UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2007 question paper

0653 COMBINED SCIENCE

0653/03 Paper 3 (Extended Theory), maximum raw mark 80

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

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1 **(a)** 4;

(b) shared pairs shown;
symbols correct and two lone pairs shown on oxygen; [2]

(c) **(i)** (**C**)
it took the shortest time / was faster, to collect the (40 cm^3 of) gas; [1]

(ii) concentration of H_2O_2 / surface area of catalyst;
reference to collision frequency (with catalyst);
higher concentration / larger surface area linked to higher rate;

or

temperature ;
reference to collision, frequency / force ;
higher temperature linked to higher rate ; [3]

2 **(a)** **(i)** arrow(s) going down; [1]

(ii) cold air is denser (than warm air);
particles closer together ;
drops / displaces warm air which moves upwards ; [2 max]

(b) **(i)** 100(J); [1]

(ii) 100W *or* 100 J/s ; [1]

(c) **(i)** $R = V/I = 240/0.04$ (=6000Ω) ; [1]

(ii) $1/R = 1/R1 + 1/R2$;
$= 1/6000 + 1/6000 = 1/3000$;
$R = 3000\Omega$ [3]

3 **(a)** leaf / **C** ;

(b) **P** to cell membrane / to membrane around vacuole ;
Q to nucleus ;
R to chloroplast ; [3]

(c) break down, tissues / cells / cell walls / cell membrane ;
remove chlorophyll / (green) colour ; [2]

(d) **(i)** insect, because it has (large) petals / no stamens hanging out / no anthers hanging out / no stigma hanging out ; [1]

(ii) sexual, because gametes / fertilisation are involved ; [1]

(iii) new plants are <u>genetically</u> identical / clones ;
have the same features as their parents / no variation ; [2]

4 **(a)** reaction is exothermic / gives out heat (energy) ; [1]

(b) potassium atoms lose one / their outer electron / e.c. becomes 2.8.8 ;
oxygen atoms gain two electrons / complete their outer shell / e.c. becomes 2.8 ;
reference to positive potassium ion / K^+ ;
reference to negative oxide ion / O^{2-};
reference to attraction between positive and negative ions/oppositely charged ions ;
ionic charge balance / each O accepts an electron from two K atoms / K_2O ; [max 5]

(c) **(i)** (not balanced)
balanced means the same number of each <u>type</u> of atom on both sides /
detail of why this is unbalanced e.g. 4 x K on left 2 x K on right / would need to have 4 KOH on right;
$2K_2O_2 + 2H_2O \longrightarrow 4KOH + O_2$;
[2]

(ii) re-lights glowing splint; [1]

(iii) OH^-; [1]

5 **(a)** **(i)** weight / gravity;
friction / air resistance; [1]

(ii) increase; [1]

(iii) travel at constant speed / terminal velocity ;
no resultant force / forces cancel out / equal and opposite forces /
weight = air resistance ; [2]

(b) speed = distance/time ;
= 400 000/80= 5000 km/h *or* 1388.9 m/s *or* 83.3 km / min ; [2]

(c) **(i)** there is no difference; [1]

(ii) weight will be less on the moon; [1]

6 **(a)** **(i)** lymphocytes ; [1]

(ii) phagocytes ; [1]

(b) **(i)** the more HIV/AIDS, the more TB ; [1]

(ii) white cells / immune system / T cells, cannot work properly ;
cannot destroy, bacteria / pathogens / antigens, that cause TB ; [2]

(c) idea that white cells react to the (weakened) bacteria ;
correct ref. to, antibodies / memory cells ;
that attack bacteria / pathogens / antigens (immediately) in future ; [max 2]

7 **(a)** **(i)** chlorine / C*l*; [1]
(ii) aluminium / A*l*; [1]

(b) orange substance is bromine / bromine is produced;
chlorine is more reactive than bromine;
chlorine displaces bromine / chlorine reacts with bromide ;
correct reference to redox; [max 2]

(c) **(i)** iron(III) oxide;
carbon dioxide;
because these substances lose oxygen / reduction is loss of oxygen;
oxygen;
because carbon is oxidised and so oxygen must be reduced; [max 3]

(ii) (56 x 2) + (16 x 3) or 160; [1]

8 **(a)** **(i)** arrows in right direction;
ray of light from tooth to touch mirror and mirror to eye;
approx correct angles; [3]

(ii) measure mass of object;
measure volume of object;
by displacement / Eureka can + measure volume of displaced water ;
density = mass / volume; [4]

(b) **(i)** one cell is back to front; [1]

(ii) circuit diagram as in Fig. 8.2 with one cell reversed ; [1]

9 **(a)** respiration ; [1]

(b) decay organisms / detritivores / decomposers / ref to decomposing ;
bacteria / fungi ;
respire ; [2 max]

(c) dead organisms / plants / animals / bacteria ;
do not decay fully ;
in airless / anaerobic / waterlogged conditions ;
idea that they are, compressed / buried ;
ref to long time period ; [max 2]

(d) **(i)** removal of sulphur from fuels / use of low-sulphur fuels ; [1]

(ii) idea that not all nitrogen oxides react in catalytic converter ;
not all cars fitted with catalytic converters ;
not all catalytic converters work; [2]

(iii) acid rain ;
damages trees ;
makes rivers / lakes acidic which;
allows heavy metals / aluminium, to leach from soil ;
kills fish / kills aquatic organisms / kills named aquatic organism ; [max 3]