

**MARK SCHEME for the October/November 2010 question paper  
for the guidance of teachers**

**0654 CO-ORDINATED SCIENCES**

**0654/22**

Paper 2 (Core Theory), maximum raw mark 100

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) driving force is less than braking / friction force ; [1]  
(ii) driving force = braking / friction force ; [1]
- (b) (i) anywhere between 0 and 13 seconds ; [1]  
(ii) 16 m/s ; [1]  
(iii)  $KE = \frac{1}{2} mv^2$  ;  
 $= 0.5 \times 800 \times 16 \times 16 = 102400 \text{ J}$  ; [2]
- (c) (i) 50 J ; [1]  
(ii) current = power / voltage ;  
 $= 50 / 12 = 4.2 \text{ A}$  ; [2]

**[Total: 9]**

- 2 (a) hair / fur ;  
mammary glands ;  
different types of teeth ; [2 max]
- (b) (i) homeostasis ; [1]  
(ii) respiration ; [1]  
(iii) sensed by pancreas ;  
pancreas secretes insulin ;  
insulin affects liver ;  
causes liver to take glucose from blood ;  
(liver) converts glucose to glycogen ; [3 max]
- (c) (i) liver ; [1]  
(ii) (excess) amino acids ; [1]  
(iii) kidneys ; [1]

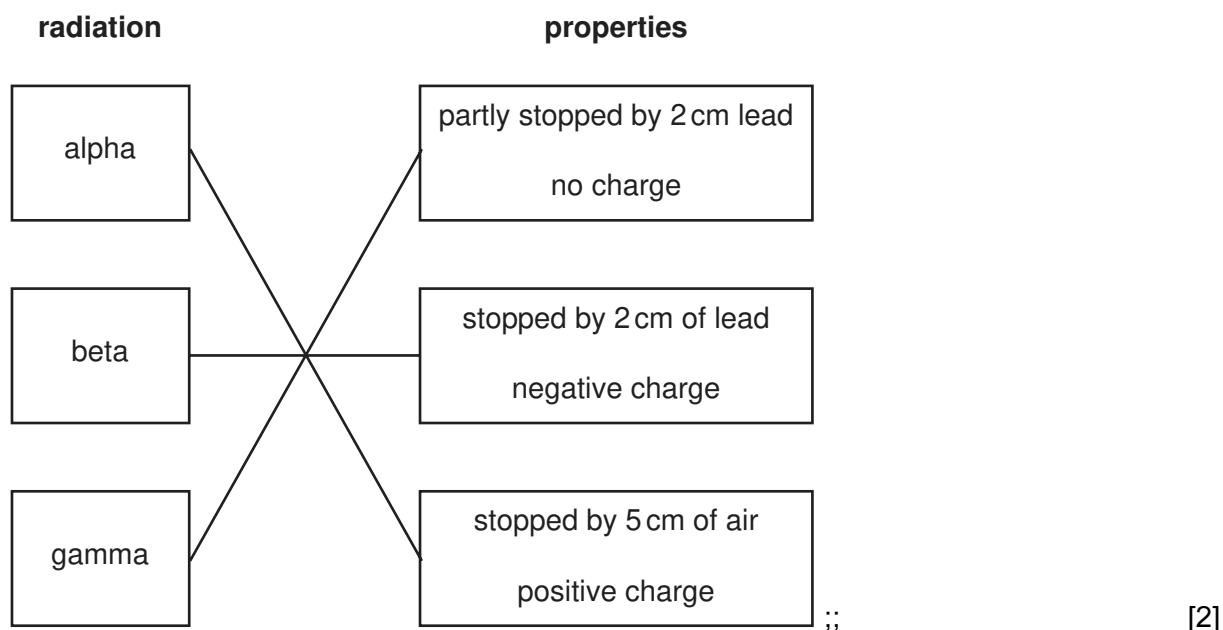
**[Total: 10]**

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- 3 (a) (i)** (dc) power supply / battery / cell ; [1]
- (ii)** chlorine ;  
(anode)  
non-metals form at the anode / chlorine is a non-metal / chloride ions are negative and anode is positive ; [2]
- (iii)** pink / orange / copper (layer / deposit / solid)) ; [1]
- (b) (i)** (lead oxide + carbon →) lead + carbon dioxide ;; [2]
- (ii)** lead oxide / carbon dioxide ;  
compounds contain more than one type of element / atom ;  
reference to (different) elements / atoms in compounds being joined / bonded ; [3]
- (c) (i)** silicon dioxide ; [1]
- (ii)** copper oxide ;  
copper is a transition metal / transition metal compounds are usually coloured ; [2]

