CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International General Certificate of Secondary Education

MARK SCHEME for the October/November 2015 series

0653 COMBINED SCIENCE

0653/31 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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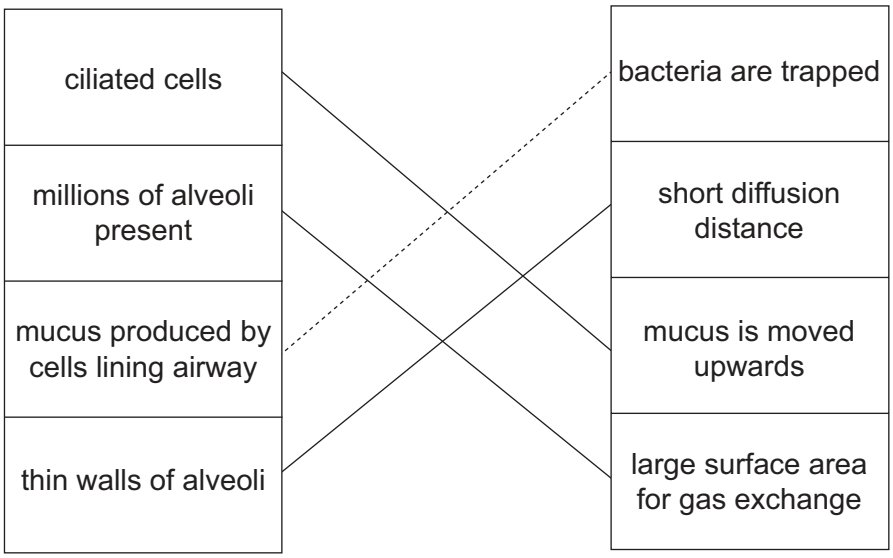
CAMBRIDGE
International Examinations

1 (a)



three or two correct: 2 marks, one correct: 1 mark ;; [2]

(b) (i) more mucus ;
cilia are paralysed / damaged ; [2]

(ii) bacteria / pathogens remain in the mucus ; [1]

(c) (i) $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O$
formulae correct ;
equation is balanced and single arrow shown LHS to RHS ; [2]

(ii) by red (blood) cells / haemoglobin ; [1]

(d) (i) *(person **C** - must be present to award mark)*
(person **C** had) highest carbon monoxide concentration at 08.00 hours /
when first measurement taken / owtte ; [1]

(ii) person **B** ;
carbon monoxide level in blood greater at 14.00 / 17.00 hours (compared with 11.00 hours) / carbon monoxide level in blood increased during the day / from 2.2 to 4.8 ; [2]

[Total: 11]

2 **(a)** increases ; [1]

(b) **(i)** bromine ; [1]

(ii) $2NaBr + Cl_2 \rightarrow 2NaCl + Br_2$
formulae ;
balancing consequential on formulae ; [2]

(iii) chlorine
bromine
iodine *(must be in this order)* ; [1]

(iv) a more reactive element / halogen displaces less reactive one / ORA ;
fluorine most reactive ; [2]

(c) (negative) fluoride ions move to / attracted to (positive) anode ;
electrons move from fluoride ion onto anode ;
ions are discharged / 1 electron moves from fluoride ion onto anode / is lost (from each ion) ; [max 2]

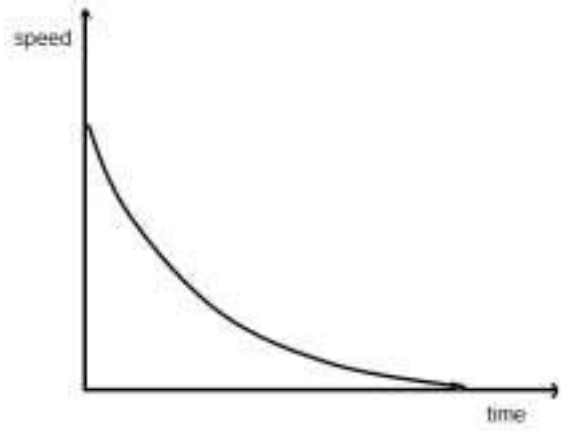
[Total: 9]

3 **(a)** **(i)** weight / gravitational force / gravity ; [1]

(ii) arrow pointing vertically upwards ; [1]

(b) **(i)** tick in first box ; [1]

(ii)



line from y-axis with negative gradient (accept straight or curved) ;
line meets x-axis ; [2]

(c) (i) kinetic
potential ; [1]

(ii) (potential energy transferred =) mgh **or** 80 × 10 × 40 ;
= 32 000 (J) ; [2]

[Total: 8]

4 (a) (i) cell wall correctly labelled ;
(large) vacuole correctly labelled ; [2]

(ii) *(in either order)*
(cell wall) provides support (for the cell) ;
(large vacuole) contains cell sap / correct named nutrient (for storage) /
provides support / shape inside the cell ; [2]

(b) (i) leaf **X** has a smaller area than leaf **Y** / leaf **X** has deeper lobes / owtte ; [1]

