

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

**0653 COMBINED SCIENCE**

**0653/32**

Paper 3 (Extended 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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Page 2	Mark Scheme	Syllabus Paper
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- 1 (a) 7 ;  
number of outer electrons = Group number ;
- (b) (i) cobalt chloride test paper / anhydrous cobalt chloride ;  
turns (from blue to) pink ;  
OR  
anhydrous copper sulphate ;  
turns (from white to) blue ; [2]
- (ii)  $2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{l})$   
formulae ;  
balancing ;  
states ; [3]
- (iii) 2 shared pairs ;  
4 non-bonding electrons on O ; [2]  
(max 1 if any other error)
- 2 (a) large surface area ;  
for rapid / efficient diffusion / uptake / absorption of water / ions /  
minerals / nutrients ; [2]  
(allow a relevant named ion)
- (b) breaking down large / insoluble molecules ;  
into small / soluble molecules ;  
that can be absorbed ; [max 2]
- (c) (i) 40 °C ; [1]
- (ii) from 10 °C to 30 °C  
speed (of digestion) was increasing ;  
due to more frequent collisions (between molecules) ;  
molecules have more kinetic energy ;  
  
above 50 °C  
speed (of digestion) was decreasing ;  
due to denaturation of the enzyme ;  
shape of enzyme / active site is changing ; [max 4]  
(two marks to be awarded for each temperature)

Page 3	Mark Scheme	Syllabus Paper
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- 3 (a) (i) running at constant speed ;  
(ii) reference to low (forward) speed / speed decreasing ;
- (b) kinetic (energy) → gravitational (potential) / potential (energy) ;  
potential (energy) → kinetic (energy) ; [2]
- (c) (falls to zero then) accelerating / going faster ; [1]
- (d) (distance =)  $\frac{1}{2}$  base  $\times$  height /  $\frac{1}{2} \times 1 \times 4$  ; [2]  
= 2 (m)
- (e) rise in temperature means particles vibrate more energetically / owtte ;  
which increases (average) distance between particles / owtte ; [2]
- 4 (a) (i) **physical:** (iron oxide) settles / produced layers in rock /  
iron compounds dissolved ;  
**chemical:** compounds oxidised to iron oxide /  
oxygen produced by bacteria ; [2]
- (ii) chemical change produces a new substance / ora ; [1]  
(allow other correct differences)
- (b) (assume reference to ancient atmosphere if not specified)  
**difference:** more carbon dioxide in ancient atmosphere ;  
(allow other reasonable ideas based on the diagram  
e.g. noble gases, polluting gases or water vapour)  
**similarity:** nitrogen largest component ; [2]
- (c) (i) carbon monoxide ; [1]
- (ii) coke / coal and air / oxygen ; [1]
- (iii) copper forms weaker bonds with oxygen than does iron ;  
copper is lower than iron in the reactivity series ; [2]
- (iv) (limestone / calcium carbonate decomposes to produce) calcium oxide ;  
which reacts with silicon dioxide ;  
to form molten slag / calcium silicate ;  
which floats on / forms a separate layer on molten iron ; [max 2]

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- 5 (a) (i) pulmonary artery correctly labelled ;  
 vena cava correctly labelled ;
- (ii) blockage / narrowing of coronary arteries ;  
 (due to) cholesterol / fat deposits / plaques ;  
 lack of oxygen supplied to heart muscle ; [max 2]
- (b) (i) number of deaths (per 100 000 population per year) increased  
 as the (average) number of cigarettes smoked increased ;  
 appropriate reference to figures ; [2]
- (ii) less stress ;  
 less fat in the diet ;  
 more exercise taken ;  
 inherited likelihood (of developing CHD) ;  
 more people die from other causes ;  
 improved / more effective treatment for CHD available ; [max 2]
- (c) cilia cannot (beat to) remove the mucus bacteria / pathogens ;  
 and then 1 from  
 bacteria / pathogens are trapped / contained in mucus OR  
 bacteria / pathogens stay in the lungs / breed in the mucus ; [max 2]
- 6 (a) (i) water goes up and down at right angles to direction of travel of wave / owtte [1]
- (ii) oscillating spring / sound waves / avp ; [1]
- (b) speed ; [1]
- (c) (i) frequency less than lower limit of hearing ; [1]
- (ii)  $(v =) f\lambda$  ;  
 =  $30 \times 1 = 30$  ;  
 unit: cm / s ; [3]  
 (unit must be consistent with working)
- (iii) by vibrations (of air) ;  
 from particle to particle / through particles / by collision between particles ;  
 (in the form of) compressions and rarefactions / as longitudinal waves ; [max 2]

Page 5	Mark Scheme	Syllabus Paper
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- 7 (a) (i) ethane ;  
C<sub>2</sub>H<sub>6</sub> ;
- (ii) fraction with higher boiling point (range) contains larger molecules ;  
larger molecules have greater intermolecular forces ;  
more energy required to overcome larger intermolecular forces ; [3]
- (b) chloride / Cl<sup>-</sup> ions move to anode/positive electrode ;  
opposite charges attract ;  
electrons pass from chloride/Cl<sup>-</sup> ions to anode/positive electrode /  
correct electrode equation ; [max 2]  
(allow chloride ions are oxidised)
- 8 (a) (i) particles reduce amount of light (landing on the leaf) ; [1]
- (ii) carbon dioxide prevented from entering leaf ; [1]
- (b) (i) less photosynthesis to produce oxygen ;  
reference to respiration by animals or decomposers using up oxygen ;  
the combustion of wood ; [max 2]
- (ii) less oxygen available for respiration ; [1]
- (c) global warming / increased greenhouse effect /  
consequence of global warming described e.g. rising sea level /  
climate change / examples of extreme weather events ; [1]
- (d) water (vapour) / sulfur dioxide / nitrogen oxide(s) / carbon monoxide / soot ; [1]

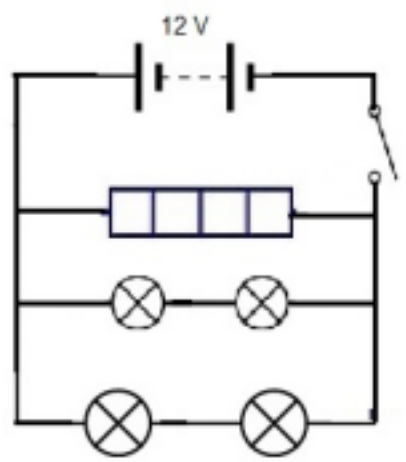
Page 6	Mark Scheme	System Paper
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- 9 (a) two points from  
potential difference / volts / voltage ;  
required to drive the current ;  
6 (volts) required to allow lamp to work properly / safely ;

two points from  
power / watts / wattage ;  
energy / second transferred ;  
120 (watts) is the safe maximum / owtte ;

[max 4]

(b)



sidelamps remain in series with each other and each pair in parallel with the battery ;  
heater, sidelamps, headlamps all in parallel ;

[2]

- (c)  $I = P/V$  or equivalent ;  
 $I = 120/12 = 10(A)$  ;

[2]

- (d) convection ;

[1]