

**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
**International General Certificate of Secondary Education**

**MARK SCHEME for the June 2005 question paper**

**0654 CO-ORDINATED SCIENCES**

**0654/03      Paper 3 (Extended Theory), maximum mark 100**

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.

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**Grade thresholds** for Syllabus 0654 (Co-ordinated Sciences) in the June 2005 examination.

	maximum mark available	minimum mark required for grade:			
		AA	CC	EE	FF
Component 3	100	63	36	17	11

The threshold (minimum mark) for BB is set halfway between those for Grades AA and CC. The threshold (minimum mark) for DD is set halfway between those for Grades CC and EE. The threshold (minimum mark) for GG is set as many marks below the FF threshold as the EE threshold is above it.

Grade A\* does not exist at the level of an individual component.

June 2005

**IGCSE**

**MARK SCHEME**

**MAXIMUM MARK: 100**

**SYLLABUS/COMPONENT: 0654/03**

**CO-ORDINATED SCIENCES  
Paper 3 (Extended Theory)**



1 (a)

	using wind power	using nuclear power
advantage	no pollution/saves fossil fuels/no CO <sub>2</sub> produced/renewable;	one power station provides lots of electricity/no air pollution;
disadvantage	need lots of turbines/damages landscape/not always windy/noisy/kills birds;	waste needs safe disposal/waste can harm people/radiation leaks;

[4]

(b) (i) coil/wire, is moving in a magnetic field/coil experiences varying magnetic field;

[1]

(ii) as coil turns, each side first passes the North Pole and then the South Pole;

(induced) current flows first in one direction and then the other;

every half turn;

max [2]

Page 2	Mark Scheme	Syllabus	Paper
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- 2 (a) small intestine/duodenum/ileum; [1]
- (b) provides large surface area/has microvilli;  
contains, blood vessel/capillary/good blood supply;  
contains lacteal;  
idea of small distance between digested food and blood; max [2]
- (c) (i) hepatic portal vein; [1]
- (ii) 1 too much glucose can harm, cells/metabolism;  
2 draws water out of cells by osmosis;  
3 liver converts excess glucose to glycogen;  
4 stores, glycogen/carbohydrate;  
5 removes excess amino acids;  
6 removes/breaks down, toxins; max [2]
- (d) (i) aerobic respiration;  
oxygen combined with glucose;  
producing carbon dioxide and water;  
ref. to ATP; max [3]
- (ii) anaerobic respiration;  
glucose (broken down) to form lactic acid;  
only small amount of energy released; max [2]
- (iii) 1 idea that smoking makes it more difficult to get oxygen, into the blood/into the muscles;  
2 because it harms the gas exchange system/specific harm described;  
3 less oxygen carried in blood;  
4 because carbon monoxide carried instead of oxygen; max [2]

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- 3 (a)** electrolyte;  
anode; [2]
- (b) (i)** neutron; [1]
- (ii)** shared pair shown;  
other electrons correct; [2]
- (c) (i)** react with bromine (solution)/potassium permanganate;  
(orange) to colourless/(purple) to colourless; [2]
- (ii)** correct arrangement of H and Cl atoms with “hangers” left; [1]
- (iii)**
- 1 poly(chloroethene)/thermoplastic, softens when heated/can be remoulded;
  - 2 Bakelite/thermoset, does not melt/becomes harder when heated/initially softens but cannot be resoftened after cooling/blackens;
  - 3 (polymer) molecules in, poly(chloroethene)/thermoplastic, move past each other because they are held in place by weak forces of attraction between the molecules;
  - 4 in Bakelite there is cross-linking/(covalent) bonds, between molecules (locking the structure);
- max [3]**

Page 4	Mark Scheme	Syllabus	Paper
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- 4 (a) gamma/X rays/UV;  
 ionisation/is ionising radiation;  
 damages DNA/causes mutation;  
 ref to cancer;  
 burns skin; max [2]
- (b) (i) [B no mark]  
 idea that mass:weight ratio = 10; [1]
- (ii) A and D; [1]
- (iii) C: least mass; [1]
- (c) (i) particles/molecules;  
 vibrate/compressions and rarefactions; [2]
- (ii) shock waves travel through the ground/he feels it through his feet/the ground shakes; [1]
- (d) (i) time = distance/speed;  
 =  $400\,000/300\,000 = 1.3(3)$  seconds; [2]
- (ii) frequency = velocity/wavelength;  
 =  $300\,000/(2 \times 10^{-3})$  or  $300\,000\,000/2$ ;  
 =  $1.5 \times 10^8$  Hz; [3]

