CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2014 series

0654 CO-ORDINATED SCIENCES

0654/22 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)** helium ;
aluminium ;
chlorine ; [3]

(b) **(i)** **B** and **C** (both needed) ; [1]

(ii) **C** ; [1]

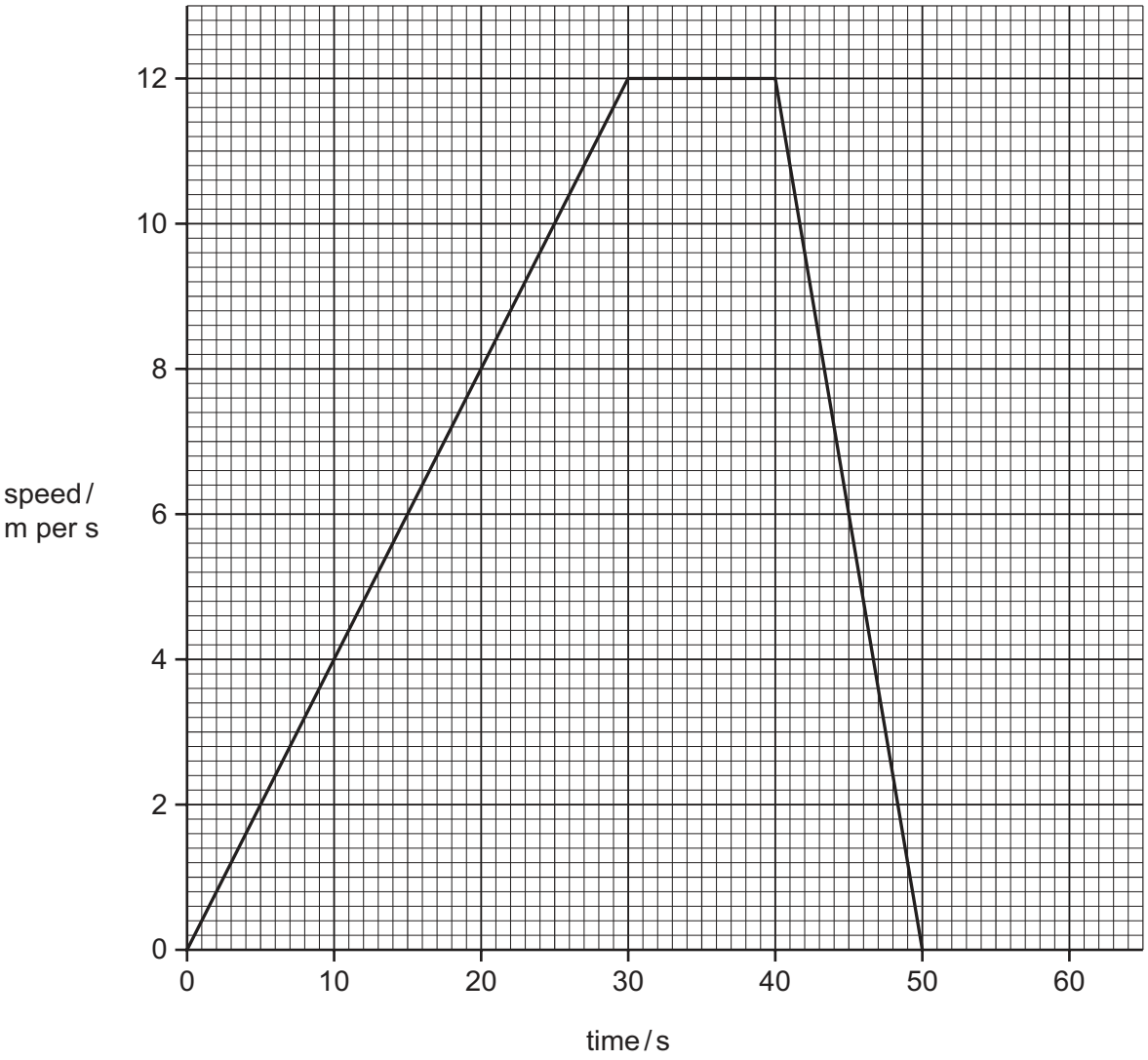
(iii) **D** ; [1]

(c) **(i)** electrolysis ; [1]

