

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

**MARK SCHEME for the November 2004 question paper**

<p><b>0654/03</b></p>	<p><b>0654 CO-ORDINATED SCIENCES</b> <b>Paper 3 (Extended Theory), maximum mark 100</b></p>
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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 November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.



**Grade thresholds** taken for Syllabus 0654 (Co-Ordinated Sciences) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 3	100	65	41	20	13

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.

November 2004

**INTERNATIONAL GCSE**

MARK SCHEME

MAXIMUM MARK: 100

SYLLABUS/COMPONENT: 0654/03

CO-ORDINATED SCIENCES

Paper 3 (Extended Theory)

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- 1 (a) evidence of working;  
5400 - 5500 years ' 2
- (b) neutron converted to proton;  
therefore loses an electron;  
beta emission; 2 max
- Total 4**
- 2 (a) (i) carbon, hydrogen and oxygen; 1
- (ii) monomer is small molecule/idea of building block;  
links in a chain (to form a polymer); 2
- (iii) nitrogen; 1
- (b) molecules/particles, move faster/gain kinetic energy;  
collide with inside of seed coat, more frequently/with more force; 2
- (c) (i) colloid; 1
- (ii) transparency means light rays are passing through;  
(in emulsion) light rays are, scattered/reflected;  
light rays shown, reflected/scattered, on diagram; 2 max
- (d) (i) *pure metal diagram shows*  
all atoms same size;  
close packed with regular pattern;
- alloy diagram shows*  
at least two different sizes of atoms;  
close packed but with one atom size breaking the regularity; 4
- Total 13**
- 3 (a) (i) label to cell wall or position of vacuole, plus appropriate name; 1
- (ii) *cell wall*  
supports the cell/holds cell in shape;  
stops it bursting when it takes up water;  
prevents entry of fungi;
- vacuole*  
contains cell sap;  
store of, minerals/sugars/(soluble) nutrients;  
reference to turgor; max 2
- (b) chloroplasts;  
which contain chlorophyll;  
(chlorophyll) absorbs sunlight; max 2

Page 5	Mark Scheme	Syllabus	Paper
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- (c) (i) 1 near the (upper) surface of the leaf;  
2 only, epidermis/one layer, above them;  
3 epidermis cells have no chloroplasts so more light reaches palisade cells;  
4 cells are arranged, upright/vertically;  
5 so light does not have to pass through many cell walls; **max 2**
- (ii) 1 air spaces/gaps;  
2 in, spongy layer/cells just below palisade layer;  
3 are in contact with outside air;  
4 allow diffusion (of carbon dioxide); **max 2**
- (d) tissue; **1**
- Total 10**
- 4 (a) B arrow pointing right;  
C arrow pointing vertically downwards;  
D pointing left;  
  
2 marks for all three correct, 1 mark for 1 correct **2**
- (b) force = mass x acceleration;  
so large force = large acceleration/small = small;  
small mass requires less force (to provide acceleration); **3**
- (c) light travels, virtually instantaneously/faster than sound;  
time taken for sound to reach spectator is longer than light;  
use of figures, e.g.  $85 \div 340 = 0.25$  s; **max 2**
- Total 7**
- 5 (a) hydrogen ' **1**
- (b) (i) Q, P, R, S; **1**
- (ii) same temperature;  
same acid concentration;  
same solid surface area;  
no insoluble salt formed; **max 3**
- (c) (i) copper nitrate - A copper;  
B oxygen;  
magnesium sulphate - A hydrogen;  
B oxygen;  
  
any two for one mark **max 2**

Page 6	Mark Scheme	Syllabus	Paper
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- (ii) if metal (ion in electrolyte) is above hydrogen then hydrogen is produced;  
if below hydrogen then metal forms (on electrode surface );

*note*

Allow one mark for the idea that more reactive metals give hydrogen  
and less reactive ones give the metal 2

**Total 9**

- 6** (a) (i) label line F to retina; 1
- (ii) label line P to iris; 1
- (b) as electrical signal/electrical impulse/action potential/nerve impulse;  
along a sensory, neurone nerve cell;  
in the optic nerve; max 2
- (c) (contraction) reduces the diameter of the ciliary muscle;  
slackens tension on the suspensory ligaments;  
allows lens to become thicker;  
decreases focal length of the lens/bends light rays more strongly; max 3
- (d) they can see colour;  
they cannot see (well) in the dark; 2
- (e) (i) longer wavelength/lower frequency; 1
- (ii) they are warmer (than their surroundings);  
they regulate their body temperature/they are homeothermic  
/endothermic;  
heat generated by, metabolic reactions/respiration/muscle activity; max 2

**Total 12**

- 7** (a) BC constant speed/20 ms<sup>-1</sup>;  
CD slowing (to a stop)/decelerating (to 0 ms<sup>-1</sup>); 2
- (b) evidence of working;  
AB 1000 m, BC 4000 m, CD 500 m;  
total distance = 5500 m; 3
- (c) momentum = mass x velocity *or* formula  
showing initial momentum = final momentum;  
working;  
 $v = 0.8125 \text{ ms}^{-1}$ ; 3
- (d)  $1/R = 1/R_1 + 1/R_2$ ; *accept alternative version*  
 $R = 2 \text{ ohms}$ ; 2

**Total 10**

Page 7	Mark Scheme	Syllabus	Paper
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8	(a)	(i)	speeds the reaction;	1	
		(ii)	reaction is reversible; so some product reacts to form reactants; mixture passes too quickly through reaction chamber/some nitrogen and hydrogen do not react;	max 2	
		(iii)	$2\text{SO}_2 \rightarrow \text{O}_2 + 2\text{SO}_2$ ;	1	
		(iv)	sulphur dioxide;	1	
	(b)	three shared pairs; lone pair on nitrogen;	2		
	(c)	(i)	use of formula - moles = (vol in $\text{cm}^3 \div 1000$ ) x concentration; (allow other correct working) for the acid $(100 \div 1000) \times 0.1$ (= 0.01); for the ammonia $(50 \div 1000) \times 0.2$ (= 0.01);	3	
		(ii)	recognises that 0.01 moles of salt will be produced; calculates formula mass of salt = $(14 \times 2) + (1 \times 4) + (16 \times 3) = 80$ ; 0.8 g	3	
				<b>Total 13</b>	
	9	(a)	(i)	grass $\rightarrow$ hog deer $\rightarrow$ tiger;	1
			(ii)	energy;	1
(iii)			three rectangular boxes stacked centrally on each other; largest box at bottom and smallest at top; labelled producer + primary consumer + secondary consumer;	3	
(b)		(i)	caused by, genes/alleles/DNA; mutation; in cell producing gametes; by both parents having a recessive allele for albino; albino offspring is homozygous for this allele;	max 2	
		(ii)	albino deer more likely to be killed/eaten/brown ones more likely to survive; by tigers/predators; because they are, less well adapted/too easily seen; less likely to (live long enough to) reproduce; so do not pass on their genes;	max 4	
					<b>Total 11</b>
10	(a)	frequency = velocity $\div$ wavelength; wavelength = 0.06 m (or shown in calculation); frequency = $5 \times 10^9$ Hz;	3		
	(b)	(i) energy = mass x shc x change in temperature; = $0.5 \times 4500 \times 80$ ; = 180 000 J;	3		

Page 8	Mark Scheme	Syllabus	Paper
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(ii)	0.75/75 %;	1
(iii)	some energy lost as, heat/light/sound;	1
(c)	reed contains magnetic strip; magnet closes switch when door is closed; this completes circuit;	3
		<b>Total 11</b>