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

0653/33 Paper 3 (Extended Theory), maximum raw mark 80

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1 **(a)** idea of restoring full / correct number (of 46) in the zygote ; [1]

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

(ii) oviduct / Fallopian tube ; [1]

(c) produces / contains, amniotic fluid ;
protects / supports, embryo ; [2]

(d) **(i)** **T**, because **Tt** does not have thalassaemia / owtte ; [1]

(ii)

phenotypes of parents	man without thalassaemia	woman without thalassaemia
genotypes of parents	Tt	**Tt**
gametes	**T** and **t**	**T** and **t**

gametes from woman

gametes from man	**T**	**t**
T	**TT**	**Tt**
t	**Tt**	**tt** thalassaemia

parental genotype ;
gamete genotypes ;
offspring genotypes ;
child with thalassaemia identified ; [4]

(iii) haemoglobin transports oxygen / person with thalassaemia has less oxygen (in blood) ;
so less respiration (in cells) / description of respiration ;
which releases energy ; [2 max]

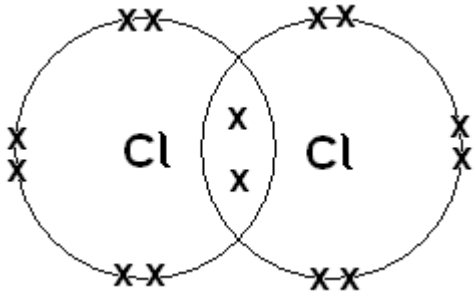
[Total: 12]

2 (a) (i) pink / orange / brown / copper (layer) ; [1]

(ii) 2+ ;
two negative charges from chloride must balance the charge on the copper ion / owtte ;
[2]

(iii) (**L**)
it is a negative ion / has a negative charge / has more electrons than protons ;
reference to attraction between opposite charges ; [2]
(points separately marked)

(iv)



one shared pair ;
all other electrons correctly shown ; [2]

(b) (i) carbon dioxide ; [1]

(ii) $2PbO + C \rightarrow 2Pb + CO_2$;;
(correct formulae and balanced) [2]

[Total: 10]

3 (a) (i)

	description	**charge**	**range in air**	**ionising ability**
alpha	***helium nucleus***	positive	5 cm	very strong
beta	electron	***negative***	50 cm	***medium***
gamma	electromagnetic wave	***none***	many kilometres	weak

(the wording for ionising ability **must** show beta lies between alpha and gamma) ;;;; [4]

(ii) alpha particles have low penetration in air / absorbed by casing / will not reach people living in house / smoke detectors are a long way from people ; [1]

(b) working (on graph or numerically) ;
5 hours ; [2]

[Total: 7]

4 **(a)** terracing / building of walls (qualified) ;
bunds / embankments / ditches ;
plough along slope (not up and down) ;
keep crop cover ;
plant trees ; [max 2]

(b) **(i)** *advantage*
kills more pests / can completely destroy pest population / faster acting ;
does not introduce a (potentially) damaging new organism (to the ecosystem) ;

disadvantage
may kill other beneficial / all insects / toxic to humans / have to apply several times / development of resistance ;
bioaccumulation / persistence provided related directly to DDT ;

(ignore refs to costs unless related to reason)
(1 max for advantage, 1 max for disadvantage) [2]

(ii) *meaning*
absorbed (by plant) and transported (in phloem) ;
reaches all parts of plant ;

advantage
can kill pests even if it does not directly hit them ;
only affects insects feeding on the plant ; [2]

(1 max for advantage, 1 max for disadvantage)

[Total: 6]

5 **(a)** **(i)** **K** and **L** ; [1]

(ii) **J** lights up / on ;
K and **L** go off ; [2]

(b) 2 × 12 Ω resistors ;
in parallel ;
calculation to show this ; [3]

(c) **(i)** coil cuts magnetic field / coil experiences changing magnetic field ; [1]

(ii) direction of magnetic field relative to coil changes (every half turn) / direction of motion of coil through magnetic field changes / reverses ; [1]

[Total: 8]

6 **(a)** $(H^+ +)\ OH^- \rightarrow H_2O$;; [2]

(b) (acid is added) until indicator / solution changes colour ;
colour change correct – allow blue to either red or reasonable intermediate ; [2]

(c) no indicator added / use of pH meter to show neutrality ;
ref. to same amount / volume of sodium hydroxide solution / alkali (as in **(b)**) ;
ref. to same amount / volume of acid (as in **(b)**) ;
evaporate / heat / boil off the water (from the solution) ; [max 3]

[Total: 7]

7 **(a)** **(i)** traps layer of air ;
acts as insulator / reduces convection and conduction ; [2]

(ii) white surfaces radiate less heat than black surfaces ;
less heat is lost ; [2]

(b) **(i)** below 20 Hz ;
lowest frequency of human hearing is 20 Hz / below range of human hearing ; [1]

(ii) (number of) waves / oscillations produced per unit time / wavelengths passing a point per unit time ; [1]

(iii) waves have same amplitude ;
less waves shown on trace ; [2]

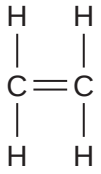
(c) **(i)** 1.6 cm ; [1]

(ii) both rays drawn backwards to meet ;
image labelled / clearly and unambiguously visible on diagram ; [2]

(iii) image which cannot be projected (onto a screen) / light (rays) does not pass through it ; [1]

[Total: 12]

8 (a)



(2C and 4H bonded and double bond shown) [2]

(b) (catalytic / thermal) cracking ;
fractions are boiled / vaporised / heated ;
passed over (hot) catalyst / subjected to very high temp. and pressure ; (allow named catalyst e.g. alumina, silica, pumice, porcelain) [3]

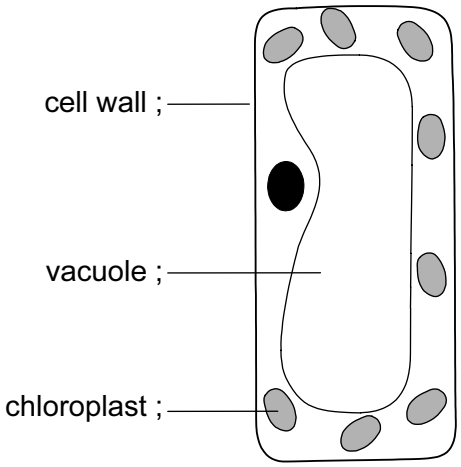
(c) double bonds become single ;
single bonds form between molecules to form a long chain ; [2]
(marks can be obtained by clear diagrams)

(d) A_r C = 12 and H = 1;
(12 × 2) + (1 × 4) = 28 ; [2]

[Total: 9]

9 (a) water <u>vapour</u> lost from plant('s leaves) ;
correct ref. to transpiration ;
condensation ;
water vapour cooled ;
gas changed to liquid ;
ref. to particles and (kinetic) energy ; [max 4]

(b) (i)



[max 2]

(ii) water moved out of the cell ;
down a water potential gradient / from where there was a lot of water to where there was less / from dilute solution to concentrated solution ;
through partially permeable cell membrane ;
so volume of cell / vacuole shrank ;
strong cell wall cannot change shape (much) so cytoplasm / cell membrane pulls away from it ; [max 3]

[Total: 9]