CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0654 CO-ORDINATED SCIENCES

0654/23 Paper 2 (Core Theory), maximum raw mark 120

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 should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

CAMBRIDGE
International Examinations

1 (a) (i) uses renewable / sustainable energy resource / saves fossil fuels / free energy source / no pollution CO_2 etc. ; [1]

(ii) visual pollution / noise / only works when it's windy / high capital investment costs / damage to wildlife ; [1]

(iii) kinetic ; [1]

(b) (nuclear to) thermal energy ;
heat water to produce steam ;
steam turns turbine and / or generator ;
reference to kinetic energy ; [max 2]

(c) during cold weather cables will contract ;
could snap cables / damage pylons etc. ; [2]

(d) (i) **A** – shorter length ; [1]

(ii) **C** – greater cross-sectional area / diameter ; [1]

(iii) resistance $= \frac{\text{voltage}}{\text{current}}$;
$= \frac{12}{80} = 0.15$;
Ω ; [3]

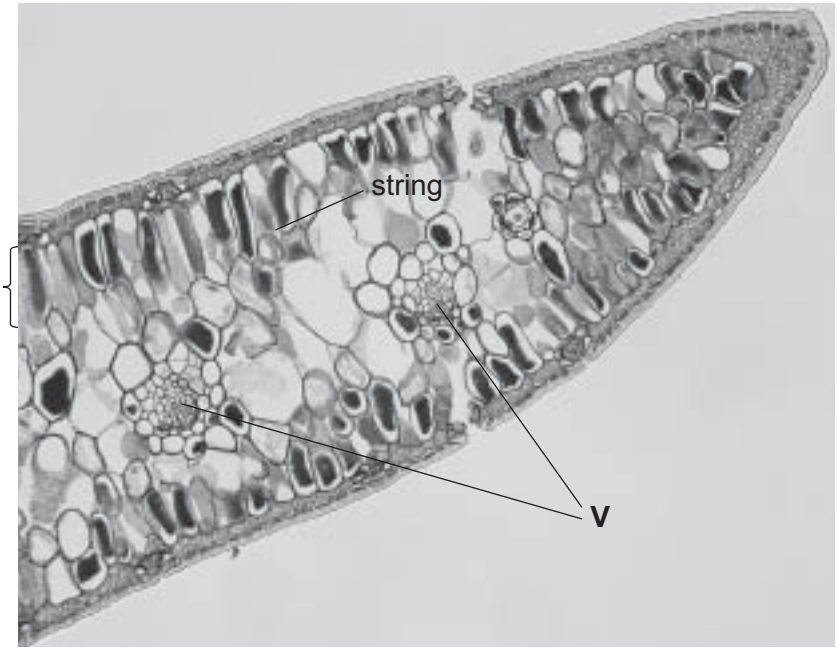
[Total: 12]

2 (a) photosynthesis ; [1]

(b) (palisade) mesophyll ; [1]

(c) large diagram, showing rectangular cell ;
nucleus labelled ;
chloroplast labelled ;
cell wall labelled ;
cytoplasm labelled ;
vacuole labelled ;
cell membrane labelled ; [max 5]

(d) (i) vascular bundle labelled (one of two places, as below) ;



[1]

(ii) xylem / phloem ; [1]

(iii) support ;
transport of water / mineral ions (into the leaf) ;
transport of sugar (out of the leaf) ; [max 2]

[Total: 11]

3 (a) (i) mixture of metals / metals and other elements ; [1]

(ii) malleability ; [1]

(iii) copper chloride ;
zinc chloride ; [2]

(b) sodium atom loses one electron ;
chlorine atom gains one electron ;
sodium now has a positive electrical charge ;
chlorine / chloride now has a negative electrical charge ; [max 2]

(c) (i) P_4O_{10} (symbols and subscripts) ;; [2]

(ii) green to red ;
solution becomes acidic / non-metal oxides form acidic solutions ; [2]

[Total: 10]

