

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2003

INTERNATIONAL GCSE

MARKING SCHEME

MAXIMUM MARK:

SYLLABUS/COMPONENT: 0654/01

**CO-ORDINATED SCIENCES
Paper 1 (Multiple Choice)**



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	1

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

CAMBRIDGE
INTERNATIONAL EXAMINATIONS

NOVEMBER 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK:

SYLLABUS/COMPONENT: 0654/02
CO-ORDINATED SCIENCES (DOUBLE AWARD)
Paper 2 (Core)



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	2

1	(a)(i)	cell/plasma, membrane; cytoplasm;		2
	(ii)	no cell wall; no vacuole ;		2
	(b)	makes mucus; which traps, dirt/bacteria; keeps lungs clean;	2 max	2
	(c)	cilia (normally) sweep mucus upwards; mucus now collects in lungs; bacteria live in it/bacteria collect in lungs; coughing/poor gas exchange/shortness of breath;	3 max	3
2	(a)	all symbols correct;; lose one mark for one mistake accurate diagram;		3
	(b)	more cells/reduce resistance/remove lamp/remove resistor/increase voltage;		1
	(c)(i)	decreases - resistance of circuit higher;		
	(ii)	decreases - resistance of circuit higher;		
	(iii)	gets dimmer - less current flowing/less voltage across lamp;		3
3	(a)(i)	reference to ignition; (squeaky) pop;		2
	(ii)	measure time for a certain volume to be collected; the more gas collected per unit time the higher the rate; some reference to 'fair test' e.g. same temp/surface area/ concentration of acid;		3
	(b)	rusting prevented if attached metal is more reactive than iron; iron rusts if attached metal is less reactive than iron; rusting is worse than control if less reactive metal is attached;	2 max	
4	(a)(i)	distance = speed x time; distance = 330 x 0.2 = 66m; moth is 33m away;		3
	(ii)	series of compressions and rarefactions; or air particles vibrate; this vibration is passed on from one particle to the next;		2
	(iii)	more waves; same amplitude;		2

Page 2	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – JUNE 2003	0654	2

	(b)	kinetic energy = $\frac{1}{2} mv^2$; = $0.5 \times 2.5/1000 \times 3 \times 3$; (or for converting g to kg); = $11.25 \times 10^{-3} \text{ J}$;		3
5	(a)(i)	7.5;		1
	(ii)	bacteria act on food; produce acids;		2
	(iii)	line higher than original ; <i>accept either going up, or going down less</i>		1
	(iv)	increases pH/reduces acidity; by neutralisation; by removing, food/bacteria ; less acid to damage teeth; by, acting on/reacting with/dissolving, enamel;	3 max	3
	(b)(i)	one of the front two teeth labelled ;		1
	(ii)	chewing/crushing/grinding; breaks food down into smaller pieces; increase surface area of food; so enzymes can act on it more, rapidly/easily;	2 max	2
	(iii)	food gets stuck, in depressions on tooth surface/between teeth; food in contact with teeth for longer ;		2
6	(a)(i)	phosphorus/sulphur/chlorine/argon;		1
	(ii)	tin/lead;		1
	(iii)	four; Si in group IV outer electrons same as group number;		2
	(b)(i)	mixture B will be coloured and A will be colourless; B contains a transition metal compound/an iron compound;		2
	(ii)	giant structure; disorderly arrangement of atoms;		2
	(c)	conserves raw materials; avoids damage to landscape; removes waste glass/reference to reducing (dangerous) waste; uses less energy (per kg of glass)/less fossil fuel used per kg;	2 max	2
7	(a)	A a mirror; light is reflected;		
		B a glass or perspex block/lens etc; light is refracted;		4