Page 5	Mark Scheme	Syllabus	Paper
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- 5 (a) (i) as force increases length of wool increases;  
proportional;  
directly (proportional); max [2]
- (ii) break/will not return to their original length/increase of length out of  
proportion to force applied/pass their elastic limit; [1]
- (b) traps air;  
acts as insulator;  
less convection/less (heat loss by) radiation; max [2]
- (c) (i) age/diet/time of year/gender;  
may affect, growth of wool/kind of wool; [2]
- (ii) group **A** sheep have smaller wool diameter in both areas/group **B**  
sheep have larger diameter in both areas; [1]
- (iii) both A and B sheep have smaller wool diameter in cool area; [1]
- (iv) range of thicknesses;  
(results in table show that) wool can be any diameter/no clear-cut  
categories for wool diameter;  
use of numbers from table to support answer; max [2]



Page 6	Mark Scheme	Syllabus	Paper
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- 6 (a) (i) 1.0 g;  
idea that catalyst is not consumed; [2]
- (ii)  $2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$  ; ; (formulae + balanced) [2]
- (b) 1 idea that, calcium/magnesium, (ions) cause hardness;  
2 (hard) water, passes through/contacts, the ion exchange material;  
3 dissolved, calcium/magnesium/ions causing hardness, sticks to resin;  
4 sodium/ions not causing hardness, released into the water;  
5 calcium/magnesium, replaced by other ions not causing hardness; max [3]
- (c) (i) B;  
more soap needed to make a lather; [2]
- (ii) partially softened by boiling/some of the hardness removed by boiling/not all the hardness removed by boiling;  
might contain both temporary and permanent hardness;  
may not have been boiled for a sufficient length of time to remove all hardness; max [2]

<b>Page 7</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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- 7 (a) (i)**  $R = V/I$ ;  
evidence of working (0.4/0.4);  
1 ohm; **[3]**
- (ii)** should be a straight line/should be directly proportional;  
lamp gets hot so resistance increases; **[2]**
- (iii)** straight line through origin;  
gradient correct; **[2]**
- (b)**
- 1 electrons are negative (or implication);
  - 2 rod gains electrons;
  - 3 electrons/negative charge, removed by friction;
  - 4 flow of, electrons/negative charge, is an electric current; **[4]**

<b>Page 8</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
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- 8 (a)**
- A** anther/stamen;
- B** ovary; **[2]**
- (b)**
- 1 insects/birds;
- 2 attracted by, petals/scent;
- 3 pick up pollen from anther/pollen falls from anther;
- 4 pollen deposited on stigma; **max [3]**
- (c) (i)** male gamete/male nucleus/pollen nucleus; (NOT grain) **[1]**
- (ii)** fertilisation;
- male, gamete/nucleus/sex cell, fuses with female, gamete/nucleus/sex cell;
- zygote formed; **[2]**
- (d) (i)**
- 1 pesticides may harm the plants;
- 2 pesticides harm, bees/pollinating insects;
- 3 so less pollination;
- 4 pesticides kill predators of aphids; **max [2]**
- (ii)** biological control;
- use, ladybirds/predator;
- which will eat aphids;
- mechanical method described, e.g. spray with water; **max [2]**

Page 9	Mark Scheme	Syllabus	Paper
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- 9 (a) would not contain manganese (di)oxide;  
would not contain iron oxide;  
reference to avoiding transition metal compounds/transition metal  
compounds impart the colour; [3]
- (b) (i) two electron shells with electrons arranged 2,8; [1]
- (ii) reference to ion having filled outer shell;  
filled outer shell is stable/less tendency to change/owtte; [2]
- (iii)  $\text{Fe}^{3+}$ ;  
working to show the need for charge balance; [2]
- (c) 1  $M_r \text{ CaO} = 40 + 16 = 56$ ;  
2 14g is 0.25 mole of CaO;  
3 use of equation e.g. 1 mole of CaO from 1 mole of  $\text{CaCO}_3$ ;  
4 0.25 moles of  $\text{CaCO}_3$  required; max [3]