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

0653/32   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.
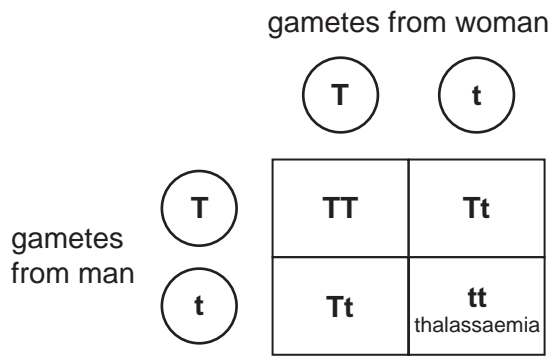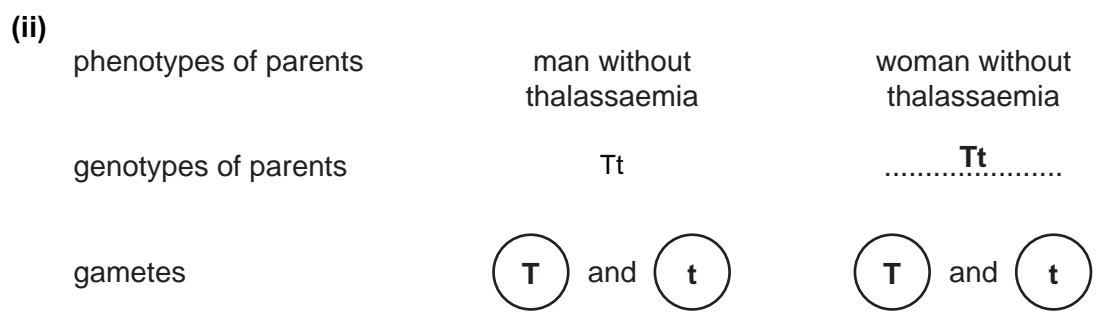
Mark schemes must be read in conjunction with the question papers and the report on the examination.

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1 (a) idea of restoring full / correct <u>number</u> (of 46) in the zygote ;

(b) (i) ovary ;

   (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

	T	t
T	TT	Tt
t	Tt	tt thalassaemia

gametes from man

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) ;

(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 ;
(points separately marked)

[2]

(iv)
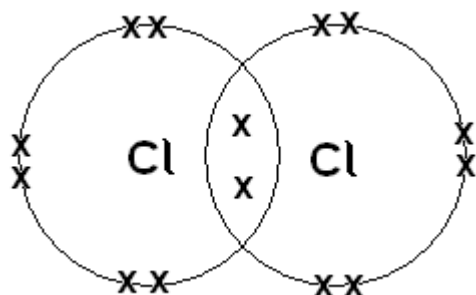
one shared pair ;
all other electrons correctly shown ;

[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)** $(H^+ +) OH^- \rightarrow H_2O$;;

(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 <u>radiate</u> 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)

```
H   H
|   |
C = C
|   |
H   H ;;
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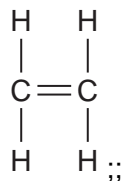
(2C and 4H bonded and double bond shown)   [2]

(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;
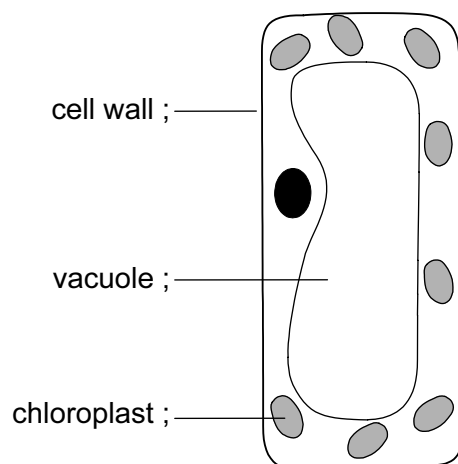(12 × 2) + (1 × 4) = 28 ;   [2]

[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)

cell wall ;

vacuole ;

chloroplast ;

[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]