(ii) copper chloride $\longrightarrow$ copper + chlorine ;; (L.H.S ; + R.H.S ;) [2]

[Total: 9]

2 **(a)** suitable scales ;
all four key points identified ;
only positive gradient for acceleration, only negative gradient for deceleration, horizontal straight line for constant speed ; [3]



(b) distance = speed × time ;
= 12 × 10 = 120 (m) ; [2]

(c) **(i)** kinetic ; [1]

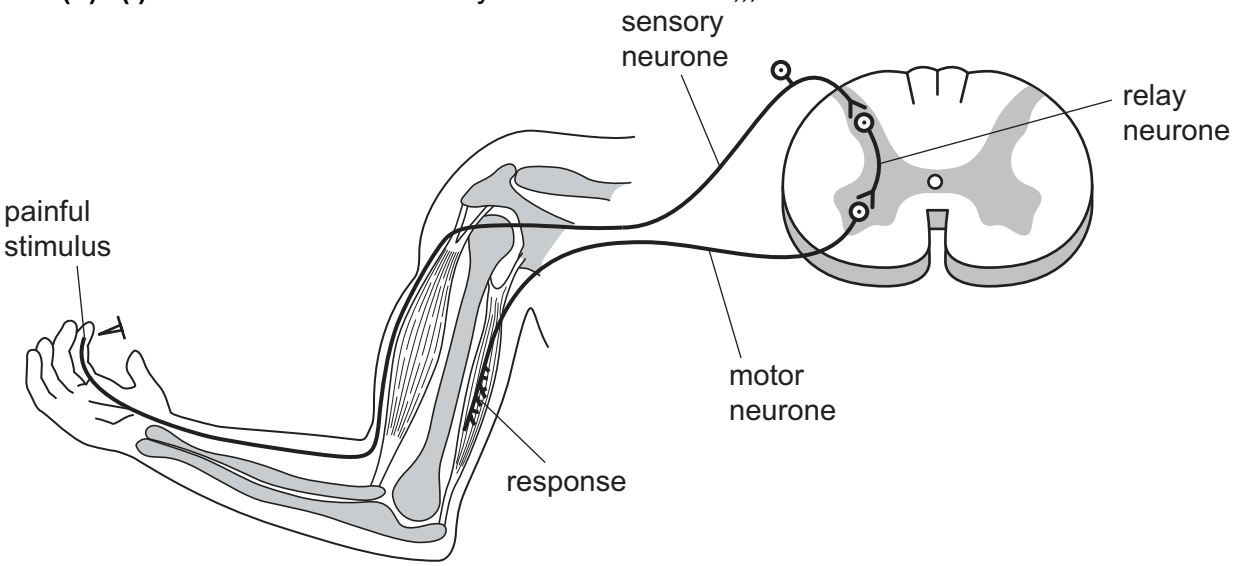
(ii) gravitational potential energy ; [1]

(iii) joule and J (both required) ; [1]

[Total: 8]

3 **(a)** sensitivity / movement ; [1]

(b) **(i)** three neurones correctly labelled as below ;;;



[3]

(ii) relay / connector ; [1]

(iii) behaviour more flexible / coordinated with other responses / can be controlled by the brain ; [1]

(c) conscious / consciously controlled ;
not automatic ;
always involves the brain ; [max 2]

(d) do not need to be learned / protect the young animal from danger ; [1]

[Total: 9]

4 **(a)** **(i)** *hydrogen and carbon*
(each) contains one type of atom / is found in the Periodic Table / cannot be broken down into simpler substances ;
propane contains different atoms (allow elements) bonded together / can be broken down into simpler substances / into elements ; [2]

(ii) petroleum / natural gas ; [1]

(iii) <u>fractional</u> distillation ; [1]

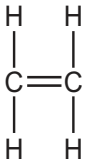
(iv) heating / lighting / burners / cooking / vehicle fuel / refrigerant / feedstock ; [1]

(b) (i) (catalytic) cracking ; [1]

(ii) only single bonds (in a molecule) / contains maximum possible hydrogen atoms ; [1]

(iii) ethene and propene (both required) ; [1]

(iv)



(2 × C and 4 × H; all else correct) ; [2]

[Total: 10]

5 (a) (magnet) moves towards / attraction ; [1]

(b) (i) (magnet) moves towards / will line up / owtte ; [1]

