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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

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

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1 (a) (i) liquid – particles touching but random arrangement ;
gas – particles well spaced out, random arrangement ; [2]

(ii) forces greater in a liquid than in a gas, ora ;
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	**red**
Rr	**red**
rr	**white**

; [1]

(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 ; [2]

(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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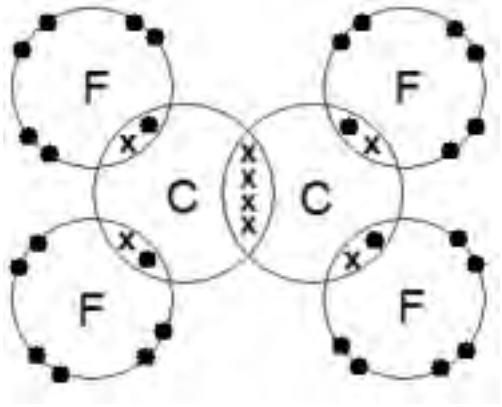
5 **(a)** **(i)** no hydrogen / hydrocarbons contain carbon and hydrogen (only) ; [1]

(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 ; [1]

(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 ;
working to show need for charge balance ; [2]

[Total: 7]

8 (a) (i) **X** = voltmeter <u>and</u> **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) = 2 Ω ; [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 ½ 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]

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