

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0653 COMBINED SCIENCE

0653/21

Paper 2 (Core Theory), maximum raw mark 80

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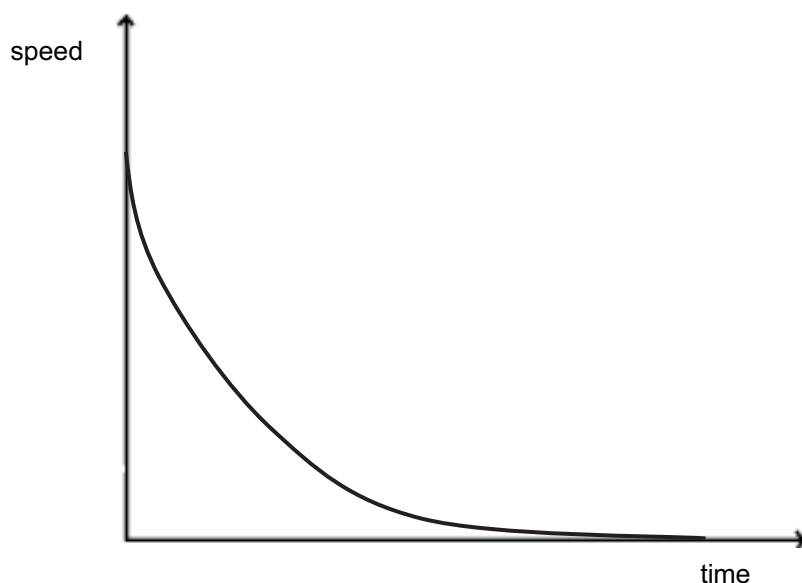
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Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) (i) **B and D** ; [1]
- (ii) **C** ; [1]
- (b) (on either cell **B** or **D** or a mixture of both) correct labelling of:
 cell wall ;
 vacuole ;
 chloroplast ; [max 2]
- (c) (i) shape **X**, **AND**
 lost less water (by transpiration) ;
 this leaf / shoot has smaller (total) surface area ; [2]
- (ii) (*temperature*) (distance increases as) rate of transpiration increases / more water lost in warmer conditions ;
 (*humidity*) (distance increases as) rate of transpiration increases / more water lost with reduced humidity ; [2]
- [Total: 8]**
- 2 (a) increases ; [1]
- (b) sodium atoms lose electrons ;
 bromine atoms gain electrons ; [2]
- (c) (i) bromine ; [1]
- (ii) chlorine + sodium bromide → bromine + sodium chloride
 LHS ; RHS ; [2]
- (iii) chlorine displaces bromine but iodine does not displace bromine ;
 a more reactive halogen displaces a less reactive halogen / owtte ;
OR
 chlorine more reactive than bromine and so displaces it ;
 iodine less reactive than bromine so does not displace it ; [max 2]
- [Total: 8]**
- 3 (a) potential (energy) **to** kinetic (energy) ; [1]
- (b) (i) weight / gravitational force ; [1]
- (ii) arrow on Fig. 3.1 pointing upwards ; [1]
- (iii) newton ; [1]

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(c)



straight line / curve from higher on the y-axis with negative gradient ;
line intersects x-axis ;

[2]

(d) any estimate less than 40 m, greater than 25 m ;
weight of man stretching rope ;

[2]

(e) (KE causes) friction in the rope as it stretches and slackens / owtte ;

[1]

[Total: 9]

4 (a) (i) urethra correctly labelled ;
prostate gland correctly labelled ;

[2]

(ii) yes, **AND**
the sperm duct / tube ;
on the unblocked / other side is clear ;
idea of clear route for sperms (from testis) ;
allow: idea of reduced fertility ;

[max 3]

(b) (i) days 0–5 / 6 / 7 and / or 30–35 / 36 / 37 ;
lining of uterus is being shed / breaking down ;

[2]

(ii) day 14 / 15 / 16 ;

[1]

(iii) controlled by hormones / controlled by ovaries ;

[1]

(iv) for implantation / nourishment of embryo / ball of cells ;

[1]

[Total: 10]

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5 (a) natural gas / biogas ; [1]

(b) (i)

<i>gases present before the explosion</i>		<i>gases present just after the explosion</i>
(methane)	➔	carbon dioxide
(oxygen)		water (vapour)
(nitrogen)		nitrogen