**[Total: 12]**

**4 (a)** radiation properties



**(b) (i)** wear gloves / protective clothing / handle samples at arm's length, etc. ; [1]

**(ii)** start – 200 cps  
after 5 hours – 100 cps [1]

**(iii)** 5 hours ; [1]

**(c) (i)** causes atoms to lose electrons / atoms become ions ;; [1]

**(ii)** alpha is less penetrating (than gamma);  
alpha is the more ionising (than gamma) ; [2]

**(d)** involve nuclei of atoms ;  
fission – nuclei split, fusion = nuclei join together ; [2]

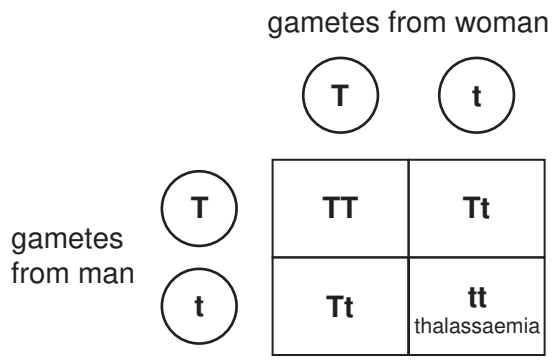
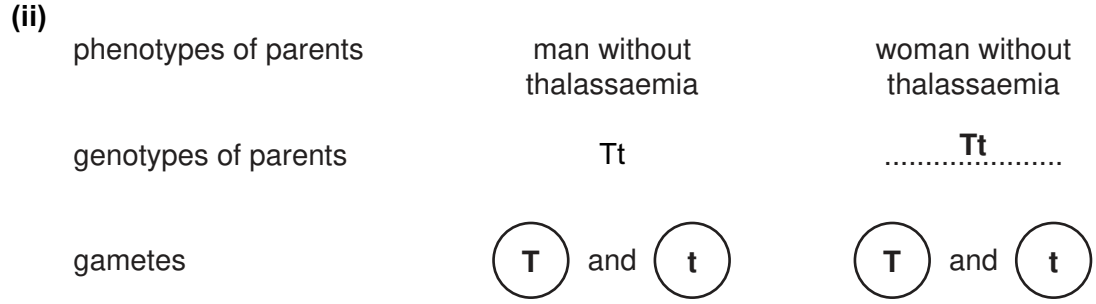
**[Total: 10]**

- 5 (a) (i) 23 ; [1]  
(ii) 46 ; [1]  
(iii) nucleus ; [1]

(b) nucleus of sperm and nucleus of egg ;  
(sperm and egg) fuse ; [2]

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

(d) (i) T, because Tt does not have thalassaemia / words to that effect ; [1]



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) ;  
which releases energy ; [max 2]

[Total: 14]

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- 6 (a) circuit containing resistor, voltmeter, ammeter and power supply ;  
correct symbols for resistor, voltmeter, ammeter and power supply ;  
ammeter in series ;  
voltmeter in parallel with resistor ; [4]
- (b) (i) 3 (A) ;  
explanation –  $2 \times 1.5 \text{ A}$  ; [2]
- (ii) 0.5 (C) ; [1]
- (iii) electron ; [1]
- [Total: 8]**
- 7 (a) (i) (leaching or run off of) fertiliser / animal wastes / herbicide / pesticide ; [1]
- (ii) sulfur (compounds) produce sulfur dioxide (when fuel burns) ;  
sulfur dioxide dissolves in / reacts with rain water ;  
(produces) acidic solution / sulfurous / sulfuric acid / acid rain ;  
acid rain collects in rivers / lakes ;  
reference to harmful effects of acidity, e.g. kills organisms ; [max 4]
- (iii) (filtration)  
microorganisms will pass through the filter / owtte ; [1]  
(allow things like chlorination and distillation kill microorganisms whereas  
filtration does not)
- (b) (i) calcium / magnesium (ions) / any soluble Ca or Mg compound ; [1]
- (ii) the water samples had differing degrees of hardness / differing amounts of  
(dissolved) Ca / Mg ;  
more scum / less lather shows harder water / ora ;  
the order of hardness is **C** (hardest) then **A** then **B** ; [max 2]
- [Total: 9]**

