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

0654 CO-ORDINATED SCIENCES

0654/21 Paper 2 (Core Theory), maximum raw mark 100

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 October/November 2011 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

1 (a) (i) **X** retina ;
Y optic nerve ;

(ii) line drawn starting outside the eye, passing through pupil and lens ;
line ends at retina ; [2]

(iii) label to either cornea, lens or vitreous humour ; [1]

(iv) as impulse / electrical signal / action potentials ;
along nerve / along **Y** ; [2]

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

(ii) 46 ; [1]

(iii) stores information;
on making proteins ;
ref. to hereditary material ; [max 2]

[Total: 11]

2 (a) (i) (**Y**) (no mark)
proton number of 6 ; [1]

(ii) 11 ; [1]

(b) (i) contains elements aluminium and oxygen ;
proportions / number ratio Al : O is 2:3 / owtte ; [2]

(ii) ion (electrically) charged / ion protons ≠ electrons ; [1]

(c) (i) electrolysis ;
positive electrode ; [2]

(ii) (contains) ions (which) must be mobile / if solid then ions cannot move ;
conduct electrical charge / make an electrolyte; [2]

(iii) → aluminium + oxygen ; [1]

[Total: 10]

3 (a) (i) constant speed ;

(ii) deceleration / slowing down ;

(b) 8 / 5 ;
= 1.6 (m / s^2) ; [2]

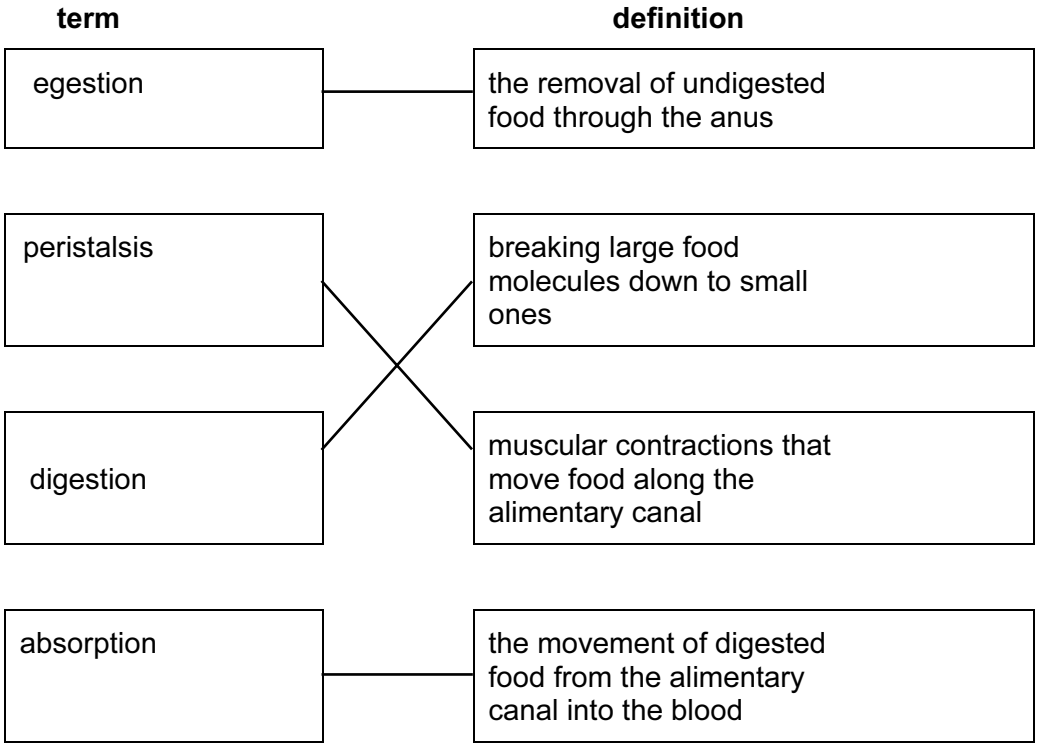
(c) speed =) distance / time ;
= 160 / 25 = 6.4 (m / s) ; [2]

(d) (energy =) power × time ;
= 600 × 5 = 3000 (J) ; [2]

(e) heat transferred to (water) particles (from surroundings) ;
(water) changes from liquid to gas ;
ref. to attraction between particles in the liquid ;
fastest moving particles escape ;
(escape) at surface / ref. to process happening at temperature below boiling point ;
average energy of the rest of the particles reduced / heat removed from liquid ; [max 2]

[Total: 10]

4 (a)



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

(b)

enzyme	substrate	product
amylase	**starch** ;	maltose
protease ;	proteins	amino acids
lipase ;	**fats / lipids** ;	fatty acids and glycerol

[4]

(c) (i) urea ; [1]

(ii) kidneys ; [1]

