**CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**Cambridge International General Certificate of Secondary Education**

# MARK SCHEME for the October/November 2015 series

# 0653 COMBINED SCIENCE

**0653/33** Paper 3 (Extended Theory), maximum raw mark 80

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**1** **(a)** large ;
into ;
capillaries ; [3]

**(b)** smaller airway diameter ;
presence of mucus obstructing flow ; [2]

**(c)** **(i)** 12.5 – 5.8 = 6.7 ($dm^3$ / min) ;
$\frac{6.7}{5.8} \times 100 = 115(\%)$ or $116(\%)$ ;
**or**
$\frac{12.5}{5.8} = 215$ ;
215 – 100 = 115 (%) ; [max 2]

**(ii)** to get more oxygen (into the blood) / remove more carbon dioxide ;
for respiration ; [2]

**(d)** *(cilia become paralysed)*
mucus cannot be shifted upwards ;
airways become even more restricted / more mucus for bacteria to breed in /
bacteria / tar will not be removed from the lungs / increases risk of bronchitis ;
**or**
*(more mucus is produced)*
airway becomes even more restricted / blocked ;
more mucus for bacteria to breed in / remain in lungs / increases chances of
chest infections / reduces oxygen supply for the body ; [max 2]

**[Total: 11]**

**2** **(a)** thermal energy to chemical energy ; [1]

**(b)** **(i)** steeper gradient than solid line ; [1]

**(ii)** increasing concentration increases rate of reaction ;
increased frequency of collisions ; [2]

**(c)** **(i)** atoms ions
ions atoms ; *(must be in this order)* [1]

**(ii)** silver written below copper ; [1]

**(iii)** the atoms of more reactive metals become ions more readily than those of
less reactive metals ; [1]

**[Total: 7]**

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

**(b)** (gravitational) potential (energy) to kinetic (energy) ; [1]

**(c)** **(i)** accelerating ;
constant speed ; [2]

**(ii)** area under graph between **A** and **C** *or* (½ × 2 × 9) + (2 × 9) *or* ½(2+4) × 9 ;
= 27 (m) ; [2]

**(d)** particles far apart in air / gas, but close together / touching in water / liquid *(accept diagrammatic description)* ;
stopping the skateboarder requires loss of KE ;
more work done / loses more KE / more difficult to push water particles aside than pushing air particles aside / owtte / diagrams ;
harder to push water molecules apart because of the forces between them / more particles ; [max 3]

**[Total: 9]**

**4** **(a)** **(i)** contains the correct proportions of nutrients for an individual ; [1]

**(ii)** to prevent scurvy / AVP ; [1]

**(b)** **(i)** as temperature increases the amount of vitamin C decreases ; [1]

**(ii)** rate / amount of decomposition / breakdown / disappearance increases with temperature ; [1]

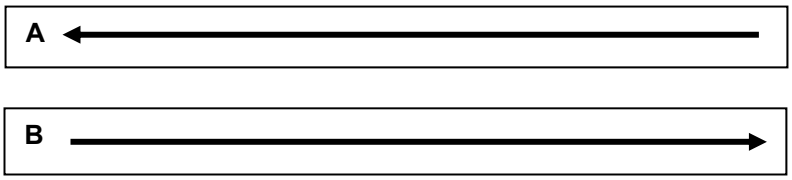
**(iii)** temperature will vary in different parts of the world ;
this will affect the amount of vitamin C (in fruit before the experiment) ;
**OR**
amount of water given / contained in1 fruit may vary ;
this could affect concentration of the fruit juice ;
**OR**
different variety of orange / fruits vary genetically ;
(naturally) contains different amounts of vitamin C ;
AVPs ;; [max 2]

**(c)** boiling water destroy some / all of the <u>vitamin C</u> ; [1]

**(d)** *(advantage)*
convenient if you need to leave the baby / mother may not have enough milk / AVP ;
*(disadvantage)*
does not contain antibodies / any reference to bonding / AVP ; [2]

