

**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
International General Certificate of Secondary Education

**MARK SCHEME for the October/November 2012 series**

**0653 COMBINED SCIENCE**

**0653/21**

Paper 2 (Core 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.

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- 1 (a) *statement given*
- |  |               |     |
|--|---------------|-----|
| a particle with a negative electrical charge | word required |     |
| measures electrical current                  | electron ;    |     |
| unit of potential difference                 | ammeter ;     |     |
| does not conduct electricity                 | volt ;        | [4] |
|  | insulator ;   |     |
- (b) (i) goes out ;  
incomplete circuit/ circuit is broken ; [2]
- (ii) so that they can be individually turned on and off ;  
so that they all get the full mains voltage ;  
so that if one fails the rest still operate ; [max 2]
- (iii)  $R = R_1 + R_2$  ;  
 $= 2.4 \Omega$  ; [2]
- [Total: 10]**
- 2 (a) (i) A ; [1]
- (ii) B, E, F ; [1]
- (iii) starch/cellulose/sugar/any other correct ; [1]
- (iv) 0.04% ; (allow 0.03%) [1]
- (b) (i) remove undigested substances ;  
from the, alimentary canal/ digestive system/ anus or as faeces ; [2]
- (ii) consumer **and** herbivore ; [1]
- (iii) to prevent extinction (of earthworms) ;  
reference effect on, food chains/ecosystem ;  
because they improve the soil by aeration ;  
because they improve the soil by releasing plant nutrients ;  
other valid point ; [max 2]
- [Total: 9]**
- 3 (a) (i) 7 ;  
>7 to 14 ;  
<7 to 0 ; [3]
- (ii) meter is more accurate/precise/reference to quantitative/litmus paper only  
shows that solution is acidic/owtte ;
- meter can show degree of acidity ; [max 1]

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(b) add the silver nitrate to the solution ;  
white precipitate/solid indicates chloride (ions)/no reaction shows chloride absent ;

(c) (i) any Group 1 (also strontium/barium) ;  
reference to explosive/ reacts violently/corrosive substances splashing onto skin/eyes ; [2]

(ii) pops ;  
hydrogen given off ; [2]

**[Total: 10]**

4 (a) chemical energy in muscles ;  
kinetic energy as she takes off ;  
changed to gravitational potential energy ;  
only gravitational potential energy at top of jump ;  
changed back to kinetic energy as she falls ;  
heat and sound energy on landing ; [max 3]

(b) (i) water/sweat turns to a gas/(water) vapour ;  
(as) particles get further apart ;  
heat is needed/used to cause evaporation ;  
(more) energetic particles escape ; [max 2]

(ii) heat is needed/used to cause evaporation ;  
(so) heat (energy) of body is reduced ; [max 1]

**[Total: 6]**

5 (a) (i) sugar and starch ; [2]

(ii) protein ; [1]

(iii) A and C ; [1]

(iv) A/C ; [1]

(v) D ; [1]

(b) (i) weak bones/rickets ; [1]

(ii) tiredness/anaemia ; [1]

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- (c) reference to bacteria ;  
bacteria feed on sugar ;  
produce acids ;  
acid dissolves tooth enamel ;

[max 2]

**[Total: 11]**

- 6 (a) (i) heat ;  
light ;  
sound ;

[max 2]

- (ii) increases the rate ;

[1]

- (b) (i) (B)  
particle **B** is uncharged / neutral / also has 13 electrons / number of protons =  
number of electrons ;

[1]

- (ii) **A** and **D** ;  
(**A** is) ion of oxygen and (**D** is) ion of aluminium ;  
metals and non-metals bond ionically / ionic ;  
they have opposite electrical charges / they attract each other ;

[max 3]

- (c) (i) oxygen ;

[1]

- (ii) firework mixture needs oxygen to burn ;  
potassium perchlorate produces oxygen when heated ;  
idea that oxygen needs to be produced in situ / air cannot easily get into  
firework mixture ;

[max 2]

**[Total: 10]**

- 7 (a) amplitude labelled ;  
wavelength labelled ;  
correct dimensions ;

[3]

- (b) (i) **A** is louder than **B** ;

[1]

- (ii) **X** has higher pitch / sound ;

[1]

- (c) radiation ;  
only radiation can travel through vacuum / conduction and convection need  
medium ;

[2]

**[Total: 7]**

- 8 (a) (i) **C** scrotum ;  
**D** urethra ;

[2]

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(ii) carries, sperm/ semen ;  
produce fluid, for sperm to swim in/ containing sugar ;

(iii) label to testis ;

(b) from mother to baby in uterus/ during birth ;  
from mother to baby in breast milk ;  
sharing needles ;  
blood transfusion ;  
exchange of blood ;

[max 2]

**[Total: 7]**

9 (a) (i) chlorine/ an element is in the Periodic Table/ compounds are not ;  
chlorine/ an element only contains one type of atom/ compounds contain  
more than one type ;  
chlorine/ an element cannot be broken down into simpler  
substances/ compounds (usually) can ;  
the atoms in a compound are bonded together ;

[max 2]

(ii) litmus/ Universal Indicator paper/ solution ;  
bleached ;

[2]

(b) (i) the positive electrode ;

[1]

(ii) (sodium chloride)  
contains (the) chlorine/ owtte ;

[1]

(c) (i) liquid ;  
solid ;

[2]

(ii) chlorine reacts with (sodium) bromide ;  
chlorine displaces bromine/ bromine is produced ;  
chlorine is more reactive than bromine/ reactivity decreases down the group ;  
bromine is orange ;

[max 2]

**[Total: 10]**