(ii) smaller area gives less water loss ;
by transpiration ;
OR
deeper lobes allow more light through / owtte ;
for photosynthesis in lower leaves ; [max 2]

(iii) larger area for trapping light ;
for <u>photosynthesis</u> ; [2]

[Total: 9]

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

(b) (i)

before		*just after*
(methane)	→	carbon dioxide
(oxygen)		water (vapour)
nitrogen		nitrogen

all 4 correct = 2 marks, 3 or 2 correct = 1 mark ;; [2]

(ii) <u>chemical</u> (potential) ***to*** thermal (heat) / light / sound / kinetic ; [1]

(iii) exothermic ; [1]

(c) (i) (2 because) in Period 2 ;
(6 because) in Group VI / 6 ;
(allow explanations based on the electron configuration 2,6) [2]

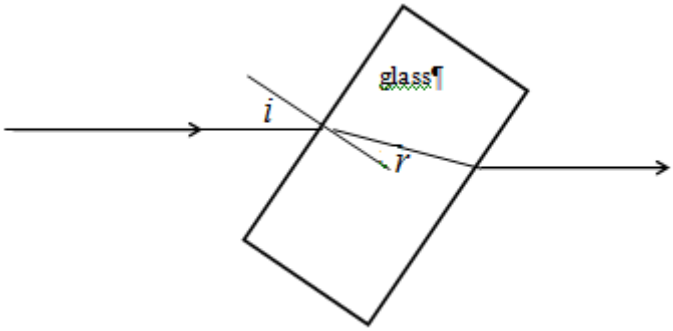
(ii) 4 shared pairs ;
correct symbols and all else correct ; [2]

(d) (i) noble / inert gases / Group 0 **or** 8 / Group VIII ; [1]

(ii) all / outer shells complete / filled ; [1]

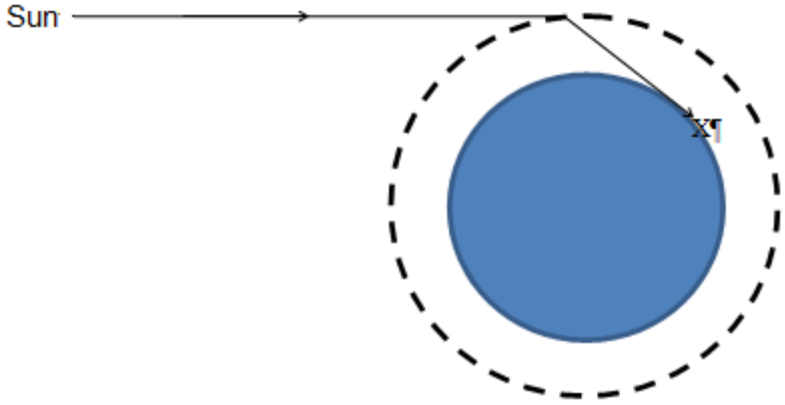
[Total: 11]

6 (a) (i) ray in glass bent towards normal ;
emergent ray parallel to incident ;
angles of incidence and refraction shown correctly ;



[3]

(ii) ray from Sun bending towards normal on entering atmosphere and reaching **X** ;
Sun's rays are refracted (by the atmosphere) ;



[2]

(b) (i) infra-red / IR ; [1]

(ii) sand is better absorber of infra-red / radiation than (sea) water ; [1]

(c) use of $v = f\lambda$;
λ decreases ; [2]

[Total: 9]

7 **(a)** organisms that feed on / get their energy from / reference to respiration ;
dead or waste organic matter ; [2]

(b) **(i)** enzymes break down the wood / large molecules into small molecules ;
that can be absorbed (by the fungi) ; [2]

(ii) may slow down / stop process ;
due to denaturation of digestive enzymes ; [2]

[Total: 6]

8 **(a)** **(i)** (rate of reaction decreases due to) decreasing concentration / ORA ; [1]

(ii) **X** vertically in line with 8–9 time units ; [1]

(iii) acid used up ; [1]

(b) **(i)** increased initial value on vertical axis ;
intercept with time axis before 8 minutes ; [2]

(ii) particles move / collide faster / have more <u>kinetic</u> energy ;
collide more frequently ;
greater chance of reaction during collision / owtte ;
(accept answers referring to activation energy) [max 2]

[Total: 7]

9 **(a)** **(i)** (R =) $\frac{V}{I}$ **or** $\frac{1.2}{0.5}$;
= 2.4 (Ω) ; [2]

(ii) 1.2 (Ω) (ecf) ; [1]

(b) **(i)** P = IV ; [1]

(ii) watt **and** W ; [1]

(iii) (energy =) power × time **or** 1.2 × 0.5 × 120 ;
= 72 (J) ; [2]

(c) **(i)** convection ; [1]

(ii) by conduction ;
reference to particles in wire vibrating more quickly ;
reference to vibrational collisions (between resistance and connecting wires) ;
(also allow answers discussing the role of delocalised electrons) [max 2]

[Total: 10]