**[Total: 9]**

**5 (a)**




[1]

**(b) (i)**

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

[2]

**(ii)** more vigorous reaction / hydrogen produced faster / greater temperature rise ;
alkali metals become more reactive down the group ;
*(accept correct references to ease of ionisation of metal atoms)* [2]

**(iii)** one electron in shell ;
all Group I elements have 1 electron in outer shell ; [2]

**[Total: 7]**

**6 (a) (i)** $(\frac{10}{20} =) 0.5$ ;
Hz / hertz ; [2]

**(ii)** $(\frac{30}{10}) = 3$ (m / s) [1]

**(iii)** $v = f\lambda$ (in any form) / $\frac{3}{0.5}$ ;
= 6 (m) ;
*(allow ecf from **(i)** and / or **(ii)** )* [2]

**(b)** 2 × amplitude (0.5) = 1 (m) ; [1]

**(c)** **R** placed in right-hand end box ; [1]

**(d) (i)** tidal energy more predictable / nearer to land so easier access / installation / any other reasonable suggestion based on access to the energy involved or easier technology / ORA ; [1]

**(ii)** *(efficiency =* $\frac{\textit{useful energy output}}{\textit{energy input}}$ *)*

$= \frac{150}{500} \times 100 = 30(\%)$ ; [1]

**[Total: 9]**

**7** **(a)** allows solar radiation to reach the Earth's surface ;
contains greenhouse gas molecules / example ;
(greenhouse gases in the atmosphere) absorb infra-red radiation (that is emitted from the Earth's surface) ;
infra-red radiation is then (re-)emitted by the greenhouse gases into the atmosphere / back to the Earth's surface ; [max 2]

**(b)** ***two*** *from:*
carbon dioxide / methane / water vapour ; [1]

**(c)** ***two*** *from:*
(increased) use of fossil fuels / example;
(increased) deforestation ;
(increased) keeping of cows / growing rice ;
AVP ; [max 2]

**(d)** reduced use of fossil fuels / removal of carbon dioxide from exhaust / promote the use of public transport ;
reduced deforestation ;
reduced agricultural practices that cause methane to be produced ;
plant more trees ;
use more renewable energy sources ;
AVP ; [max 1]

**[Total: 6]**

**8** **(a)** **(i)** $2HCl + (CuCO_3) \rightarrow (CuCl_2) + CO_2 + H_2O$
formulae ; balanced ; [2]

**(ii)** limewater ;
turns milky / cloudy etc. ; [2]

**(b)** **(i)** copper (deposit on cathode) ;
chlorine (gas at anode) ; [2]

**(ii)** *(copper ions):*
move towards cathode / negative (electrode) ;
*(chloride ions):*
move towards anode / positive (electrode) ; [2]

**(c)** **(i)** CuC$l$ ;
reference to the need for charge balance ; [2]

**(ii)** high density / high melting point / form coloured compounds / act as catalysts ; [max 1]

**(d)** correct structure of methane molecule ;
correct structure of ethane molecule ; [2]

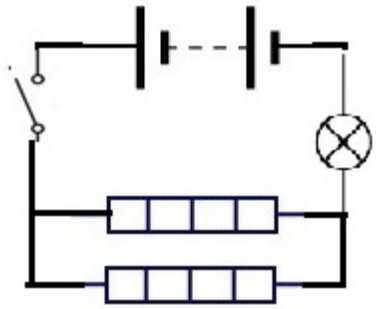
**[Total: 13]**

**9** **(a)** **(i)** move towards each other ;
unlike charges attract ; [2]

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

**(ii)** any path heading towards the upper positive plate ; [1]

**(c)** **(i)** complete circuit with 2 extra components included in series and / or in parallel ;
two heaters in parallel ;
lamp in series in main circuit ;



[3]

**(ii)** water expands / volume increases / particles get further apart water becomes less dense ;
(less dense) / warm water rises (above denser colder water) / owtte ; [2]

**[Total: 9]**