

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

**0654 CO-ORDINATED SCIENCES**

**0654/32**

Paper 3 (Extended 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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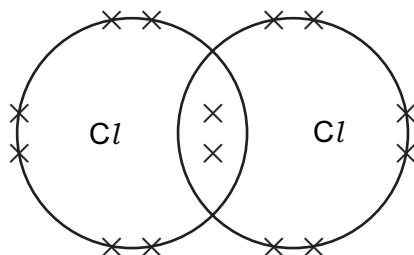


1 (a) (i) pink / orange / brown / copper (layer) ; [1]

(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]

(iv)



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

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

(ii)  $2\text{PbO} + \text{C} \rightarrow 2\text{Pb} + \text{CO}_2$  ;  
(correct formula then look for balance) [2]

(iii) (no reaction)  
idea that carbon is less reactive than potassium ;  
and so cannot remove / combine with the oxygen ; [2]  
(allow 1 mark for saying potassium is too reactive)

[Total: 12]

2 (a)

ammeter	current / amps
A <sub>1</sub>	0.7
A <sub>2</sub>	<b>0.3</b>
A <sub>3</sub>	<b>0.4</b>
A <sub>4</sub>	0.3

::

[2]

(b) (i) (yes – no mark)  
straight line on graph so current is directly proportional to voltage ; [1]

(ii) 2 amps ;  
explanation e.g.  $13 \times 0.15 \text{ A}$  or  $2 \times 1 \text{ A}$  ; [2]

<b>Page 3</b>	<b>Mark Scheme: Teachers' version</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>IGCSE – October/November 2010</b>	<b>0654</b>	<b>32</b>

(c) (i) make magnetic field stronger ;  
only magnetic while the current is on ;  
so that magnetic field can be reversed ; [max 2]

(ii)  $V_s = V_p \times N_s / N_p = 200 \times 1000 / 10000 = 20 \text{ V}$  ; [1]

**[Total: 8]**

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

(b) (i) loss of turgor (in leaf cells) / cells become flaccid ;  
because water lost from the cells ; [2]

(ii) (supported by) xylem / lignin ; (reject if reason is that xylem contains water) [1]

(iii) approximately similar shaped cell, with all parts shown ;  
outer cell wall slightly caved in ;  
vacuole much smaller ;  
cytoplasm pulled away from cell wall ; [max 3]

**[Total: 10]**

4 (a) (i) sound / ultrasound ; [1]

(ii) infra-red ;

(iii) gamma ; [1]

(b) (i) number of, waves / oscillations, per, second / unit time ; [1]

(ii) (no – no mark)  
maximum human frequency about 20 000 Hz ; [1]

(iii)  $v = f \times \lambda$  ;  
wavelength =  $330 / 50\,000$  ;  
= 0.0066 m ; [3]

**[Total: 8]**

Page 4	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0654	32

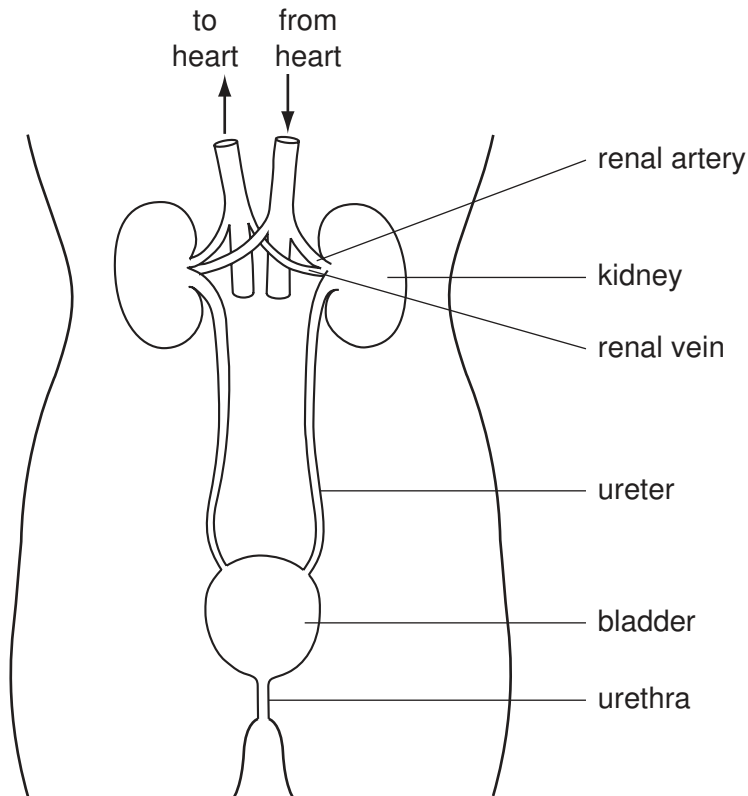
- 5 (a) (filtration)  
microorganisms will pass through the filter / owtte ; [1]  
(allow idea that chlorination and distillation kill microorganisms whereas filtration does not)
- (b) light rays are scattered ;  
by reflection from dispersed material ;  
transparency requires most rays to be undeviated / owtte ; [max 2]  
(first two points could come from diagram of scattered rays)
- (c) (i) 0.05 ; [1]
- (ii) relevant working e.g.  $0.05 \times 12.5 / 1000$ ;  
 $= 0.000625$  ; [2]
- (iii) evidence of the use of molar ratio. e.g. 2 mols of alkali neutralise one mole of acid / acid to alkali = 1:2 /  $0.000625 \div 2$  ;  
 $= 0.00031(25)$  ; [2]
- [Total: 8]**
- 6 (a) A written anywhere between 0 and 13 seconds ; [1]
- (b) area under graph / other working ;  
 $\frac{1}{2} \times 12.8 \times 8 = 51.2$  m ; [2]
- (c) maximum speed = 16 m / s  
 $KE = \frac{1}{2} mv^2$  ;  
 $= 0.5 \times 800 \times 16 \times 16 = 102400$  J ; [3]
- (d) momentum is directly proportional to v / momentum = mv ;  
KE is directly proportional to  $v^2$  / explained using numbers ; [2]
- [Total: 8]**
- 7 (a) hair / fur ;  
mammary glands ;  
different types of teeth ;  
pinnae / ear flaps ; [max 2]
- (b) arterioles ;  
delivering blood to skin surface ;  
dilate / get wider ;  
so more blood flows close to skin surface ;  
loses heat (by radiation to air) ; [max 3]

