[kills harmful micro-organisms scores both]
[reject viruses, germs, algae, bugs]

4 (a) (ignore step up or down) transformer; 1

(b) $\frac{v_P}{v_S} = \frac{N_p}{N_s}$;

[accept if set out correctly using words]

$V_s = \frac{24 x 200}{10} = 480$; 2

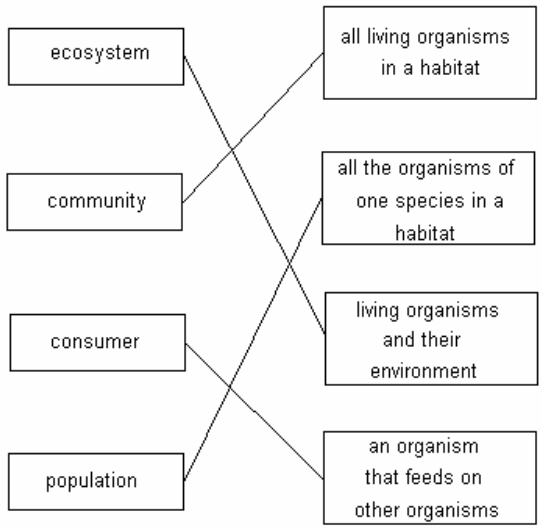
[accept working alone or answer alone for second mark but reject if incorrect answer given]

(c) reduces (heat) energy losses;
by ensuring low current; 2

(d)(i) alternating current/an electric current;
passes one way and then the other repeatedly; 2

(ii) frequency/number of waves per second/number of times current reverses per second/number of times a wave occurs in a given time period; 1

5 (a)



all three right = 2 marks; one right = 1 mark; 2

(b)(i) food supply/temperature/rainfall/vegetation/diet; 1

(ii) breed them/strong implication that breeding has occurred;
see if the number of stripes is inherited/compare stripes between generations
look for patterns in stripes between parent and offspring; 2

6 (a)(i) nitrogen; 1

(ii) (argon) is a noble gas/in Gp 0/inert gas/(atoms) have full outer shell; 1

(iii) carbon monoxide/nitrogen oxides are released/in the exhaust;
these are toxic/can kill (if breathed in); 2
[reject anything to do with carbon dioxide]

(b)(i) same number of atoms of each element on both sides/owtte; 1
[allow numerical response e.g. 4 H's and 2 O's on each side]

(ii) any proportions in a mixture/
fixed ratios in a compound/owtte;

or

mixture retains properties of components/
compound is new substance/has different properties from elements;

or

atoms of different elements not bonded (to each other) in mixture/ are bonded in compound;

or

mixture is separable by physical means/named example/compound cannot be separated this way; 1

(c) using hydrogen, waste product is water (which is non-polluting);
using hydrocarbons waste products include CO_2/CO/NOx/other which are harmful; 2

[so burning H_2 does not produce CO etc. gets 1 mark]

7 (a) speed = distance ÷ time (or appropriate symbols);
288 ÷ 1.2/240; 2

(b)(i) A/0,0/origin; 1

(ii) B to C/D to E/F to G;
line is horizontal/flat/of gradient zero; 2
[allow line is *straight* only if qualified by saying that speed constant at 100 mph/40 mph]

(iii) C to D; 1

8 (a) one mark for each correct label;;;; 4

(b)(i) goblet cells make mucus;
[ignore excrete mucus]
mucus traps bacteria/dirt;
cilia sweep (mucus) upward;
keeping bacteria/dirt out of lungs; 2max
[cilia sweep out bacteria/dirt scores both]

(ii) cilia stop working/are damaged;
more mucus is made/mucus continues to be made;
(excess) mucus collects in lungs/bronchioles;
bacteria breed in it; 2max

[bacteria are not swept out and stay in lungs causing disease with the first point scores both]

9 (a) aluminium;
electrolyte;
positive;
cathode; 4

(b)(i) red-brown/orange/pink/brown/copper solid forms/
(green) gas bubbles/a gas is given off/pungent odour (of chlorine)/
solution loses colour; 1

(ii) (copper chloride $\rightarrow$) copper + chlorine; 1
[reject symbols and any additional product(s) negate mark

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INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0653/03

