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Cambridge International General Certificate of Secondary Education

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## **MARK SCHEME for the May/June 2015 series**

### **0653 COMBINED SCIENCE**

**0653/21**

Paper 2 (Core Theory), maximum raw mark 80

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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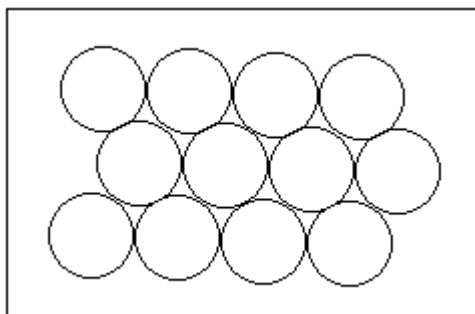
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Page 2	Mark Scheme	Syllabus Paper
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- 1 (a) (i) 1 proton ; 1 electron ;
- (ii) covalent;
- (iii) hydrogen + oxygen ; water ; [2]
- (iv) heat energy given out / increase in temperature ; [1]
- (v) named metal above hydrogen in reactivity series up to and including calcium ;  
above hydrogen in reactivity series ; [2]
- (b) noble gas so unreactive (with oxygen) / not flammable ; [1]
- (c) C<sub>3</sub>H<sub>8</sub> ; [1]
- [Total: 10]
- 2 (a) (i) carbon, hydrogen, oxygen ; [1]
- (ii) carbon, hydrogen, oxygen ; [1]
- (b) (i) X cell membrane ; [2]  
Y cytoplasm ;
- (ii) from alveoli into blood / capillaries ; [max 2]  
in blood ;  
in red cells ;  
carried by haemoglobin ;  
any valid reference to diffusion ;
- (c) (energy needed) for contraction of muscles / movement ; [1]
- (d) (i) 2760 and 2260 ; [1]
- (ii) Sarbjit because she used more energy ; [2]  
she broke down a greater amount of food stores ;  
(allow ecf if calculation in (i) indicates the wrong girl)
- (iii) activities done at different rates owtte ; [1]
- [Total: 11]

Page 3	Mark Scheme	Syllabus Paper
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- 3 (a) weight (accept gravity) ;
- (b) **A to B:** accelerating/going faster ;  
**B to C:** constant speed ;
- (c) (distance =) speed x time (in any form) ; [2]  
(OR use of area under graph between **B** and **C**)  
= 25 x 30 = 750 (m) ;
- (d) (i) reduces friction(al force) (opposing effect of gravity) ; [1]  
(ii) reduces air resistance (opposing effect of gravity) ; [1]
- (e) [2]



or acceptable equivalent with at least 12 spheres in total  
regular pattern ;  
most touching ;

[Total: 9]

- 4 (a) (i) green to yellow / orange / red ; [1]  
(ii) gas dissolves in / reacts with water etc. in atmosphere ; [2]  
acid rain falls on soil ;
- (iii) calcium chloride ; [2]  
water ;
- (b) (i) decreasing size of pieces decreases time taken / [1]  
increases rate / v.v. ;
- (ii) increasing concentration (of acid) decreases time / [1]  
increases rate / v.v.  
**OR**  
increasing temperature decreases time / increases rate / v.v. ;

[Total: 7]

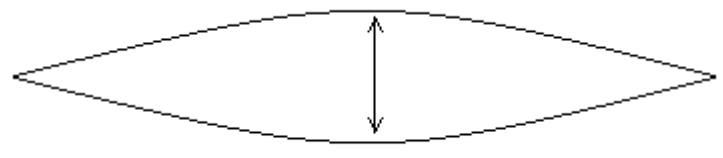
Page 4	Mark Scheme	Syllabus Paper
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- 5 (a) (i) arrow correctly drawn from anther of flower **A** ;  
to stigma of flower **B** ;  
(allow 1 mark if the arrow points to the correct structures but is the wrong way round)
- (ii) large petals ; [max 2]  
anthers inside flower ;  
stigma inside flower ;
- (b) (i) no germination at 4°C / in dish **3** ; [2]  
no germination when water is absent / in dish **2** ;
- (ii) (light is not needed) no mark [1]  
because germination took place in dish **4** ;
- (iii) oxygen ; [1]