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – JUNE 2003	0654	2

	(b)	ray is a series of straight lines; reflected off surface; at correct angles;		3
8	(a)(i)	water; air; fire;		3
	(ii)	any element; substance which; cannot be made simpler/be broken down and further/ contains only one type of atom;		2
	(b)(i)	protons; neutrons;		2
	(ii)	electrons;		1
	(iii)	gains (one) electron/achieves eight electrons in outer shell;		1
9	(a)	water; oxygen; carbohydrate/sugar/glucose/starch; <i>all three for two marks, two for one mark</i>		2
	(b)	absorb sunlight; <i>not 'attract'</i> provides energy for reaction; allows plants to use energy; able to use sunlight;	max 2	2
	(c)(i)	phloem;		1
	(ii)	for respiration; to provide energy; or for nectar; to attract insects to flower; or for stigma; to stimulate pollen to germinate ;		2
	(d)(i)	fewer plants means less carbon dioxide absorbed; so carbon dioxide in atmosphere may increase; if trees burnt then carbon dioxide released; carbon dioxide is a greenhouse gas/words to that effect; more heat trapped in atmosphere ;	3 max	3
	(ii)	loss of, habitat/food; animals become extinct; may lead to drier atmosphere; plants/animals, short of water;	2 max	

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – JUNE 2003	0654	2

10	(a)(i)	work = force x distance; = 650 x 50; = 32500J;		3
	(ii)	gravitational potential energy etc;		1
	(b)(i)	need large pressure to get stick into ice/snow; gets this with a small area; use less force;	max 2	2
	(ii)	stick only needs to go in a few centimetres then stop; disc reduces pressure - larger area;		2
	(c)	reduce friction;		1
11	(a)	water/rain enters tiny cracks and may freeze; expansion (of ice) deepens cracks; or heat/sun causes rock to expand; this causes rock to crack/weaken; or sand/dust carried by wind; hits rock weakening it/damaging surface;	2 max	2
	(b)(i)	reacts with soap/forms scum with soap/ reduces ability of soap to clean things; causes limescale in hot water systems/reduces efficiency of water heating/blocks pipes/scales kettles;		2
	(ii)	boil it/distill it/use ion exchange/use washing soda;		2
	(c)(i)	(thermal) decomposition;		1
	(ii)	add acid to solid; if gas/CO ₂ evolved then solid is a carbonate;		2

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NOVEMBER 2003

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 110

SYLLABUS/COMPONENT: 0654/03
CO-ORDINATED SCIENCES (DOUBLE AWARD)
Paper 3 (Extended)



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 1 (a) sawdust has greater surface area;
so higher rate of reaction; [2]
- (b) in (primary) cell reactants are used up/reaction cannot be reversed;
car battery is rechargeable (by the engine); [2]
- (c) glowing splint tests for (free) oxygen;
in water oxygen is combined;
heating does not decompose water; 2 max
- (d) MgO has giant structure/many strong bonds;
much energy needed to break bonds;
CO₂ is simple molecular/weak forces between molecules;
less energy needed to break bonds; 3 max
- 2 (a) ray bent in the correct direction and dispersed at first surface;
ray bent in the correct direction and dispersed at second surface;
red at top and blue at bottom; [3]
- (b) have a different, frequency/wavelength; [1]
- (c) equation $v = f\lambda$ stated in any form; *ignore formula triangles*
correct substitution, e.g. $f = 3 \times 10^8 \div 6 \times 10^{-7}$;
 5×10^{14} Hz/ 5×10^{11} kHz; [3]

Page 2	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 3 (a)(i) reflex (action); [1]
- (ii) sensory, relay/intermediate, motor;;
all correct for 2 marks
2 in correct sequence relative to each other for 1 mark [2]
- (b)(i) mass converted to newtons/20 used in calculation;
 $F = 20 \times 30 \div 5$ /any correct working;
 $= 120 \text{ N}$; [3]
- (ii) 1 food/glucose/carbohydrate;
2 respiration/combined with oxygen/oxidised;
3 in the (muscle), tissue/cells/mitochondria;
4 idea that the energy originated in the Sun;
5 Sun's/light, energy converted to chemical energy by photosynthesis; max 3
- (iii) when one contracts the other relaxes;
(contraction of) one causes bending while the other causes straightening; [2]

