

**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

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

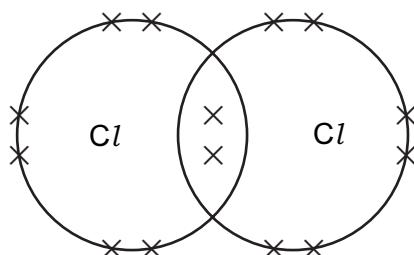
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- 1 (a) (i) pink / orange / brown / copper (layer) ;
- (ii) 2+ ;  
two negative charges from chloride must balance the charge on the copper ion / owtte ; [2]
- (iii) (L)  
it is a negative ion / has a negative charge / has more electrons than protons ;  
reference to attraction between opposite charges ; [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]

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- (c) (i) make magnetic field stronger ;  
only magnetic while the current is on ;  
so that magnetic field can be reversed ; [1]
- (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]

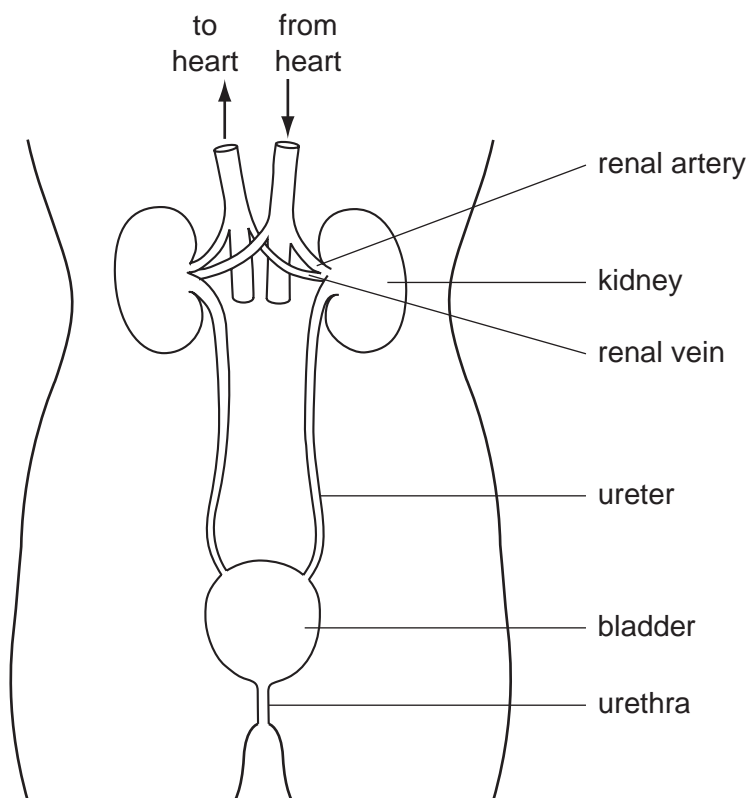
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- 5 (a) (filtration)  
microorganisms will pass through the filter / owtte ;  
(allow idea that chlorination and distillation kill microorganisms whereas filtration does not)
- (b) light rays are scattered ;  
by reflection from dispersed material ;  
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]

- (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]

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

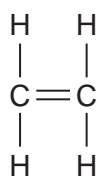
- (b) (i) silicon / Si ;  
periodic pattern refers to (repeating) patterns (of properties) across periods /  
every eight elements / owtte ;  
silicon is eight elements further on (in Periodic Table) from element No. 6 /  
carbon ;

[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 ;  
(marks can be obtained by clear diagrams)

[2]

[Total: 14]

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- 10 (a) (i) 23 ;  
(ii) 46 ;  
(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]**