4 **(a)** artificial ;
breeding ;
generations ;
increase ; [4]

(b) **(i)** Awassi and Merino ;
Awassi for high milk yield, Merino for high wool yield ; [2]

(ii) disease resistance ;
hardiness / ability to stand dry / hot / cold conditions ;
temperament ;
reproduction rate ;
milk / meat quality ; [max 2]

(c) food / energy used in making meat / muscle is not being used in making wool ; [1]

(d) females are kept for breeding / milk ; [1]

[Total: 10]

5 **(a)** **(i)** moves away from magnet / will repel ;
like poles repel ; [2]

(ii) gravity ;
tension in string ;
magnetic attraction of North pole / Earth's magnetic field ; [max 2]

(b) **(i)** positive – opposite charges attract ; [1]

(ii) when rubbed with a cloth / friction ;
electrons are gained by ball Y / electrons transferred ; [2]

(c) density $= \frac{\text{mass}}{\text{volume}}$;

$= \frac{4}{4.2} = 0.95$; [2]

[Total: 9]

6 (a) (i) 6 ;
proton / atomic number is 6 and numbers of protons and electrons are equal ; [2]

(ii) covalent ;
non-metals are bonded / compounds exist as (small) molecules ; [2]

(iii) (**P**)
carbon dioxide formula is CO_2 / contains 3 atoms ; [1]

(iv) burning carbon fuels / specific example ;
respiration ;
brewing / fermentation (of sugars) ; [max 2]

(b) (i) limewater / calcium hydroxide solution ;
goes cloudy / white precipitate ; [2]

(ii) mass (of test-tube **C**) <u>decreases</u> ;
CO_2 is evolved so the mass of carbon dioxide is lost / carbon dioxide has mass ; [2]

[Total: 11]

7 (a) (i) downwards ; [1]

(ii) upwards ; [1]

(b) (i) high frequency – high pitch means high frequency ; [1]

(ii) small amplitude – small amplitude means quiet sound ; [1]

(c) more molecules / particles / atoms enter tyre ;
they / molecules / particles / atoms are moving / vibrating / have kinetic energy ;
they / molecules / particles / atoms collide ;
(they / molecules / particles / atoms collide) with walls ;
other relevant point e.g. exert force / momentum change / bounce back /
lots over an area ; [max 3]

(d) distance = speed × time ;
= 330 × 0.6 = 198 (m) ;
divide by two = 99 (m) ; [3]

[Total: 10]

8 **(a)** **(i)** genotype = genetic makeup / alleles present (in an organism) ;
gamete = (male or female) sex cell; [2]

(ii) green / **G** ;

(b) yellow is recessive / must be homozygous / no green allele present ; [1]

(c) **Gg**, **Gg** ;
G, **g**, **G**, **g** (shown in F1 or in Punnett square) ;
GG, **Gg**, **gg** (in Punnett square) ;
green, green, yellow (in Punnett square) ;
3:1 ; [5]

(d) chlorophyll ; [1]

[Total: 10]

9 **(a)** **(i)** nitrogen ;
78% ; [2]

(ii) sulfur dioxide ;
reference to acid rain reacting with building materials / damage to respiratory system if inhaled ;
increase acidity of lakes / soil ;
OR
oxides of nitrogen / named oxide ;
damage to respiratory systems if inhaled / reference to smog ; [max 2]

(b) **(i)** flame ;
pops ; [2]