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 4 (a)(i) cracking; [1]
- (ii) one mark for each entirely correct;; [2]
- (b)(i) (molecular mass of ethane =) 30;
 $300 \div 30 = 10$; [2]
- (ii) 9; [1]
- (iii) (molecular mass of ethene =) 28;
 $9 \times 28 = 252$ g; [2]
- (c)(i) reaction with steam;
in presence of catalyst;
ref. to addition reaction; 2 max
- (ii) must be unsaturated/unsaturated/alkene;
undergoes addition reaction with bromine; [2]
- (d) melts/becomes softer;
as molecules separate and move;
only relatively weak attractive forces between molecules; 2 max

Page 4	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 5 (a)(i) friction;
as clothes rub against, one another/plastic door;
electron transfer; [2]
- (ii) electrons; [1]
- (b)(i) 2000; [1]
- (ii) 2000 W/Js⁻¹; [1]
- (iii) substitution, e.g. 2000 = 250 x current;
current = 8 A; [2]
- (iv) $I = V \div R$;
 $250/125 = 2 \text{ A}$; [2]

Page 5	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 6 (a)(i) curve rises then, flattens/falls;
S shaped; [2]
- (ii) point at which the curve begins to flatten/fall; [1]
- (b)(i) a change in, genetic material/DNA/genes/chromosomes;
sudden/random/unpredictable; [2]
- (ii) 1 allele **a**/allele (for long hair), is recessive;
2 no goat in the next generation could be aa;
3 all goats in the next generation will be Aa or AA; 2 max
- (iii) 1 two heterozygous goats/Aa and Aa, could breed together;
2 some gametes from each will contain allele a;
3 so some offspring will be aa;
take from written explanation and/or genetic diagram [3]
- (c)(i) 1 long hair, provides insulation/traps warm air;
2 less heat lost from body of long-haired goat;
3 food required to generate heat;
4 by respiration;
5 if less heat lost then less heat needs to be produced
(to keep temperature constant); 3 max
- (ii) 1 long-haired goats more likely to survive/vice versa;
2 when food is in short supply/when weather is cold/during winter;
3 so they breed;
4 passing on their alleles/genes, to their offspring;
5 this happens over several generations;
6 this is natural selection; 3 max

Page 6	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 7 (a)(i) 3 O₂ and 2 SO₂; [1]
- (ii) too unreactive/strong bonds in N₂; [1]
- (b)(i) zinc oxide + sulphuric acid → zinc sulphate + water;; [2]
- (ii) neutralisation; [1]
- (c) 1 zinc ion moves to cathode/negative electrode;
 2 because opposite charges attract;
 3 gains electrons (from cathode);
 4 each ion gains two electrons;
 5 becomes neutral/electrons cancel ionic charge; 4 max
- (d) (gelatinous) white, precipitate/solid;
 (re-)dissolves in excess; [2]
- (e) 1 brass is less malleable than pure metal/more difficult to bend/less chance of damage when connection is made;
 2 diagram of pure metal showing atoms all the same size;
note - must be regularly arranged and touching
 3 reference to slippage of atoms (under pressure);
 4 diagram of allow with atoms of different sizes;
 5 reference to greater difficulty of slippage; 3 max

Page 7	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 8 (a) cosmic radiation/the Sun; *not sunlight* [1]
- (b)(i) 2600 cps \pm 100; [1]
- (ii) 52 s \pm 1;
working (on graph or with answer); [2]
- (iii) (atoms containing) same number of protons;
different number of neutrons; [2]
- (c)(i) ionising;
damages, DNA/genes/chromosomes;
causes mutations;
causes cancer;
harms/kills, cells; 2 max
- (ii) alpha particle contains 2 protons and 2 neutrons;
radon 220 contains 86 protons and 134 neutrons;
so atom now contains 84 protons and 132 neutrons;
allow ecf if radon 220 p and n incorrect [3]