(iii) cells might take up water ;
because concentration inside cells is greater than outside ; [2]

(iv) for energy ;
respiration ;
glucose oxidised / glucose combined with oxygen ;
for movement / other named use of energy ; [max 2]

[Total: 13]

5 (a) (i) the power rating of bulb / how much energy is transferred per second ;
the voltage / potential difference that the bulb operates at ; [2]

(ii) electrical ;
into light ;
into heat ; [3]

(iii) gas will not react with hot filament / reduces oxidation ; [1]

(b) (i) decreases ;
to constant (minimum) value ; [2]

(ii) 0.20 (A) ; [1]

(c) (i) $R_T = R_1 + R_2$;
(= 1000 + 2000)
R = 3000 (Ω) ; [2]

(ii) cross sectional area / thickness ;
temperature of wire ; [2]

[Total: 13]

6 **(a)** **(i)** (**B**) low electrical conductivity ;

(ii) (**C**) high density and (high) electrical conductivity ;

(b) **(i)** all three metals must be melted together ; [1]

(ii) solder maintains the electrical connection / owtte ; [1]

(c) second electrode ;
container plus liquid ;
suitable named electrolyte (into which electrodes are placed) ;
indication that second electrode is a different metal ;
indication that pd is produced e.g. value on voltmeter ; [max 3]

(d) **(i)** carbon dioxide ;
water (vapour) ; [2]

(ii) carbon monoxide / NOx or specific example / hydrocarbons ; [1]

[Total: 10]

7 **(a)** **(i)** (frequency =) 0.5 (Hz) ; [1]

(ii) matter / mass ;
travels / moves / goes ; [2]

(iii) sound / ultra sound / infrasound ; [1]

(b) **(i)** 500 (N) ; [1]

(ii) (work done =) force × distance ;
= 500 × 10 = 5000 (J) ; [2]

(iii) (kinetic energy =) ½ mv^2 ;
= ½ × 50 × 12 × 12 = 3600 (J) ; [2]

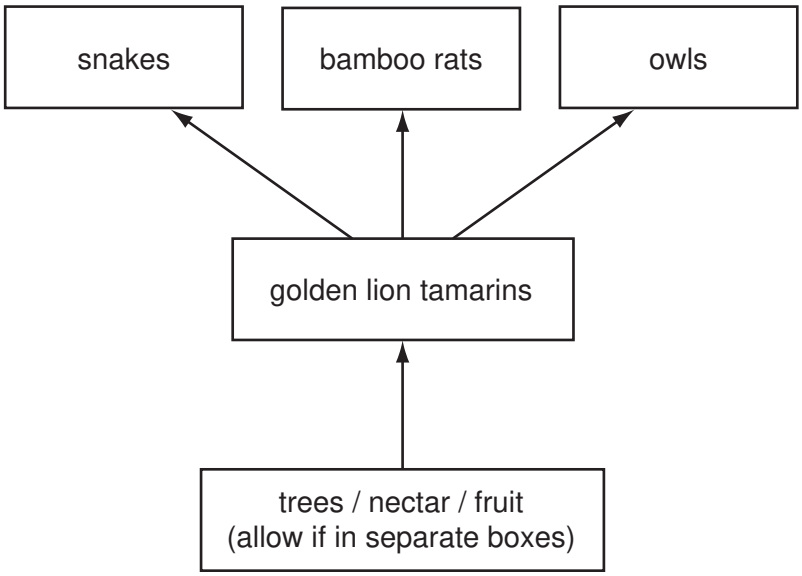
(c) radiation ; [1]

[Total: 10]

8 (a) (i) binomial ;

(ii) idea that it is the same all over the world / in every language ;

(b) (i)



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

(ii) circle round tree, nectar or fruit ; [1]

(c) (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 ; [max 2]

(ii) faeces provide nutrients for, young plants / seedlings (**not** seeds) ;
less competition (for seedlings) away from parent tree ;
factor competed for – water / light ;
help to colonise new areas ; [max 2]

[Total: 10]

9 (a) (i) element made of one type of atom / found in Periodic Table ;
compound made of two or more different elements ;

(ii) (damp red) litmus paper / (red) litmus solution / full range / Universal Indicator ;
turns blue ; [2]

(b) (i) nitrogen inert / difficult to break N_2 molecule ; [1]

(ii) nitric acid ; [1]

(iii) carbon, hydrogen, oxygen ;; [2]
(all three – 2 marks, only two correct – 1 mark)

(iv) join / link / react together ;
to form a (long) chain ; [2]

(c) (i) increases rate of reaction ;
not consumed / used up / can be regenerated ; [2]

(ii) it would react / corrode / sodium does not have catalytic properties / sodium not a transition metal ; [1]

[Total: 13]