



**Cambridge International Examinations**  
Cambridge International General Certificate of Secondary Education

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**COMBINED SCIENCE**

**0653/21**

Paper 2 Core Theory

**October/November 2016**

MARK SCHEME

Maximum Mark: 80

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**Published**

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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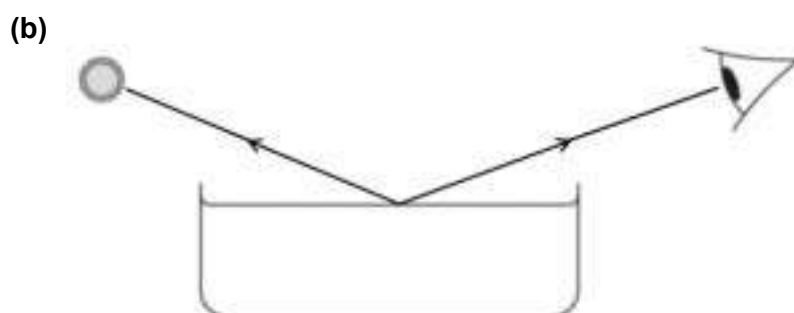
**[Turn over**

Page 2	Mark Scheme	Syllabus	Paper
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- 1 (a) (i) light / radiation (energy) ;  
kinetic (energy) ; [2]
- (ii) (average) speed = distance / time OR  $900 / 12$  ;  
 $75 \text{ (cm/s)}$  ; [2]
- (iii) any two from:  
volume/s = cross-sectional area  $\times$  speed / volume = length  $\times$  cross-sectional area ;  
 $75 \times 10$  ;  
 $\times 60 \text{ (s)}$  seen ;  
**and**  
 $45\,000 \text{ cm}^3$  ; [3]
- (b) wind energy / hydro-power / AVA ;  
use to turn a turbine (wind or water); [2]
- 2 (a) (i) electron ;  
proton ; [2]
- (ii) 23 ; [1]
- (b) (i) electron loss ;  
one (electron lost) ; [2]
- (ii) oxidation [1]
- (iii) exothermic [1]
- (iv)  $\text{Na}_2\text{O}$  ; [1]
- (c) (i) increases ; [1]
- (ii) decreases ; [1]

Page 3	Mark Scheme	Syllabus	Paper
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- 3 (a) (i) oxygen ;  
suitable temperature ; [2]
- (ii) geotropism ; [1]
- (b) seedlings get maximum amount of / more light ;  
for photosynthesis ; [2]
- (c) (i) xylem ; [1]
- (ii) no leaves present ;  
therefore no transpiration ; [2]
- (iii) any two from:  
more humid ;  
lower temperature ;  
darker ; [2]
- 4 (a) (i) evaporation ; [1]
- (ii) infra-red ; [1]
- (iii) (thermal energy from Sun) causes water molecules to move faster / gain  
more kinetic energy ;  
(more) molecules moving fast enough / have enough energy to escape  
(surface) ; [2]
- (iv) 10+ more molecules drawn touching below water level ;  
in random arrangement ; [2]

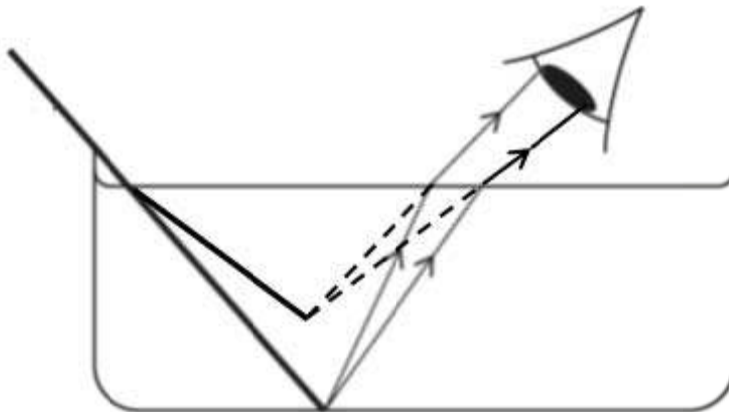


- ray from Sun reflected at surface to eye ;  
angles of incidence and reflection look equal (by eye) **and** (at least) one arrow ; [2]