(all 3 correct for 2 marks, 2 correct for 1 mark)

::

[2]

(ii) exothermic ;

[1]

(c) (i) C_9H_{20} ;

[1]

(ii) covalent ;
bonding between non-metals / electron sharing ;

[2]

(d) (i) condenses ;

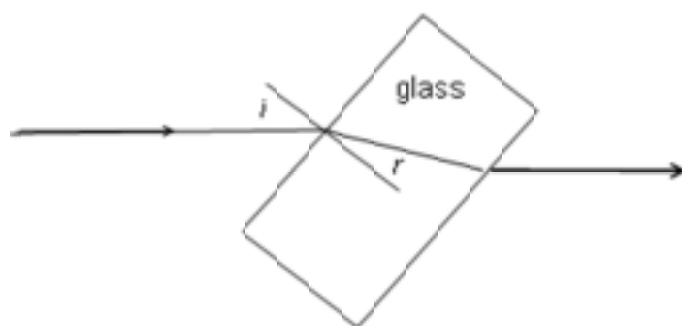
[1]

(ii) different boiling points ;

[1]

[Total: 9]

6 (a)



ray in glass bent towards normal ;
emergent ray parallel to incident ;
 i and r clearly marked for correct angles ;

[3]

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- (b) (i) ultra-violet / X-rays / gamma radiation ; [1]
- (ii) infra-red / IR ; [1]
- (c) (i) wavelength shown correctly and clearly ;
amplitude shown correctly and clearly from x-axis to peak ; [2]
- (ii) loudness / volume ; [1]

[Total: 8]

7 (a)

<i>component of blood</i>	<i>function</i>
plasma	transport of oxygen
platelets	clotting of blood
red blood cells	defence against disease
white blood cells	transport of dissolved substances

(all correct for 2 marks, 2 or 1 correct for 1 mark)

;;

[2]

- (b) (i) diffusion happens from a higher to a lower concentration ; [1]
- (ii) used to react / break down glucose ;
during respiration ; [2]
- (iii) any flight / fight / fear situation described ; [1]
- (iv) increase in pulse rate ;
increase in blood glucose ;
AVP ; [max 2]

[Total: 8]

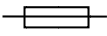
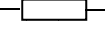
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- 8 (a) (i) flame/lighted splint ;
explosion/‘pop’/burns with a squeaky pop ; [2]
- (ii) acid concentration decreases ;
acid used up/not enough acid to react with all the iron ;
rate of reaction decreases/reaction stops ; [max 2]
- (iii) silver nitrate ;
white precipitate/owtte ; [2]
- (b) faster/more bubbling ;
increase in temperature causes increase in rate of reaction/reaction finishes more quickly ; [2]
- (c) no reaction/bubbles ;
copper is below hydrogen in the reactivity series/owtte ; [2]

[Total: 10]

- 9 (a) (i) potential difference/p.d. ; [1]
- (ii) current increases/goes up ; [1]
- (iii) meter reading increases/goes up ;
current increases/goes up ;
resistance decreases/goes down in a parallel circuit ; [max 2]
- (iv) $(4 \times 2) = 8 (\Omega)$; [1]

(b)

<i>circuit component</i>	<i>symbol</i>
<i>direct current source</i>	
<i>fuse</i>	
lamp / bulb	
<i>fixed resistor</i>	

;;
(all correct for 2 marks, 2 or 1 correct for 1 mark)

[2]

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(c) (i) convection ; [1]

(ii) description / diagram of suitable apparatus ;
description of observation made that shows convection ; [2]

[Total: 10]

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0653 COMBINED SCIENCE

0653/22

Paper 2 (Core Theory), maximum raw mark 80

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1 (a) (i) force **X** = friction (force) ;
force **Y** = weight ; [2]

(ii) 750 N ;
for constant speed, forces must be balanced / owtte ; [2]

(b) (i) (30–90 s) constant speed ;
(90–120 s) (negative) acceleration / deceleration ; [2]

(ii) $20 \text{ m/s} = 20 \times 3600 \text{ m/h}$;
 $= 72000 \text{ m/h} = 72 \text{ (km/h)}$; [2]

[Total: 8]