COMBINED SCIENCE
Paper 3 (Extended)

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1	(a)	amylase/carbohydrase; fats/lipids; amino acids/peptides/polypeptides; stomach/small intestine/duodenum/ileum;	4
	(b)(i)	attracts animals/animals eat them; animals carry, fruits/seeds, to a new place;	2
	(ii)	crush/chop (seed)/cut in half/make a solution; add biuret (solution)/add copper sulphate and pot. hydroxide (solution); lose this mark if heated purple if protein present ;	3
2	(a)(i)	ray reflects at surface of mirror ; (lose this mark if arrows going wrong way) straight lines drawn; angles approximately equal and ray enters eye;	3
	(ii)	image (of lamp) shown behind the mirror; approximately 39 mm behind it and level with the lamp;	2
	(b)(i)	speed/both tranverse/both can travel through vacuum;	1
	(ii)	frequency/wavelength;	1
3	(a)(i)	limestone/calcium carbonate;	1
	(ii)	iron oxide + carbon monoxide/carbon → iron + carbon dioxide;;	2
	(iii)	oxygen removed (from iron oxide)/electron gained by iron;	1
	(b)(i)	Fe^{3+}; balancing of charges used as evidence;	2
	(ii)	working; *e.g. (56 x 2) + (16 x 3)* 160; (ignore units)	2
4	(a)(i)	light (intensity)/air movement/humidity;	1
	(ii)	so that light could enter; for photosynthesis;	2
	(b)(i)	1 water was lost from plants A and B; 2 by transpiration/by evaporation; 3 as water vapour/from the leaves/through stomata; 4 water could not escape from C/words to that effect ;	max 3
	(ii)	1 it was in warmer conditions; 2 which increased transpiration; 3 as water evaporated (in the leaves) more rapidly; 4 water (vapour) diffused (out of the leaf) more rapidly;	max 3

(iii) 1 plant had closed its stomata;
2 because plant was running short of water;
3 most of the water in the soil had been lost;
4 less difference in water concentration between the leaf and the air;
5 so smaller diffusion gradient; max 2

5 1 particles touch in solid and liquid;
2 particles widely spaced in gas;
3 particles vibrate in solid;
4 particles move within liquid;
5 particles move more freely in gas;
6 solid particles, strongly attracted to each other/strong forces between them;
7 liquid particles, strongly attracted to each other/strong forces between them;
8 gas particles, not attracted to each other/no forces between them; max 5

6 (a)(i) methane + oxygen → carbon dioxide + water;; 2

(ii) (fractions) used as fuel/burnt;
sulphur converted to sulphur dioxide/sulphur dioxide is formed;
(sulphur dioxide may) produce acid rain/be harmful if breathed in/
damage stonework/kill plants/acidify lakes/kill fish ; 3

(b) mix with bromine (solution/water);
solution decolourised; 2

(c)(i) 5; 1

(ii) each ethene molecule has two carbons/ref to 10 ÷ 2; 1

7 (a)(i) A has twice the mass of B;
gravity was the same for both so equal weight means equal mass/
similar argument; 2

(ii) 60 (cm);
explanation using idea of moments; 2

(b)(i) shown on mid line in both;
in bottom half of flask and top half of glass; 2

(ii) 1 conical flask has wider base;
2 so more difficult to move c of g outside this;
3 conical flask has lower centre of gravity; max 2

8 (a) organ; 1

(b)(i) 1 at least 6 of these cells drawn (shape recognisably similar);
2 each cell touching at least one other;
3 all orientated in the same direction;
4 more than one 'row' of cells shown; max 3

(ii) 1 (onion epidermal cell) has no chloroplasts/chlorophyll;
2 it is underground/does not receive light;
3 chloroplasts/chlorophyll, absorb light;
4 for photosynthesis; max 3

9 (a)(i) battery acid ; 1

(ii) $H^+ + OH^- \rightarrow H_2O$;; 2

(b) sodium chloride;
carbon dioxide;
water;
any order 3

(c) 1 mix acid and copper oxide;
2 warm/stir;
3 copper oxide in excess/add copper oxide until no more dissolves;
4 filter/decant;
5 allow, filtrate/solution, to form crystals or evaporate some water; 4 max

