UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2010 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.

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1 (a) (i)

carbon dioxide	+	water	→	glucose / starch / carbohydrate / sugar	+	oxygen

one mark for each side correct ;; [2]

(b) (i) (provide) energy ;
(light) allows carbon dioxide to combine with water ; [2]

(ii) large surface area ;
thin ;
many chloroplasts / contains chlorophyll ;
other valid point ; [max 2]

(c) (i) **B**, **D**, **C**, **E**, **A** ;;;
(all five correct for 3 marks, any four in correct sequence 2 marks, any three in correct sequence 1 mark) [3]

(ii) area covered by paper shown on diagram ;
orange-brown where paper was, blue-black elsewhere ; [2]

[Total: 11]

2 (a) (i) hydrogen ; [1]

(ii) lighted splint pops ; [1]

(iii) (**Z**)
copper does not react with dilute (hydrochloric) acid / is unreactive ; [1]

(iv) reaction would be slower / lower collision frequency ;
(single piece) has lower surface area ; [2]

(b) (i) the acid had all reacted / been used up ; [1]

(ii) zinc sulfate ; [1]

(c) (i) carbon dioxide dissolves (and reacts) ;
carbon dioxide is a non-metal oxide ;
causes rain to become (slightly) acidic ; [max 2]

(ii) minerals / compounds dissolve (from the rock) ;
provide nutrients / essential minerals / substances needed for (healthy) growth ; [2]

[Total: 11]

3 **(a)** longitudinal ;
movement ;
quickly ;
vacuum ;

(b) electrical energy into chemical energy ; [1]

(c) **(i)** microwaves, infra-red, ultraviolet, X-rays, gamma ; [1]

(ii) correct use ; [1]

[Total: 7]

4 **(a)** **(i)** C_8H_{18} ; [1]

(ii)

RHS ;
LHS ; [2]

(iii) nitrogen is in the air / enters with the air / owtte ;
nitrogen does not burn / react / change / is unreactive ; [2]

(iv) heat comes from the burning fuel /
combustion of the fuel is exothermic /
there is an exothermic reaction (inside engine) /
heat is conducted from where the fuel is burning ; [1]

(b) **(i)** 6 ;
6 ; [2]

(ii) Si / Ge / Sn / Pb ; [1]

(c) **(i)** alloy contains more than one element / is a mixture / other correct ; [1]

(ii) high strength for safety / resist breakage / because high forces on airframe in flight ;
low density to reduce weight / reduce fuel cost ; [2]

[Total: 12]

5 **(a)** receptors ;
nerves ;
effectors ;

(b) **(i)** changes starch ;
to maltose / sugar ; [2]

(ii) produces small molecules (from large ones) ;
so that the (small) molecules / particles / nutrients can be absorbed ;
into blood / through gut wall ;
so they can be used by cells / builds new cells ; [max 2]

(iii) peristalsis ;
ref. to muscle contraction / circular and longitudinal muscles ; [2]

[Total: 9]

6 **(a)** **(i)** 40 (m / s) ; [1]

(ii) KE = ½ mv^2 ;
= ½ × 2 × 1600 = 1600 (J) ; (ecf) [2]

(b) distance = speed × time ;
330 × 0.25 seconds = 82.5 (m); [2]

(c) density = mass / volume ;
= 2000 / 700 = 2.86 ;
g / cm^3 ; (or 2860 kg / m^3) [3]

(d) **(i)** Geiger counter / Geiger-Müller tube / any other suitable ; [1]