2 (a) (i) fractional distillation ; [1]

(ii) because new substances are not made ; [1]

(b) (i) petroleum fraction boils and vapour moves into delivery tube ;
vapour condenses in delivery tube ; [2]

(ii) increasing boiling point from **A** to **D** ; [1]

(c) (hydrocarbon) + oxygen ;
water + carbon dioxide ; [2]

[Total: 7]

3 (a)

chemical		description
fats		can be joined together to make starch or glycogen
glycogen		turns purple with the biuret test
protein		made from fatty acids and glycerol
sugars		storage carbohydrate not found in plants

(3 correct for 2 marks, 2 or 1 correct for 1 mark)

;;

[2]

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(b) (i) respiration ; [1]

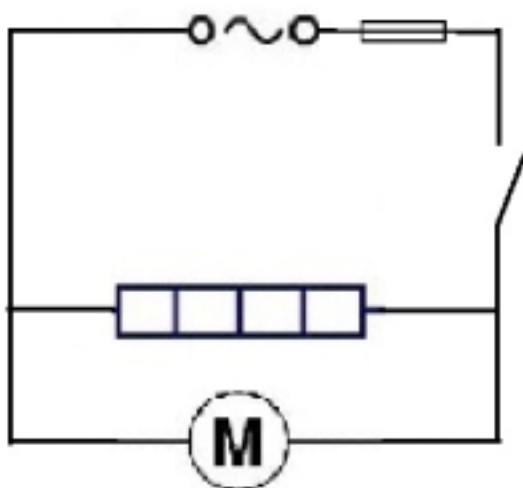
(ii) (milk **A**) it contains the highest total of fat, carbohydrate and protein ;
(athlete) would need most energy / it releases most energy ;
for (contraction of) muscles ; [max 2]

(iii) $\frac{900}{129}$ (= 6.97(8)) ;
 $\times 100 = 697.6$ **or** 698 (cm³) ; [2]

(iv) pregnant women ;
extra calcium needed for bones of fetus ;
AVP e.g. osteoporosis in older women ; [max 2]

[Total: 9]

4 (a)



complete circuit with no 'dead ends' or short circuits ;
on-off switch in main circuit using correct symbol ;
fuse in main circuit using correct symbol ; [3]

(b) (i) X marked in the heater branch, either side of heater ; [1]

(ii) heated ;
bend ;
broken ; [3]

(iii) in the air coming into the heater (owtte) ;
senses / switches off when air temperature in room is too high / so it can check room temperature ; [2]

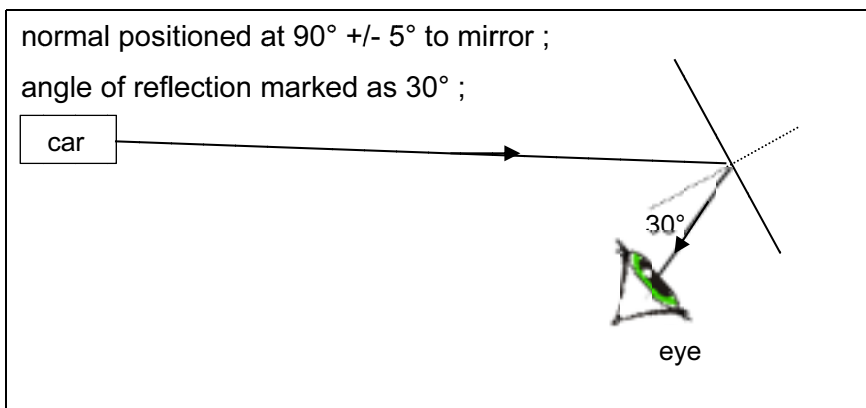
[Total: 9]

