

**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

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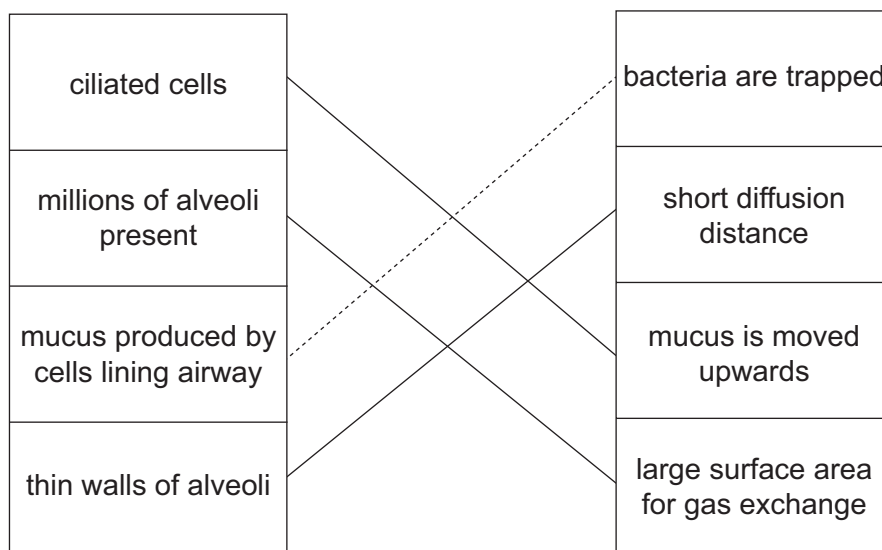
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1 (a)



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]

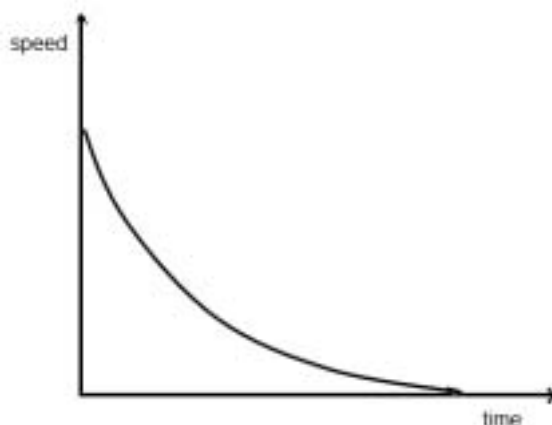
[Total: 11]

| Page 3 | Mark Scheme                             | Syllabus | Paper |
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- 2 (a) increases ; [1]
- (b) (i) bromine ; [1]
- (ii)  $2\text{NaBr} + \text{Cl}_2 \rightarrow 2\text{NaCl} + \text{Br}_2$   
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]

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

(ii) (potential energy transferred =)  $mgh$  or  $80 \times 10 \times 40$  ;  
= 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 photosynthesis ; [2]

[Total: 9]

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

(b) (i)

|                  |   |                   |
|------------------|---|-------------------|
| <i>before</i>    | → | <i>just after</i> |
| <i>(methane)</i> |   | carbon dioxide    |
| <i>(oxygen)</i>  |   | water (vapour)    |
| nitrogen         |   | nitrogen          |

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

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

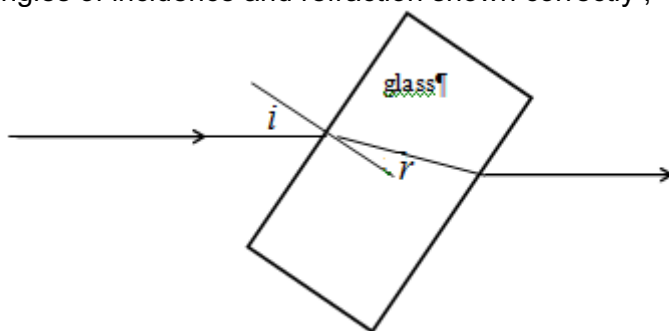
(iii) exothermic ; [1]

| Page 5 | Mark Scheme                             | Syllabus | Paper |
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- (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]

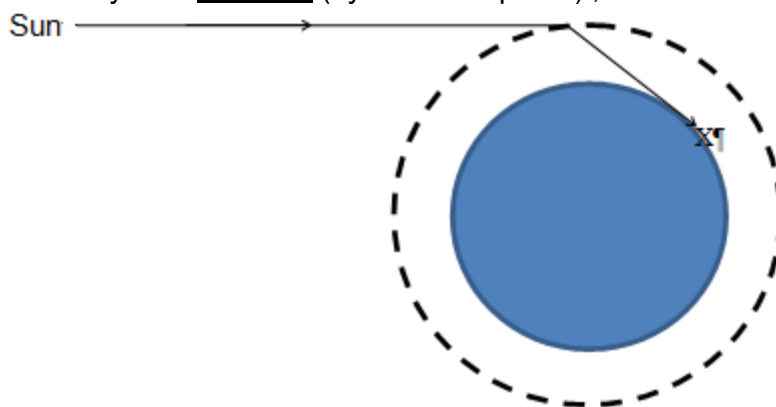
[Total: 11]

- 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  $v = f\lambda$  ;  
 $\lambda$  decreases ; [2]

[Total: 9]

| Page 6 | Mark Scheme                             | Syllabus | Paper |
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- 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 kinetic energy ;  
collide more frequently ;  
greater chance of reaction during collision/owtte ;  
(*accept answers referring to activation energy*) [max 2]
- [Total: 7]**
- 9 (a) (i)  $(R =) \frac{V}{I} \text{ or } \frac{1.2}{0.5} ;$   
 $= 2.4 (\Omega) ;$  [2]
- (ii)  $1.2 (\Omega)$  (ecf) ; [1]
- (b) (i)  $P = IV ;$  [1]
- (ii) watt **and** W ; [1]
- (iii) (energy =) power  $\times$  time **or**  $1.2 \times 0.5 \times 120 ;$   
 $= 72 (\text{J}) ;$  [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]**