

**MARK SCHEME for the October/November 2007 question paper**

**0653 COMBINED SCIENCE**

**0653/03**

Paper 3 (Extended Theory), maximum raw mark 80

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.

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.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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- 1 (a) 4; [1]
- (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<sup>3</sup> of) gas; [1]
- (ii) concentration of H<sub>2</sub>O<sub>2</sub> / 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)  $R = V/I = 240/0.04 (=6000\Omega)$  ; [1]
- (ii)  $1/R = 1/R1 + 1/R2$  ;  
 $= 1/6000 + 1/6000 = 1/3000$ ;  
 $R = 3000\Omega$  [3]

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- 3 (a) leaf / C ; [1]
- (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 genetically 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<sup>+</sup> ;  
 reference to negative oxide ion / O<sup>2-</sup> ;  
 reference to attraction between positive and negative ions/oppositely charged ions ;  
 ionic charge balance / each O accepts an electron from two K atoms / K<sub>2</sub>O ; [max 5]
- (c) (i) (not balanced)  
 balanced means the same number of each type 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<sup>-</sup>; [1]

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- 5 (a) (i) weight / gravity;  
friction / air resistance; [2]
- (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 / Cl<sub>2</sub>; [1]
- (ii) aluminium / Al; [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]

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- 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]