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

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UNIVERSITY of CAMBRIDGE
International Examinations

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 ; [4]

(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 ; [3]

(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]

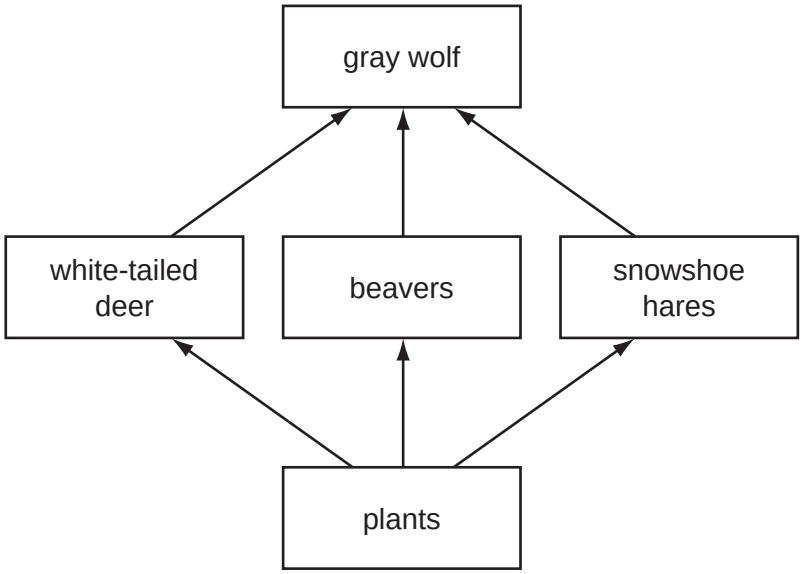
(ii) causes ionisation within cells ;
mutation ;
cancer ;
radiation burns / burns skin ;
damages / kills cells / damages DNA ;
radiation sickness ; [max 1]

[Total: 10]

7 **(a)** fur ; [1]

(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 ; [1]

(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 ; [4]

(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]