10 (a) 1 causes ionisation;
2 damages DNA/chromosomes/genes;
3 causes mutations;
4 destroys/damages, cells;
5 causes cancer; 2 max

(b) it is charged;
positively charged;
so is attracted to negative side/repelled by positive side (of field); 2 max

(c) contains less protons and neutrons;
two less of each; 2

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

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INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK: 30

SYLLABUS/COMPONENT: 0653/05

COMBINED SCIENCE
Practical

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1	(a)	temperatures at time 0 mins included time 0-10 mins all temps. decrease and B less than A	3
	(b)(i)	suitable scale for temperature correct plotting of points two smooth curves drawn	3
	(ii)	tube A	1
	(c)	yes explanation involving results or in terms of heat transfer	2
	(d)	lines continued as smooth curves	1
			total 10
2	(a)	blue colour	1
	(b)(i)	white ppt. chloride ion	2
	(ii)	litmus turns blue ammonia gas	2
	(c)	test for copper ion correctly described	3
	(d)	ammonium chloride and copper …….	2
			total 10
3	(c)(d)	Table correctly calculating mass of nitrate/100g at least three temperatures recorded temperatures within 4°C of expected values 70-78, 62-70, 55-63, 50-58	1 1 4
	(e)	correct plotting curve drawn smooth curve	3
	(f)	correctly read from graph	1
			total 10

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MARKING SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0653/06

COMBINED SCIENCE
Alternative to Practical

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1. (a) Average values correct as in table. (-1 for each error, 2 errors = 0 marks)

alcohol concn. /%	average heart rate per minute
0	210
1	192
2	174
3	146
4	92
5	46
6	34
7	24
8	18

[2]

(b) suitable scales (1) points plotted correctly (1) smooth curve drawn (1) [3]

(c)(i) (gradual) fall in heart rate (1)
(ii) steeper fall than in (i) (1) [2]

(d) slower reaction/reaction time increased [1]

(e)(i) counting error/variation in individual daphnia/warming effect of light
different temperatures/ any other appropriate reason [1]
(ii) longer count time/repeat several times at each alcohol strength/
check temperatures/any other appropriate (any one) [1]

Total 10 marks

2. (a) 25, 3, 44, cm^3 [3]

(b)(i) copper or zinc, (no reaction with water) [1]

(ii) iron (1)
iron rusts (and reacts with oxygen) (1) [2]

(iii) magnesium or calcium (1)
reacts with water (1) [2]

(c) hydrogen [1]

Total 9 marks

3. (a) 70, 62, 55°C [3]

(b) 140 g [1]

(c) points plotted (2) (-1 for each error)
smooth curve (not straight line) (1) [3]

(d) 40g of potassium nitrate in 100g water at 60^0C [1]

(e) heat to evaporate (1)
allow to cool (1) [2]

Total 10 marks

4. (a)(i) 57
(ii) 43 [2]

(b) Table with 3 columns correctly headed and 2 rows (or vice versa), (1)
data correctly entered (1) (-1 overall if 0 time omitted) [2]

(c) tube A [1]

(d) (yes) (no mark for this)
A stayed warm for longer/surrounding tubes acted as insulation/
any reference to mechanism of heat loss/smaller difference in
temperature across the wall of tube A compared with tube B [3]

(e) repeat and average/put all tubes in a water bath at first/measure
volumes accurately/any sensible suggestion (any 2) [2]

Total 10 marks

5. (a) test 1 carbon or copper oxide
test 3 not a carbonate
test 4 chloride (ions)
test 5 ammonia [4]

(b) fumes with HC*l* [2]

(c)(i) light (1) blue precipitate (1)
(ii) deep (1) blue solution(1) (any 3 points) [3]

(d) ammonium chloride
copper oxide [2]

Total 11 marks

6. (a)(i) radio (wave)
(ii) sound (wave) [2]

(b) The further away the source, the weaker is the sound OWTTE [1]

(c)(i) 3.0 s
(ii) 3.8 +/- 0.1s [2]

(d)(i) 1000/3 = 333 m/s [1]

(ii) 1000/3.8 = 263 m/s [1]

(e) The first (1), because the other one may be affected by the responses of the observer (1) OWTTE [2]

(f) repeat the experiment and average the results [1]

Total 10 marks