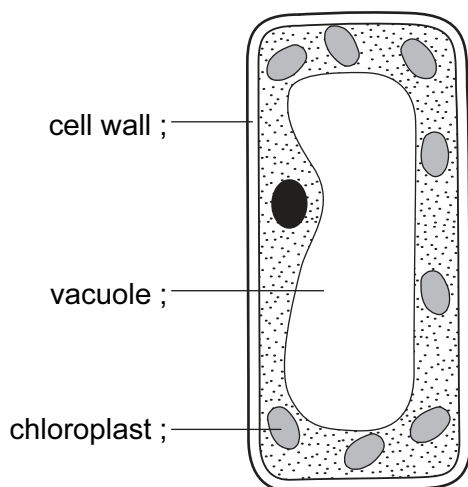
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8 (a) (i) from plant's leaves ;  
transpiration ;  
through stomata ; [max 2]

(ii) condensation ;  
water vapour cooled ;  
gas changed to liquid / water droplets ;  
ref. to particles and (kinetic) energy ; [max 2]

(b) loss of turgor (in leaf cells) / cells become flaccid ;  
(stem supported by) xylem / lignin ; [2]

(c) (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 ;  
through partially permeable cell membrane ;  
so volume of cell shrank / contents of cell / vacuole shrank ;  
strong cell wall cannot change shape (much) so cytoplasm / cell membrane  
pulls away from it ; [max 2]

**[Total: 10]**

9 (a) (i) O and S ; [1]

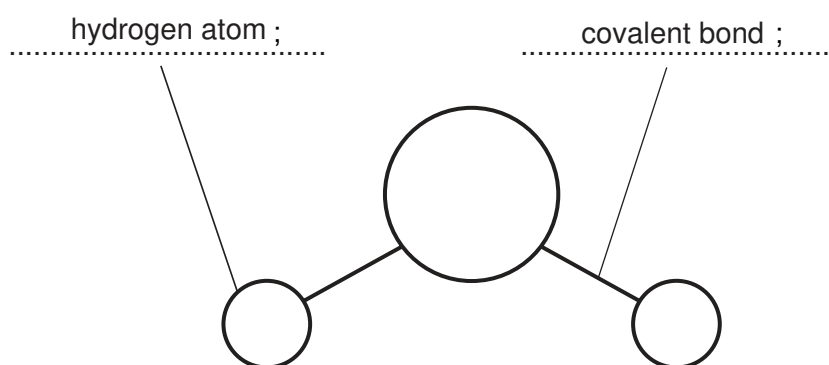
(ii)

Table 9.1

element name	protons	neutrons
(oxygen)	8	8
phosphorus	(15)	(16)

one mark for each row ;; [2]

(b)



[2]

(c) (i) hydrocarbons ; [1]

(ii) molecules contain a double bond ;  
between the carbon atoms ;  
so molecules do not possess maximum possible hydrogen atoms / owtte ; [max 2]

(iii) combustion / oxidation ;  
oxygen ; [2]

(iv) polymerisation ;  
molecules join together / form chains ; [2]

[Total: 12]



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- 10 (a) (i)** sound / ultrasound ; [1]
- (ii)** gamma / infra-red / ultraviolet / microwave / visible light ; [1]
- (iii)** infra-red ; [1]
- (iv)** microwaves ; [1]
- (b) (i)** blue ; [1]
- (ii)** yellow / cyan / magenta ; [1]

**[Total: 6]**