

**MARK SCHEME for the October/November 2011 question paper  
for the guidance of teachers**

**0653 COMBINED SCIENCE**

**0653/33**

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, which would have considered the acceptability of alternative answers.

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- 1 (a) (i) liquid – particles touching but random arrangement ;  
 gas – particles well spaced out, random arrangement ;
- (ii) forces greater in a liquid than in a gas, or a ;  
 reference to forces of attraction / forces holding particles together ; [2]
- (b) (i) white surfaces reflect the radiation well (better than dark surfaces)/poor  
 absorbers of radiation ; [1]
- (ii) metal base is a good heat conductor/wood/plastic handle is a good heat  
 insulator/poor conductor ; [1]
- (iii) convection ;  
 hot water expands and becomes less dense ;  
 hot water rises (and displaces colder water) ; [max 2]

[Total: 8]

- 2 (a) (i) line from cell **A** to leaf ;  
 line from cell **B** to root ; [2]
- (ii) structure **X**, is a chloroplast/ contains chlorophyll/ absorbs energy from light ;  
 for photosynthesis ;  
 cell **B** does not have them because it, is underground/ gets no light ; [3]
- (iii) has a large surface area ;  
 for uptake of, water/ mineral salts ; [2]

(b) (i)

genotype	phenotype
RR	<b>red</b>
Rr	<b>red</b>
rr	<b>white</b>

- (ii) circle around **Rr** ; [1]
- (iii) 3 red : 1 white ; (if red and white not stated, assume first number refers to  
 red) [1]

- (c) all new plants identical to parent plant ;  
genetically identical/ clone;  
 if used seeds would produce variation/ not have unusual flowers ;  
 seeds may not germinate/ (mature) plants obtained more quickly ;  
 only one parent needed to produce the offspring ; [max 2]

[Total: 12]

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- 3 (a) (i) Q – oxygen ;  
R – hydrogen ;
- (ii) (oxygen)  
relights glowing (wooden) splint ;  
**OR**  
(hydrogen)  
pops with application of flame ; [max 1]

- (b) (i) potassium hydroxide + sulfuric acid ;  
(potassium sulfate +) water ; [2]

- (ii) addition of one reagent to the other ;  
slowly / carefully (until neutral) ;  
suitable method of testing neutrality ;  
detail of indication of neutrality e.g. pH meter shows 7 / universal indicator goes green ; [max 3]

- (iii)  $H^+ + OH^-$  ;  
 $\longrightarrow H_2O$  ; [2]

[Total: 10]

- 4 (a) (i) beta radiation ; [1]

- (ii) gamma, infra-red, ultraviolet ;; [2]

- (iii) cancer treatment ;  
tracer ;  
food sterilization ;  
surgical instrument sterilization ; [max 1]

(iv)

	alpha	beta	gamma
most penetrating			✓
most ionising	✓		
not deflected by an electric field			✓

(3 correct for 2 marks ; 2 correct for 1 mark)

[2]

- (b) count rate decreased / decay curve ;  
some randomness of results ;  
half-life about 14 days ; [max 2]

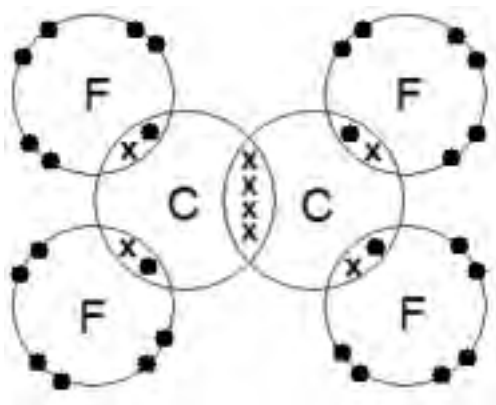
[Total: 8]

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5 (a) (i) no hydrogen/hydrocarbons contain carbon and hydrogen (only) ;

(ii)



bonding pairs ;  
non-bonding pairs ;

[2]

(iii) four **C** and 8 **F** ;  
all single bonds ;  
indication that chain continues ;

[3]

(b) (i) gas;  
boiling point decreases up the group/increases down the group/description  
of trend in physical state in group ;

[2]

(ii) (no reaction)  
reactivity increases up the group ;  
so bromine is less reactive than fluorine ;

[2]

[Total: 10]

6 (a) label to stomach ;  
label to colon ;

[2]

(b) label to liver/pancreas/gall bladder/tongue/salivary gland ;

[1]

(c) protease/pepsin ;  
breaks down proteins ;  
to, amino acids/polypeptides/peptides ;  
hydrochloric acid provides low pH/acid conditions for pepsin enzymes ;

[max 2]

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- (d) (i) put predatory wasps on the plants ;
- (ii) pesticides can harm people who eat the tomatoes ;  
pesticides could harm other (beneficial) insects ;  
whitefly could become resistant to pesticides ;  
might need to apply pesticides often/only need to add wasps once ; [max 2]

[Total: 8]

- 7 (a) calcium oxide and water react ;  
(reaction is) exothermic/reaction produces heat ;  
heat transferred to coffee ; [max 2]

- (b) (i) calcium is in Group 2/atoms have two outer electrons ;  
outer 2 electrons lost ;  
ion has two more positive charges (protons) than negative charges (electrons) ; [3]

- (ii) single negative ; [2]  
working to show need for charge balance ;

[Total: 7]

- 8 (a) (i) X = voltmeter and Y = ammeter ; [1]
- (ii) changing/controlling voltage/current in circuit/across resistor ; [1]
- (iii) resistance = voltage ÷ current / 1 ÷ gradient ;  
= 4/2 (or other correct values) = 2Ω ; [2]

- (b)  $1/R = 1/R_1 + 1/R_2$  ;  
=  $1/10 + 1/10$  ;  
 $R = 10/2 = 5\Omega$  ; [3]

- (c) (i) changes direction ; [1]

- (ii) spins faster ; [1]

- (iii) allows current to change direction in coil (every 1/2 turn) ;  
means force on coil stays in same direction ;  
keeps coil spinning in same direction ; [max 2]

[Total: 11]

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- 9 (a) voluntary  
voluntary  
reflex  
voluntary  
(one mark for any two correct) ;; [2]
- (b) (advantage) faster ;  
(disadvantage) no choice / cannot make the best decision ; [2]
- (c) (receptor) receives stimulus / senses change in the environment / hears the sound ;  
(motor neurone) transmits, nerve impulse / signal, to an, effector / muscle ; [2]

**[Total: 6]**