<b>Page 5</b>	<b>Mark Scheme: Teachers' version</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>IGCSE – October/November 2010</b>	<b>0654</b>	<b>32</b>

- (c) (i) sensed by pancreas ;  
 pancreas secretes insulin ;  
 insulin affects liver ;  
 causes liver to take glucose from blood ;  
 (liver) converts glucose to glycogen ;

[max 3]

(ii)



- one renal artery and vein drawn and labelled ;  
 two renal arteries and veins drawn ;  
 (at least one) ureter drawn and labelled ;  
 urethra drawn and labelled ;

[4]

**[Total: 12]**

- 8 (a) working ;  
 5 hours ; (allow leeway if carefully shown on graph)

[2]

- (b) (i) causes, atoms / molecules, to lose electrons / to become ions ;

[1]

- (ii) alpha is less penetrating and is stopped by, the air / clothes / skin ;  
 alpha is more ionising and so causes more damage when close to cells ;

[2]

Page 6	Mark Scheme: Teachers' version	Syllabus	Paper
	IGCSE – October/November 2010	0654	32

(c) (i) fusion is joining and fission is splitting (of atoms / nuclei) ;  
of nuclei ; [2]

(ii) radiation leaks / ref. Chernobyl ;  
cancer / mutations in, local people / animals ;  
or disposal of waste ;  
needs to be stored safely for a long period ; [max 2]

[Total: 9]

9 (a)

Table 9.1

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

;; (1 mark per row)

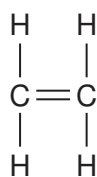
[2]

(b) (i) silicon / Si ;  
periodic pattern refers to (repeating) patterns (of properties) across periods /  
every eight elements / owtte ;  
silicon is eight elements further on (in Periodic Table) from element No. 6 /  
carbon ;

[max 2]

(ii) carbon has a giant structure and nitrogen is simple molecular ;  
much energy needed to, melt / break down, giants / converse for molecular ;  
because strong bonds must be broken / converse for molecular ;  
because many bonds must be broken / converse for molecular ; [max 3]

(c) (i)



;; (2C and 4H bonded and double bond shown)

[2]

(ii) (catalytic / thermal) cracking ;  
fractions are boiled / vaporised / heated ;  
passed over (hot) catalyst / subjected to very high temperature and pressure ; [3]

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

[Total: 14]

<b>Page 7</b>	<b>Mark Scheme: Teachers' version</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>IGCSE – October/November 2010</b>	<b>0654</b>	<b>32</b>

- 10 (a) (i)** 23 ; [1]  
(ii) 46 ; [1]  
(iii) nucleus ; [1]
- (b) (i)** oviduct / fallopian tube ; [1]  
(ii) uterus / womb ; [1]
- (c)** produces / contains, amniotic fluid ;  
protects / supports, embryo ; [2]
- (d)** individual with the mutation is more likely to survive ;  
individual with the mutation is more likely to reproduce ;  
passing mutation on to its offspring ;  
repeated over many generations ;  
most / all, of population have the mutation ;  
and the characteristic that the mutated gene produces ; [max 4]

**[Total: 11]**