**UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS**

**International General Certificate of Secondary Education**

# MARK SCHEME for the May/June 2011 question paper

# for the guidance of teachers

## 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 must be read in conjunction with the question papers and the report on the examination.

- Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

**1** **(a)** ref. to digestion / absorption (in dung beetle) ;
ref. to respiration (in dung beetle) ;
carbon <u>dioxide</u> into air / breathed out;
carbon dioxide absorbed by plant ;
carbon dioxide used in <u>photosynthesis</u> (in plant) ; [max 3]

**(b)** nitrates / minerals absorbed by plant roots ;
used for making proteins ;
proteins used for making new cells ; [max 2]

**(c)** **(i)** to kill / destroy, pests / insects ;
which eat / damage, crop / grass for grazing ;
increase yields ; [max 2]

**(ii)** kill dung beetles ;
dung not buried / nitrate (in dung) does not enter soil ; [2]

**[Total: 9]**

**2** **(a)** powder held in a flame / reasonable reference to flame test ;
flame colour would enable powder to be identified / potassium (feldspar) – lilac / sodium (feldspar) – yellow ; [2]

**(b)** 40 + 12 + 16 x 3 (= 100) ; [1]

**(c)** **(i)** $CaMg(CO_3)_2 \longrightarrow CaO + MgO + 2CO_2$ ; [1]
[allow multiples]

**(ii)** (thermal) decomposition ;
(heating) causes a substance to break down into simpler ones / calcium / magnesium oxide (and carbon dioxide) is (are) simpler substances than dolomite ; [2]

**(d)** **(i)** hydroxide / $OH^-$ ; [1]

**(ii)** calcium hydroxide + hydrochloric acid $\longrightarrow$ calcium chloride + water ;; [2]
(LHS and RHS)

**[Total: 9]**

**3** **(a)** extension = 18 mm ; (58 – 40 = 18)

**(b)** proportional ;
between 0 and 8 / 8.4 N ;
curved section beyond elastic limit ;
after 8 / 8.4 N permanent deformation ; [max 3]

**(c)** **(i)** 2.4 N ; [1]

**(ii)** mass = 240 g ;
density = mass / volume ;
volume = 240 / 0.8 = 300 $cm^3$ ; [3]

**[Total: 8]**

**4** **(a)** label to cell membrane ;
label to cytoplasm ; [2]

**(b)** testis ; [1]

**(c)** **(i)** single sperm quantities would be too small to measure ; [1]

**(ii)** respiration ;
oxygen combined with sugar to release energy ; [2]
(word or correct balanced equation must show energy released)

**(iii)** (formula) power = work / time **OR** power = energy / time ;
(substitution) 164 / 60 × 60 ;
(answer + unit) 0.046 / 0.05, W / J $s^{-1}$ ; [3]

**(iv)** pointed head / small head / streamlined;
reduces friction / drag;
idea that less (forward-acting) force required ; [max 2]

**[Total: 11]**

**5 (a) (i)** no fossil fuels used up / no $CO_2$ released / no global warming effect ;
radiation leaks / nuclear waste problems / nuclear accidents ;

**(ii)** nucleus splits ; [

**(iii)** "radiation blew across farmland" ;
wind unable to deviate path of radiation ;
**OR**
"gamma particles" ;
gamma is not particulate / owtte ; [max 2]

**(b) (i)**

| *radiation* | *will section A turn black?* | *will section B turn black?* |
|---|---|---|
| *beta* | **yes** | **no** |
| *gamma* | *yes* | **yes** |

;; [2]

**(ii)** alpha is unable to penetrate the plastic / front cover ; [1]

**(c) (i)** no (electric) charge ; [1]

**(ii)** correct reference to oppositely charged particles ; [1]

**[Total: 10]**

**6 (a) (i)** **C**
**M**
**M**
**C** ;; (1 mark for each two correct) [2]

**(ii)** oxygen and nitrogen have different boiling points ;
liquefied air allowed to warm up / heated ;
as temperature rises, the components boil off when their b.pt. is attained / owtte ; [max 2]

**(b)** molecules have greater <u>kinetic</u> energy / move faster ;
collide more frequently with one another / with catalyst ;
reference to greater energy of collisions; [2]

**(c)** idea that the atoms seek a noble gas configuration / full outer shell ;
2 electrons in full outer shell of H ;
8 electrons in full outer shell of S ; [max 2]
(fully correct dot cross diagram scores both marks)

**[Total: 8]**

**7** **(a)** **(i)** reflex (action) ;

**(ii)** as <u>electrical</u> impulse ;
along nerves neurones ;
correct ref. to sensory / motor, neurone ;
correct ref. to central nervous system / brain ; [max 3]

**(b)** grinding / crushing ;
increase surface area of food ;
idea of easier access for enzymes ; [3]

**(c)** catalyst ;
protein ;
speeds up / controls (metabolic) reactions ; [max 2]

**[Total: 9]**

**8** **(a)** (nail rusted in **B**)
air / oxygen and water are present (together) / air and water needed for rusting ;
no water / water vapour in **A** ;
no air / oxygen in **C** ; [3]

**(b)** **(i)** $Cr_2O_3$ ;
idea of need for charge balance ; [2]

**(ii)** ion has more (negative) electrons than (positive) protons ;
the atom gains electrons ;
two more ; [max 2]

**(c)** **(i)** reference to bromine / bromine solution / potassium permanganate ;
reactant decolourised if hydrocarbon contains double bonds / owtte ; [2]

**(ii)** does not mix with water / air / oxygen ;
sticks to chain / steel ; [max 1]

**[Total: 10]**

**9 (a) (i)** number of waves per second / unit time ;

**(ii)** less frequency range / high and low frequency sounds missing ;

**(iii)** the frequency ranges (for **B** and **C** / both) include the human hearing range / owtte ; [1]

**(b)** $1/R_1 + 1/R_2 = 1/R$ ;
$= 1/8 + 1/8$ ;
$R = 4\ \Omega$ ; [3]

**[Total: 6]**