

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

**MARK SCHEME for the October/November 2011 question paper  
for the guidance of teachers**

**0654 CO-ORDINATED SCIENCES**

**0654/51**

Paper 5 (Practical), maximum raw mark 45

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

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- 1 (a) (i) splint relights/splint glows brighter ;  
oxygen/O<sub>2</sub> ; (second mark tied to a correct observation) [2]
- (ii) 3 reasonably similar readings for fresh yeast **B**, **C** and **D** ;  
clearly in seconds ; [2]
- (iii) correct value for  $(\mathbf{B} + \mathbf{C} + \mathbf{D}) \div 3$  to a minimum of 1 decimal place unless it is  
exactly a whole number ; [1]
- (b) (i) 'no reaction' recorded for **E** in Table 1.1 ; [1]
- (ii) fresh yeast faster reaction / fresh yeast worked (or reverse statement) ;  
enzymes (or yeast) denatured (killed/destroyed/made inactive) by boiling ; [2]
- (c) (i) *yes*: similar readings ;  
**OR**  
*no*: different values / too few repeats / difficult to time end point (if this  
response is seen here it cannot be credited in (c) (ii) as well) / loss of yeast  
down side of tube ; [max 1]
- (ii) uneven concentration of yeast ;  
timing error ;  
judgement of foam reaching the line ;  
not all yeast reaches the peroxide ;  
detergent not controlled ;  
concentration of hydrogen peroxide ;  
accuracy of measuring (must be accompanied by reference to scale) ; [max 2]
- (d) 2 or more different temperatures ;  
controlled amount of enzyme (mass/amount/size/volume) ;  
repeats ;  
method of measuring rate (volume of oxygen in a time/height of foam in a time) ;  
control of pH ;  
same peroxide concentration ;  
water baths used ; [max 4]

[Total: 15]

2 (a)

compound changes	name and formula	time/s	colour
<b>A</b>	zinc carbonate, ZnCO <sub>3</sub>	e.g. 31	yellow (when hot)
<b>B</b>	magnesium carbonate, MgCO <sub>3</sub>	e.g. 21	(remains) white
<b>C</b>	unknown metal carbonate, XCO <sub>3</sub>	e.g. 28	(green to) black

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- (ii) **A:** a value of time (in seconds) **AND** yellow/yellow when hot (ignore references to the limewater) ; [1]
- (iii) **B:** a value of time **AND** white/no change/same (ignore references to the limewater) ;  
**C:** a value of time **AND** black (ignore references to the limewater) ; [2]
- (iv) 1 (fastest) = one with shortest time  
2 = one with intermediate time  
3 (slowest) = one with longest time ; [1]  
(note: this must be consistent with candidates' results)
- (v) carbon dioxide/CO<sub>2</sub> ; [1]
- (b) (i) metal observations**
- |           |  |
|-----------|--|
| zinc      | bubbles ;                                |
| magnesium | fast bubbles/gets hot/metal disappears ; |
| <b>X</b>  | no reaction ;                            |
- [3]
- (ii) 1 (most reactive) = magnesium (**B**) ;  
2 = zinc (**A**) ;  
3 (least reactive) = **X** (**C**) ; [1]  
(this response must relate to the results in **(b) (i)**. If there are no results in **(b) (i)** then the answer must be as above.)
- (iii) yes (if answer to **(a) (iv)** is Mg, Zn, **X** (**B, A, C**) or **X**, Zn, Mg (**C, A, B**))  
**AND** order is same/reverse order compared with order in **(b) (i)** ;
- OR**
- no (if answer to **(a) (iv)** is not Mg, Zn, **X** (**B, A, C**) or **X**, Zn, Mg (**C, A, B**))  
**AND** not in same/reverse order compared with order in **(b) (i)** ; [max 1]
- (c) (i)** blue ppt./grey-blue ppt./green-blue ppt. ; [1]
- (ii)** brown/black solid **OR** zinc turns brown/black ;  
bubbles/effervescence/colourless solution/solution less blue/gets hot ; [2]

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(iii) X = copper/Cu ; (note: do **not** allow copper(II)/Cu<sup>2+</sup>) [1]

**evidence 1 and evidence 2:**

**any two for one mark**

blue ppt. with NaOH (in (c) (ii)) **and/or** blue solution in (c) ;

copper carbonate is green ;

copper oxide is black ;

brown solid (in (c) (ii)) ;

displacement by zinc gives brown solid ;

X is brown ;

X does not react with acid ;

[max 1]

**[Total: 15]**

3 (a) any five readings (allow full reading from clock) ;  
any complete column of readings (allow full reading from clock) ;  
all 15 readings entered (allow full reading from clock) ;  
average of readings increasing from  $\theta = 10^\circ$  to  $30^\circ$  ;  
all readings recorded to 0.1 s ; [5]

(b) (i) all 3 averages correctly calculated to at least 1 decimal place ; [1]

(ii) all 3 T values calculated correctly to at least 1 decimal place (average  $\div 10$ ) ; [1]

(iii) T increases as angle of swing increases ;  
**OR** a relationship consistent with results ; [max 1]

(iv) when  $\theta$  is doubled T is not doubled / T not changing by same factor / other correct statement consistent with candidates' results ; [1]

(c) use of  $l = 0.30$  m ;  
correct calculation of g to at least 1 decimal place using correct T from table which must be squared (allow ecf for l in cm in which case answer is 100 times greater) ;  
units of  $\text{m s}^{-2}$  or  $\text{m/s}^2$  ; [3]

(d) (i) any errors are reduced (divided by ten) / reduced effect of timing error ; [1]

(ii) simultaneous release of pendulum and starting stop clock ;  
judging completion of oscillations ;  
timing of 10 oscillations / human reaction time (do **not** allow just 'timing') ;  
measuring length of pendulum to centre of bob ;  
measuring angle accurately / protractor not positioned correctly ; [max 1]

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- (iii) light gate or auto release timer ;  
more oscillations ;  
measure bob with callipers and measure cotton accordingly ;  
set up protractor with a plumb line to check alignment ;

[max 1]

**[Total: 15]**