Page 8	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 9 (a)
- 1 cell wall is outside cell membrane;
 - 2 cell wall is made of cellulose;
 - 3 cell wall is (fully) permeable;
 - 4 cell membrane is made of, protein/lipids;
 - 5 cell membrane is thinner than cell wall;
 - 6 cell membrane is partially permeable;
 - 7 cell membrane is more flexible than cell wall;
 - 8 cell wall stops cell bursting (when full of water); 3 max
- (b)(i)
- 1 osmosis;
 - 2 through partially permeable (cell) membrane;
 - 3 down, diffusion/concentration, gradient;
 - 4 concentration of solution is higher inside the cell than outside; 3 max
- (ii)
- in xylem vessels;
 by mass flow;
 pulled by transpiration stream; 2 max
- (c) cells lose water;
 cells, become flaccid/lose turgor; [2]

Page 9	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	3

- 10 (a) pointer moves one way;
then in the opposite direction; [2]
- (b) magnetic (field) strength;
number of turns (of coil);
speed of turning; 2 max
- (c) 1 correct diagram of transformer with iron core and two sets of coils;
2 more turns on secondary coil than on primary;
3 primary coil voltage changes;
4 which causes change in magnetic field;
5 which induces current in secondary coil;
6 producing secondary coil voltage;
7 ref. to a.c.; 5 max

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MARK SCHEME

MAXIMUM MARK: 45

SYLLABUS/COMPONENT: 0654/05
CO-ORDINATED SCIENCES (DOUBLE AWARD)
Practical



Page 1	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – November 2003	0654	5

- 1 (a)(i) zero reading included
readings for 10 mins
temperatures show decrease and B is finally less than A [3]
- (b)(i) suitable scale for temperature
correct plotting of points
smooth curves drawn [3]
- (iii) tube A [1]
- (c) yes
test-tube A stayed warm for longer;
insulation provided by surrounding test-tubes;
rate of heat loss by conduction/convection/radiation is less;
smaller difference in temperature between tube A and surroundings
compared with tube B (and its surroundings). 3 max
- (d) suitable temperature between A and B (1)
some insulation/prevention of heat loss provided by tube A and tubes on
either side/less insulation/prevention of heat loss than tube A because of
side exposed to air. (1) [2]
- (e) lines continued as smooth curves. [1]
- (f) any suitable suggestion, e.g. ensure same starting temperatures, ensure
identical volumes

Total 15

- 2 (a) blue colour (not green) [1]
- (b)(i) no effervescence or no reaction
no carbonate [2]
- (ii) white ppt.
chloride present [2]
- (iii) litmus turns blue
ammonia [2]
- (c) each test for copper correctly described scores three [6]
- (d) ammonium chloride and copper [2]

Total 15

Page 2	Mark Scheme	Syllabus	Paper
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3 (c)(d) Table

Correctly calculating mass of nitrate/100g [1]
 At least three temperatures recorded [1]

Temperatures 70-78
 62-70
 55-63
 50-58 [4]

(e) correct plotting
 smooth curve drawn
 continues curve beyond plotted points [3]

(f) correctly read from graph [1]
 solubility correctly read [1]

(g) heating is irregular etc [1]

(h) one for each correct answer [3]

Total 15

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MARK SCHEME

MAXIMUM MARK: 60

SYLLABUS/COMPONENT: 0654/06

CO-ORDINATED SCIENCE
Alternative to Practical



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, cm³ [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

Page 2	Mark Scheme	Syllabus	Paper
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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°C [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 HCl [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

Page 3	Mark Scheme	Syllabus	Paper
	IGCSE EXAMINATIONS – NOVEMBER 2003	0654	6

6. (a)(i) radio (wave) [2]
(ii) sound (wave)
- (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) $1000/3 = 333 \text{ m/s}$ [1]
(ii) $1000/3.8 = 263 \text{ m/s}$ [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