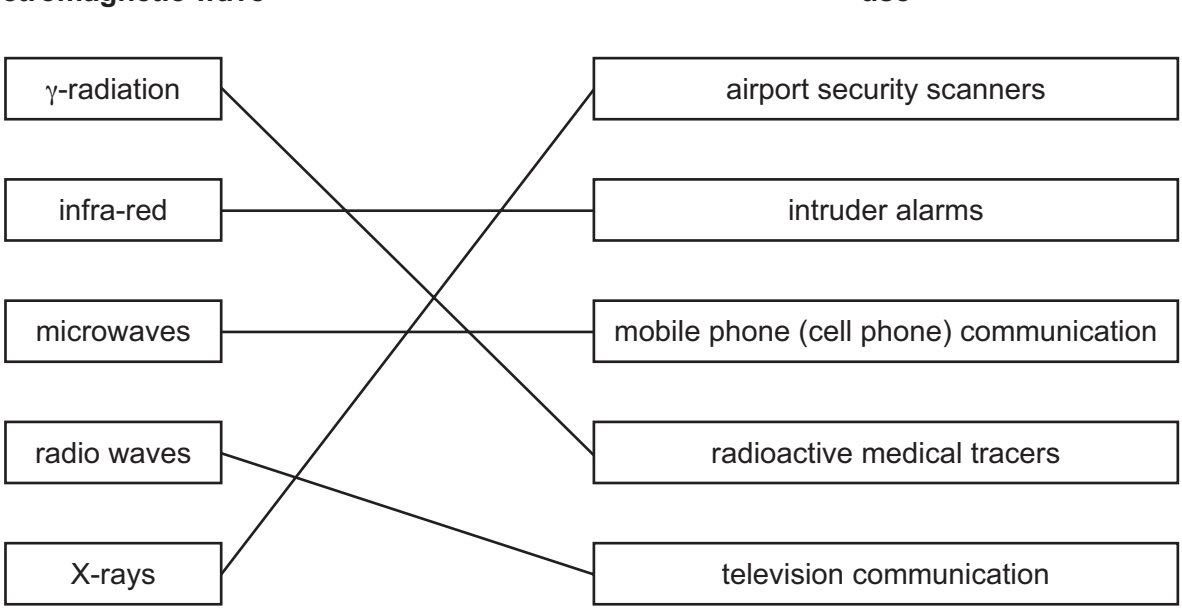
(ii) magnesium chloride ; [1]

(c) **(i)** exothermic as shown by increased temperature ; [1]

(ii) reaction stops (after 40 s) / no more heat energy is being released / reactant(s) used up / owtte ; [1]

[Total: 9]

10 (a)



(all correct, 3 marks, 2 correct = 2 marks, 1 correct = 1 mark) ;;; [3]

(b) distance between two peaks / two troughs / two identical points on consecutive waves ; [1]

(c) (i) Geiger counter / Geiger-Muller tube / scintillation counter / cloud chamber / photographic paper ; [1]

(ii) alpha
beta
gamma (in that order) ; [1]

(iii) gamma
beta
alpha (in that order) ; [1]

(iv) atoms break into (one or more) different atoms ;
release of energy / particles ; [2]

[Total: 9]

11 **(a)** **(i)** in – oxygen ;
out – CO_2 ; [2]

(ii) CO_2 ; [1]

(b) diffusion ; [1]

(c) **(i)** red cell / erythrocyte ; [1]

(ii) haemoglobin ; [1]

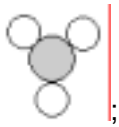
(iii) nucleus ; [1]

(d) in the blood (plasma / cell) / capillary ;
allows more oxygen to diffuse in ; [2]

[Total: 9]

12 **(a)** **(i)** 3 ; [1]

(ii) particle to be labelled **C** shown



; [1]

(iii) molecule of a compound must contain different atoms (joined) ; [1]

(b) **(i)** transition elements / metals / series ; [1]

(ii) *(properties of the transition metal)*
higher density ;
reference to use as catalysts ;
higher melting point ;
variable valency ;
(forms) coloured compounds ; [max 2]

(iii) (made into alloys for) use in aircraft manufacture ;
because low density / aircraft need to have low weight ;
OR
used to make food containers ;
because it doesn't react with food ;
OR
used in power cables ;
good electrical conductor / low density so not too heavy ;
OR
(other correct) ;; [max 2]

(c) (i) electrolysis ; [1]

(ii) oxygen / carbon dioxide / carbon monoxide ; [1]

[Total: 10]