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

0653 COMBINED SCIENCE

0653/31 Paper 3 (Extended Theory), maximum raw mark 80

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1 **(a)** (force =) mass × acceleration / (W =) m × g ;
= 10 × 4 = 40 N ; [2]

(b) distance = area under graph / ½ × b × h ;
height = 80 m ; [2]

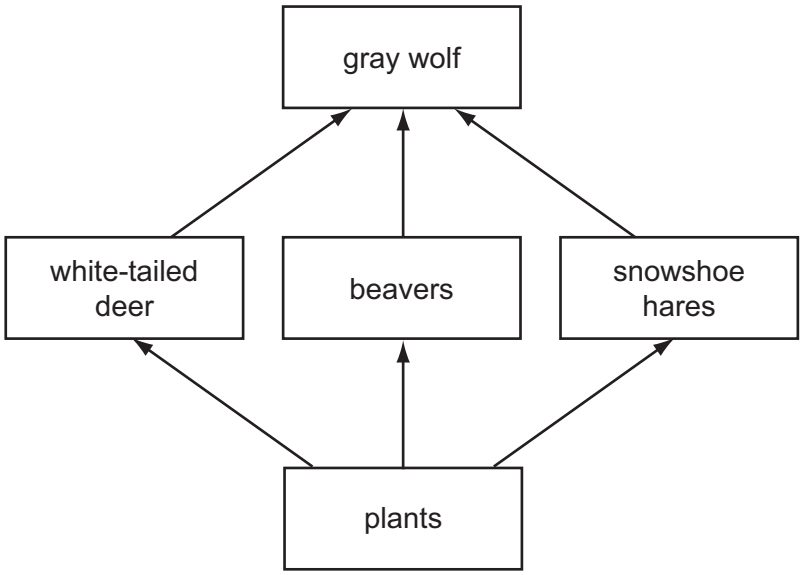
(c) use displacement can or measuring cylinder / graduated beaker ;
place object in and measure displaced water / difference in volume ;
this is the volume of the object ;
measure mass of rock using a balance ;
divide the mass by the volume / d = m / v ; [max 4]
(max 3 if final point missing)

(d) **(i)** Geiger counter / Geiger-Müller / GM tube / any other suitable ; [1]
e.g. scintillation counter / cloud chamber

(ii) ionises cell contents / ref. to cancer / kills / damages / mutates cells / changes / damages / mutates DNA / chromosomes / radiation burns / burns skin ;
(ignore refs. to eye damage) [1]

[Total: 10]

2 **(a)** **(i)**



all organisms included ;
all organisms correctly connected ;
all arrows (at least three required) are in correct directions ; [3]
(accept a named plant, ignore refs. to soil)

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

(iii) energy lost along food chains ;
80% to 90% energy (losses between trophic levels);
less energy available for, higher trophic levels / for wolves ; [2]

(b) maintain biodiversity ;
avoids extinction / depletion of wolves ;
idea that losing one species will affect others ;
ethical / moral / scientific / tourism, argument for conserving species ; [max 2]

any argument against conservation, e.g. wolves eat livestock / are danger to people ; [1]

[Total: 9]

3 (a) (i) coloured compounds / variable valency / ion charge / oxidation state ; [1]

(ii) Cu^{+} / +1 / 1;
working shows (or heavy implication of) need for charge balance ; [2]
(reject unexplained "criss-cross" diagrams)

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

(ii) ions move towards / attracted to electrodes ;
because of opposite charges / opposite charges attract ;
(specifics e.g. copper ions are positive and move to negative electrode would score first two points)
ions discharged / become atoms (at the electrode) ;
correct details of electrons e.g. metal ions are positive and gain electrons / non-metals are negative and lose electrons ; (ignore incorrect refs. to redox)
chlorine atoms pair up into molecules ; [max 4]

[Total: 9]

4 (a) (i) reflected ray drawn at correct angle and has correct arrow ; [1]

(ii) normal drawn (ignore any arrow); [1]
(labelling – normal and / or reflected ray must be labelled)

(iii) angle of incidence correctly labelled ; [1]

(b) (i) two (and only two) complete waves drawn on grid (ignore amplitude change and wavelength variation) ; [1]

(ii) wave drawn with half amplitude ; (ignore a change of frequency if correctly half amplitude) [1]

(iii) **B** and **C** ; [1]

[Total: 6]

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

(ii) (octane +) oxygen → carbon dioxide + water ; [LHS + RHS] [2]
(words required)

(b) **(i)** 5 ; [1]

(ii) three shared pairs ;
one lone pair on both atoms ; [2]
(marked separately)

(c) (duralumin)
high strength for safety / to resist breakage / air resistance / because high forces on aircraft in flight ;
low density to reduce weight / mass / reduce fuel cost ; [max 2]

[Total: 8]

6 **(a)** **X** sensory (neurone) ;
Y relay / intermediate / association / connector (neurone) ;
Z motor / effector (neurone) ; [3]

(b) any muscle / muscles ;
jump / contract / any other suitable response (not necessarily a reflex action); [2]

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

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

(iii) rises then falls ;
peak at somewhere between 30°C and 40°C ; [2]

[Total: 11]

7 (a)

switch position			lamp 'on' or 'off'		
S1	**S2**	**S3**	**L1**	**L2**	**L3**
closed	closed	closed	on	on	on
closed	closed	open	on	off	on
closed	open	open	on	off	off

(1 mark for each correct row) ;;; [3]

(b) (i) transformer ; [1]

(ii) $V_p / V_s = N_p / N_s$;
$V_s = 23 \times 200 / 20 = 230$ V ; [2]

(c) moving coil experiences changing magnetic field / coil cuts magnetic field lines owtte ;
this induces voltage / current ;
(every half turn) the coil experiences the opposite changing magnetic field / cuts the field in opposite directions ;
so this creates alternating voltage / current ;
slip rings allow a.c. to be collected / transferred / split ring / commutator would give d.c. ;

[max 4]

[Total: 10]

8 (a) (provides) energy ;
to allow carbon dioxide to combine with water ; [2]

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

(c) respire all the time ;
during daylight, plants photosynthesise more than they respire ;
respiration takes in oxygen and produces carbon dioxide ;
photosynthesis takes in carbon dioxide and releases oxygen ; [max 3]

[Total: 7]

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

(ii) H^+ / H_3O^+ ; [1]

(b) (i) acid concentration ;
temperature (of acid) ;
degree of agitation ; [2]

(ii) time taken for (the same) volume of gas (to form) was greatest / was high ; [1]

(iii) rate is lower (with single piece) ;
surface area (of single piece) is lower ;
fewer collisions per second / lower collision frequency / chance / probability (between acid and metal surface) ; [3]
ora

(c) $Mg + 2HCl \rightarrow MgCl_2 + H_2$
formulae correct then look for balanced ;; [2]
(if balanced and 2H only mistake then allow balanced mark, ignore inclusion of correct ionic charges but incorrect charges loses formulae mark)

[Total: 10]