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- 5 (a) (i) bubbles (gently)/owtte ; [1]
- (ii) zinc is above hydrogen in the reactivity series ;
zinc is below calcium in the reactivity series ;
zinc is above copper in the reactivity series ; [max 2]
- (b) (i) Increases ; [1]
- (ii) *any two from:*
melts ;
moves / floats ;
bubbles ;
dissolves / disappears ;
and
more vigorous / flame / explodes ; [3]
- [Total: 7]**
- 6 (a) (i) identical (with female adult aphid) ; [1]
- (ii) (the genetic information) will be identical ; [1]
- (iii) (the genetic information is) different from the adult female ;
(the genetic information is) different from each other ; [2]
- (b) (i) phloem ;
because it transports dissolved food substances around the plant ; [2]
- (ii) one area of phloem correctly shaded ; [1]
- (c) (i) (carbon dioxide) + water → (sugar) + oxygen ; [1]
- (ii) enough light ;
(source of) carbon dioxide ; [2]
- (d) (i) the starch / blue-black colour is only found in the green areas ; [1]
- (ii) because chlorophyll is needed for photosynthesis ;
green areas contain chlorophyll ;
starch is produced in the green areas ; [max 1]
- [Total: 12]**

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7 (a) (i)



[2]

(ii) image in a (plane) mirror is laterally inverted ;

[1]

(b) microwaves ;

[1]

(c) (i) labelled arrow to show amplitude correctly and clearly from x-axis to peak ;

[1]

(ii) loudness/ volume ;

[1]

(d) distance travelled by sound = $330 \times 2 = 660$ (m) ;
distance from building = $660 \times \frac{1}{2} = 330$ (m) ;

[2]

(e) by friction – (feet on carpet) ;
discharge to Earth (when touches door handle) causes shock ;

[2]

[Total: 10]

8 (a) neutrons / protons *and* protons / neutrons *have the same mass, but* electrons *have much smaller mass.* ;
electrons / protons *and* protons / electrons *have opposite charges but* neutrons *have no charge.* ;

[2]

(b) (i) (17)
number of electrons = number of protons / atom is has no overall charge ;

[1]

(ii) (18)
nucleon no. = proton no. + neutron no. ;

[1]

(iii) (non-metals are) on right-hand side of Periodic Table ;

[1]

(c) (i) shared electrons ;

[1]

(ii) bond between two non-metals ;

[1]

Page 6	Mark Scheme	Syllabus	Paper
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(d) (i) green ; [1]

(ii) 7 to any less than 4 ; [1]

(e) (i) (a) salt ; [1]

(ii) carbon dioxide ;
limewater ;
milky / cloudy ; [3]

[Total: 10]

9 (a) (i) a chart/diagram showing the flow of energy ;
from organism to organism ; [2]

(ii) badger connected to all three organisms ;
arrows point in the correct direction ; [2]

(b) use an alternative source of food ;
move to a different habitat ; [1]

[Total: 5]

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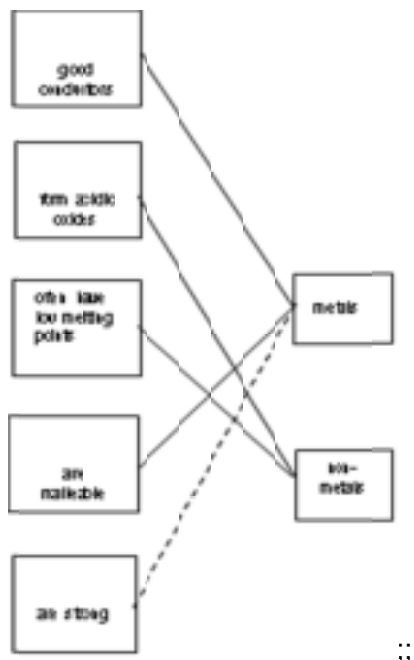
- 1 (a) bronchus correctly labelled ;
trachea correctly labelled ;
larynx correctly labelled ; [3]
- (b) smaller airway diameter ;
presence of mucus obstructing flow ; [2]
- (c) (i) $(12.5 - 5.8) = 6.7 \text{ (dm}^3\text{/min)}$;
 $(\frac{6.7}{5.8} \times 100) = 115 \text{ or } 116(\%)$; [2]
- (ii) breathe more quickly ;
take deeper / bigger breaths ; [2]
- [Total: 9]
- 2 (a) decreases **and** endothermic ; [1]
- (b) hydrogen ; [1]
- (c) rate of reaction increases / bubbles produced more rapidly / greater temperature change / increases rate of temperature change / reaction will finish faster ; [max 1]
- (d) copper below hydrogen in the reactivity series ;
copper will not displace hydrogen from acid / will not react ;
no temperature change ;
copper is less reactive than magnesium ; [max 2]
- [Total: 5]
- 3 (a) (i) weight / gravitational force ; [1]
- (ii) newton ; [1]
- (b) potential (energy) → kinetic (energy) ;
kinetic (energy) → potential (energy) ; [2]
- (c) **A to B** accelerating ;
B to C constant speed ; [2]
- (d) (distance =) speed × time 9×2 ;
= 18 (m) ; [2]
- [Total: 8]