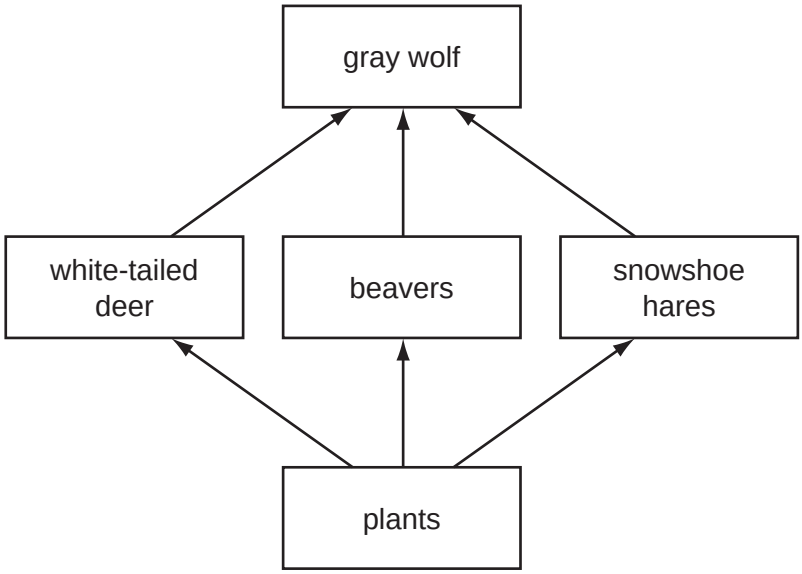
(ii) causes ionisation within cells ;
mutation ;
cancer ;
radiation burns / burns skin ;
damages / kills cells / damages DNA ;
radiation sickness ; [max 1]

[Total: 10]

7 **(a)** fur ;

(b) they belong to the same genus ;
but different species ;
they are closely related ;
they cannot breed together ; [max 2]

(c) **(i)**



all organisms at correct levels (allow if upside down) ;
all organisms correctly connected ;
all arrows shown in correct directions ; [3]

(ii) energy (flow / transfer) ; [1]

(iii) energy lost along food chains ;
only 10 % of energy passed on ;
less energy available for, higher trophic levels / for wolves ; [max 2]

(d) **(i)** ref. to limiting factors ;
not enough food ;
more disease ;
competition ; [max 2]

(ii) maintain biodiversity ;
any ethical or moral reason ;
idea that loss of one species affects others in ecosystem ;
prevent wolves becoming extinct ; [max 2]

[Total: 13]

8 **(a)** convection ;

(b) **(i)** amount of energy needed to heat up one kilogram of (water / a material) by one degree (Celsius) ; [1]

(ii) (power =) energy / time ;
= 70000 / 600 = 117 (W) ; [2]

(c) **(i)** coal / oil / gas ; [1]

(ii) running out / carbon dioxide emissions / sulfur dioxide ; [1]

(iii) solar / wind / tides / hydroelectric power / waves etc. ; [max 1]

[Total: 7]

9 **(a)** (definition) e.g. oxidation refers to reaction with / bonded with oxygen ;
(context) e.g. oxygen has reacted / bonded with copper / copper gains oxygen ; [max 1]

(b) **(i)** CuO shows there is one copper atom for every oxygen atom ;
Cu_2O shows there are two copper atoms for every oxygen atom ;
there are twice as many copper atoms for every oxygen atom in Cu_2O ; [max 2]

(ii) coloured compounds / variable valency / ionic charge / oxidation state ; [1]

(c) **(i)** anode and electrolyte clearly labelled ; [2]

(ii) atom uncharged, ion charged ;
ion has filled outer shell, atom outer shell not complete ;
atom proton number equal to electron number – unequal in ion ; [max 1]

(iii) damp litmus / indicator paper ;
is bleached ; [2]

(iv) copper ; [1]

[Total: 10]

10 (a) (i) correct symbols for lamp, voltmeter, ammeter, power supply ;
voltmeter in parallel ;
ammeter in series ;
everything else correct ; [

(ii) 0.47 (A) ; [1]

(iii) (resistance =) voltage / current ;
= 6 / 0.47 = 12.8 (Ω); [2]

(b) (i) magnets attract ; [1]

(ii) magnets repel ; [1]

(iii) iron bar attracted to magnet ; [1]

[Total: 10]