UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 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.

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1 (a) (i) speeds up reactions ;
provides lower (activation) energy route ;
without being chemically altered / owtte ;
(**reject** does not take part in the reaction) [m

(ii) transition (elements) ; [1]

(iii) Fe_3O_4 + **4**H_2 → **3**Fe + **4**H_2O ;; [2]
(allow 1 mark for **4**H_2 and **4**H_2O and then 1 mark for **3**Fe)

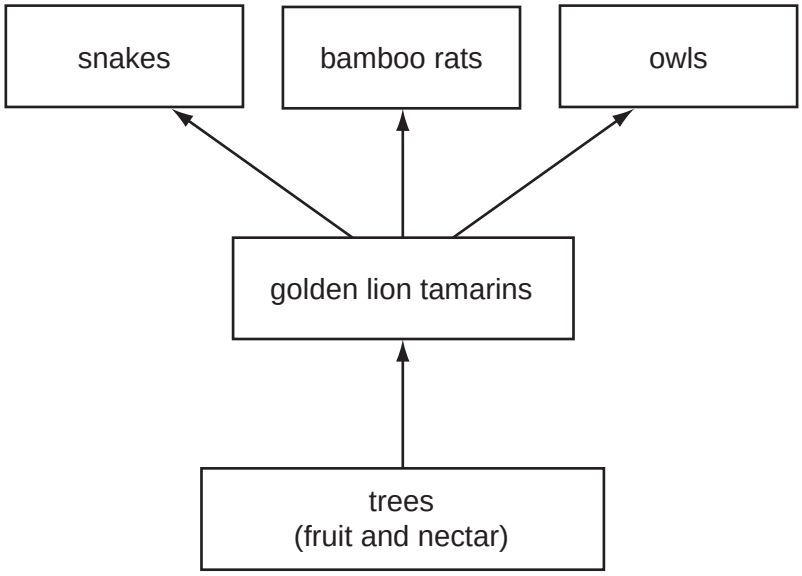
(iv) reduced ;
reduction is electron gain ;
positive (iron) ions are discharged / gain electrons ; [max 2]

(v) 56 × 3 / 16 × 4 ;
= 232 ; [2]

(b) symbols shown in correct atoms ;
three bond pairs around central atom ;
lone pair correctly shown ; [3]

[Total: 12]

2 (a) (i)



plants and tamarins correct ;
all three predators correct ;
all arrows in right direction ; [3]

(ii) energy lost, between trophic levels / as you go up the chain ;
as heat / in respiration / other way in which energy is lost ;
the idea that there is less energy for (top) predators ; [max 2]

(b) (i) fewer faeces further from tree ;
furthest distance from tree is 400 m ;
figures quoted, e.g. 31 % of faeces deposited within 50 m of tree ; [m

(ii) faeces provide nutrients for, young plants / seedlings (not seeds) ;
less competition (for seedlings) away from parent tree ;
example of factors competed for e.g. light, water, nutrients ;
help to colonise new areas ; [max 3]

[Total: 10]

3 (a) (car **B** – no mark)
low to ground / low height ;
low centre of mass ; [2]

(b) (speed =) distance / time ; (allow accepted symbols but reject use of units as symbols)
= 330 / 1.5 = 220 km / h ; [2]

(c) (i) **B** – constant speed ;
C – decelerating (negative) acceleration ; [2]

(ii) distance = area under graph / (6 × 40 × 0.5) + (4 × 40) ;
= 280 m ; [2]

(iii) acceleration = change in speed ÷ time / ref. to gradient of **A** / 40 ÷ 6 ;
= 6.67 m/s^2 ; [2]

(iv) force = mass × acceleration ;
= 1500 × 6.67 = 10 005 N ; [2]

[Total: 12]

4 (a) (i) **Q** ;
R ; [2]

(ii) arrow going upwards on **R** (towards spinal cord) and downwards on **S** ; [1]

(iii) label to spinal cord ; [1]

(iv) faster / less time for damage to be done to hand ; [1]

(b) (i) red blood cell ; [1]

(ii) 46 ; [1]

[Total: 7]

5 (a) (i) rate increases / or implied e.g. gas given off more quickly ;

(ii) particles / ions / molecules move faster / have increased K.E. ;
reference to increased collision frequency with magnesium ; [2]

(b) (i) unreactive (with acid) / not brittle ; [1]
reject references to rusting

(ii) (saturated hydrocarbons) heated / vaporised ;
contacted with catalyst ; [2]

[Total: 6]

6 (a) (i) A_1 = 8 (A), A_4 = 2 (A) ;; [2]

(ii) energy = power × time ;
72 × 20 = 1440 J ; [2]

(iii) 1 ÷ R = 1 ÷ R_1 + 1 ÷ R_2 ;
= 1 ÷ 6 + 1 ÷ 2 ;
(R =) 1.5 Ω ; [3]

(b) (i) reduce energy losses ; [1]

(ii) (Np ÷ Ns =) 25 000 ÷ 600 000 ;
= 1 : 24 ; [2]

[Total: 10]

7 (a)

enzyme	one site of action	type of nutrient that is broken down	product that is formed
amylase	mouth	**starch**	**maltose**
protease / trypsin / pepsin	**stomach / small intestine** *(see note below)*	protein	**amino acids**

note: *if protease given, allow either stomach or small intestine*
if trypsin, must be small intestine
if pepsin, must be stomach
one mark for any two correct ;;; [3]

(b) (i) (rice has) more protein ;
needed for growth ;

(ii) add Benedict's solution / Fehlings solution ;
heat ;
brick red / orange colour indicates sugar present ; [3]

(iii) as sugar / sucrose ;
in phloem ; [2]

[Total: 10]

8 (a) (i) 8 (%) ; [1]

(ii) (89) answer related logically to number of elements in Periodic Table ; [1]

(b) (i) so ions can move / if solid, ions could not move / so that it can be an electrolyte / so that it will conduct charge (not electrons) ; [1]

(ii) anode is positively charged ;
attracts negative (oxide) ions / opposite charges attract / would be repelled from negative cathode ; [2]

(iii) Al^{3+} (ions) gain electrons / O^{2-} (ions) lose electrons ;
Al^{3+} gains three electrons / O^{2-} loses two electrons ;
some relevant logical statement linking to six electrons ; [3]
e.g. so if six electrons then number of *Al* atoms is 6 ÷ 3 = 2
so six electrons must be provided by 6 ÷ 2 = 3 oxide ions

[Total: 8]

9 (a) (i) (gamma able) to penetrate the food / packaging ; [1]

(ii) 'the same number' and 'different numbers' (both required in this order) ; [1]

(iii) to protect workforce / stop radiation escaping ; [1]

(b) (i) use Geiger counter / other correct instrument to measure radiation emitted ; [1]

(ii) radiation emitted by unstable radioactive atoms / (radiated) food does not contain unstable radioactive atoms ; [1]

[Total: 5]