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- 4 (a) (i) contains the correct proportions of nutrients for an individual ; [1]
- (ii) to prevent scurvy / AVP ; [1]
- (iii) (vitamin C) is a small molecule / only large molecules need to be digested;
can be absorbed without being broken down ;
(vitamin C) must be soluble ; [max 2]
- (b) (i) orange and kiwifruit ;
(because) **both** have average portion values greater than 60 mg ;
OR
orange **AND** has average portion value 70 g / greater than 60 mg ;
kiwifruit **AND** has average portion value 74 g / greater than 60 mg ; [max 2]
- (ii) $\frac{60}{28}$;
 $\times 100 = 214.3(g)$; [2]
- (c) (i) acid would attack / destroy the enamel ; [1]
- (ii) regularly clean teeth / use mouth wash ; [1]

[Total: 10]

5 (a)



all 4 correct for 2 marks, 3 or 2 correct for 1 mark

[2]

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(b)



[1]

(c)

observation	explanation
(bubbles of gas)	hydrogen ;
(indicator changes from green to purple)	alkaline solution ;

[2]

(d) (i)

substance	diagram
(chlorine)	A
(sodium)	B
(sodium chloride)	C

;;

all 3 correct for 2 marks, 2 or 1 correct for 1 mark

[2]

- (ii) sodium atoms lose electrons ;
chlorine atoms gain electrons ;
electrons are transferred from sodium to chlorine ;

[max 2]

- (iii) opposite charges (attract) ;

[1]

- (iv) (ZnCl₂) symbols ;
numbers ;

[2]

[Total: 12]

6 (a) (i) (speed =) $\frac{30}{10} = 3 \text{ (m/s)} ;$

[1]

(ii) (frequency = $\frac{10}{20}$) = 0.5 ;
Hz / hertz ;

[2]

(b) (distance moved = 2 × amplitude) = 1.0(m) ;

[1]

(c) **R** in right hand end box ;

[1]

(d) no CO₂ emissions / wave energy comes for free / renewable / AVP ;

[max 1]

[Total: 6]

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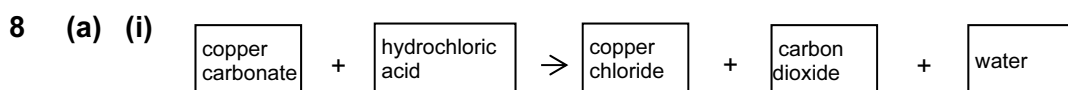
7 (a) (i) reduces soil erosion ;
roots of trees stabilise soil ; [2]

(ii) provides habitats ;
 provides shelter / protection from sun / rain / predators ;
 maintains food supply ; [max 2]

(b) (i) bacteria / microbes use it ;
 for respiration ; [2]

(ii) (sewage) blocks / reduces light ;
 light is needed for photosynthesis ; [2]

[Total: 8]



water in product row ;
 rest of equation correct ; [2]

(ii) limewater ;
 milky / cloudy ; [2]

(b) (i) (*cathode*) copper ;
 chlorine ; [2]

(ii) an ionic compound ;
 an element ;
 a covalent compound ; [3]

[Total: 9]

9 (a) (thermal) expansion ; [1]

(b) (i) conduction ; [1]

(ii) convection ; [1]

(c) (i) evaporation ; [1]

(ii) molecules gain more energy on heating ;
 molecules with enough / high / higher energy escape ; [2]

[Total: 6]

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10 (a) (i) (charging by) friction / rubbing with cloth / AVP ; [1]

(b) plastic is an insulator ;
so charge wouldn't leak away ;
OR
metal is conductor ;
so charge would leak away / earthed by student ; [2]

(c) (i) flow of charge ; [1]

(ii) workable circuit with additional heater in series / parallel and at least one switch
and no short circuit ;
two heaters in parallel ;
both switches on parallel branches ; [3]

[Total: 7]