Page 4	Mark Scheme	Syllabus	Paper
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(c) (i) Second diverging ray refracted to eye ; [1]

(ii) rays to eye projected back and converge and image drawn ; [1]

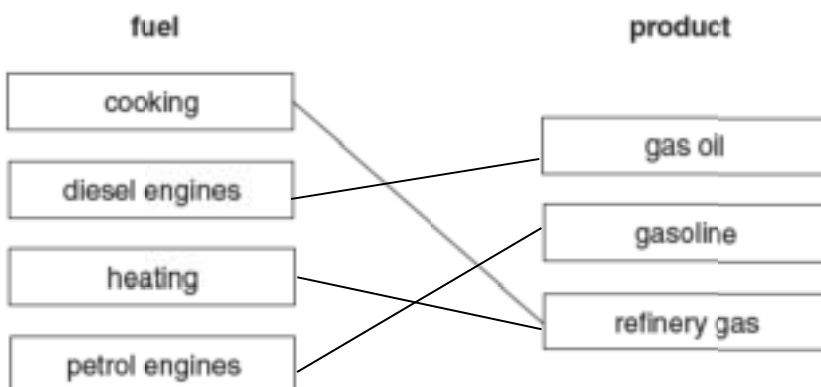


(d) microwaves ; [1]

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

(ii) refinery gas / (bottled gas)  
gasoline / (petrol)  
(kerosine)  
gas oil / (oil)  
(fuel oil)  
(bitumen)  
;;  
three correct is 2 marks, one or two correct is 1 mark [2]

(iii)



1 mark for each correct ;;; [3]

Page 5	Mark Scheme	Syllabus	Paper
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- (b) (i) C=C double bond and all four C–H bonds correct ; [1]
- (ii) carbon dioxide / CO<sub>2</sub> ; [1]
- (iii) test: cobalt chloride (paper) ;  
result: (blue to) pink ;  
**or**  
test: copper sulfate ;  
result: (white / anhydrous to) blue ; [2]
- 6 (a) (i) vitamins / named vitamin ;  
prevent diseases / named disease / role of named vitamin ; [2]
- (ii) respiration ; [1]
- (iii) carbohydrates, fat and protein ; ;  
all correct is 2 marks, two correct is 1 mark [2]
- (iv) fruit / vegetables / correctly named fruit or vegetable ; [1]
- (b) digestive ;  
methane ;  
greenhouse ;  
global warming ; [4]
- 7 (a) electrons ;  
stays the same ; [2]
- (b) (i) variable resistor ; [1]
- (ii) increase / decrease the resistance ;  
decreases / increases the speed ; [2]
- (iii) correct circuit symbol connected across motor only ; [1]
- 8 (a) proton ;  
metallic **and** non-metallic ;  
high **and** high ; [3]
- (b) (i) iron  
calcium  
magnesium ; ;  
3 correct is 2 marks, 2 correct is 1 mark [2]
- (ii) magnesium oxide / magnesium carbonate /  
magnesium hydrogen carbonate / magnesium hydroxide  
/ magnesium sulfide **or** correct formula ; [1]

Page 6	Mark Scheme	Syllabus	Paper
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- (c) chlorine /  $Cl_2$  ; [1]
- 9 (a) ovary correctly labelled ;  
oviduct correctly labelled ; [2]
- (b) (i) attaches to the wall ;  
of the uterus ; [2]
- (ii) rich blood supply / good source of nutrients / suitable temperature ; [1]
- (c) Any two from  
sexual intercourse  
**sharing** needles  
blood transfusions  
(from mother to baby) at birth  
(from mother to baby) during breast feeding  
avp ;; [2]