[Total: 8]

- 6 (a) (i) cello ; [1]  
(ii) harp ; [1]  
(iii) harp ; [1]

(b) (i)



- or similar diagram to illustrate a vibrating string ; [1]
- (ii) greater amplitude / owtte ; [1]
- (c) (time delay =) distance / speed of sound ; [2]  
= 66 / 330 = 0.2 (s) ;

[Total: 7]

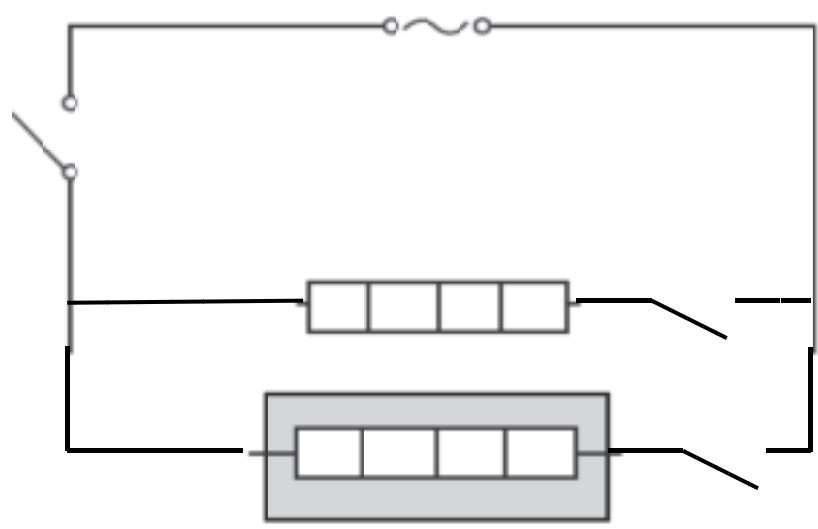
Page 5	Mark Scheme	Syllabus Paper
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- 7 (a) liquid  
solid  
1 for 2 correct, 2 for 3 correct ;
- (b) (i) anode  
cathode ;  
electrolyte ; [2]
- (ii) X on or near left-hand electrode under or just above electrolyte surface ; [1]
- (iii) brown / orange / yellow, colouration of, electrolyte / gas ; [1]
- (c) (i) (sodium) chloride ; [1]
- (ii) (sodium) iodide ; [1]
- (iii) trend in reactivity with other halides:  $Cl > Br > I$  / chlorine is more reactive than iodine ; [1]
- [Total: 9]
- 8 (a) (i) water ; [2]  
sugar / glucose ;
- (ii) zebra / lion ; [2]  
lion ;
- (b) correct arrow drawn from zebra to hyena ; [2]  
correct arrow drawn from hyena to lion ;
- (c) (i) by eating ; [1]
- (ii) carbon lost in waste materials / urine / faeces ; [max 2]  
carbon lost during respiration as carbon dioxide ;  
not all the zebra eaten ;  
not all the zebra digested / absorbed ;
- [Total: 9]

Page 6	Mark Scheme	Syllabus Paper
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- 9 (a) (i) convection ;  
(ii) conduction ;  
(iii) any reasonable description of thermal insulation/lagging ; [2]  
explanation **either** in terms of  
reducing thermal energy transfer by conduction through tank wall  
**or** the lagging preventing thermal energy transfer by convection ;

- (b) switches in both heater branches (can be either side of heater) ; [2]  
rest of circuit completed properly ;  
(accept any circuit that fulfils the criteria (with or without single switch))



- (c) resistance of water heater less than that of warm air heater ; [3]  
p.d. same across both, so current twice / higher,  
and so resistance must be half / lower ;  
(or vice versa)

- (d) damaged insulation ; [max 1]  
accept water leak / dampness  
the heater is not earthed ;

[Total: 10]