(ii) magnet moves away from / is repelled by ; [1]

(iii) like poles repel / unlike poles attract / only magnets repel ; [1]

(c) (i) 0.5 (A) ; [1]

(ii) $(R) = \frac{V}{I}$;

$= \frac{1.5}{0.5} = 3\,(\Omega)$; [2]

(iii) (R =) R1 + R2 + R3 = 3 + 3 + 3 ;
= 9 (Ω) ; [2]

[Total: 9]

6 (a) (i) decreased ;
from 1350 to 400 km^2 (over 5 year period) / by 950 km^2 (over 5 year period) / use of numbers ;
rapid decrease, then slower ; [max 2]

(ii) government regulation / increased awareness / reduced demand for timber / land / decreased areas of forest remaining ; [1]

(b) (i) fewer trees absorbing CO_2 ;
by photosynthesis ; [2]

(ii) CO_2 acts as greenhouse gas / traps thermal **OR** infra-red energy ;
global warming ; [2]

(c) soil erosion / loss of soil ;
flooding ;
extinction of species ;
loss of habitat ; [max 2]

(d) to get timber ;
for fuel ;
clearing land for housing ;
clearing land for agriculture ;
clearing land for roads / factories ; [max 2]

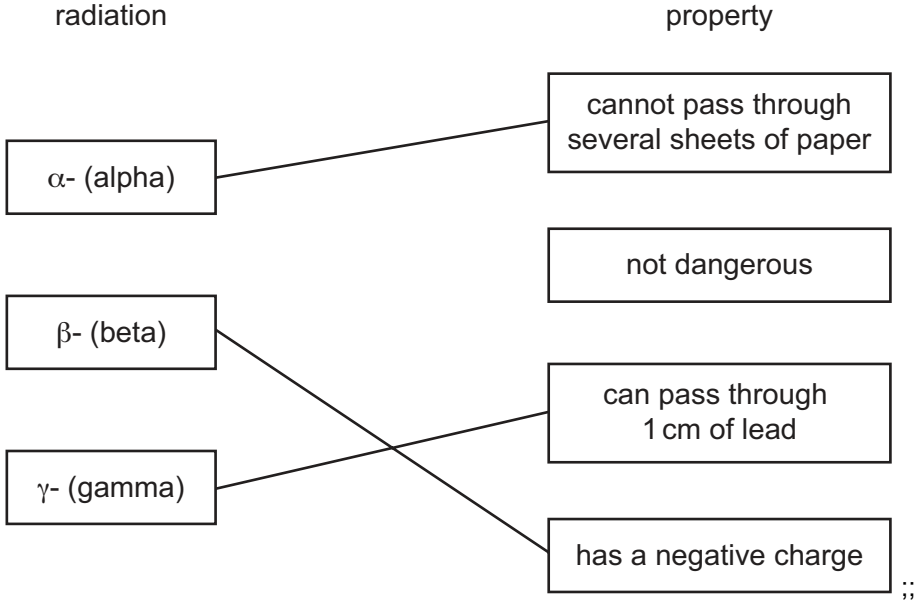
[Total: 11]

7 **(a)** element whose atoms contain the same number of protons but different numbers of neutrons ; [1]

(b) **(i)** the natural ionising radiation that is always present in the environment / owtte ; [1]

(ii) curve above original ;
approx. 50 cps (one square) above ; [2]

(c)



;;

(3 correct = 2 marks, 1 correct = 1 mark)

[2]

(d) **(i)** ultraviolet (LHS) ;
radiowaves (RHS) ; [2]

(ii) gamma end / left hand side ; [1]

(e) friction removes electrons / electrons are transferred ;
from cloth to balloon ; [2]

[Total: 11]

8 **(a)** photosynthesis ;
transport ;
support ;
turgor ;
part of cytoplasm ; [max 2]

(b) **(i)** leaves / stomata / mesophyll ; [1]

(ii) soil ;
[1]

(c) **(i)** increases ;
after a delay / slowly at first, then faster ; [2]

(ii) 15.00 (hours) ; [1]

(iii) high temperature / windy / low humidity / high light intensity / stomata open ; [1]

(iv) more cloud cover / cooler / less wind / less light / increased humidity ; [1]

[Total: 9]

9 **(a)** **(i)** **L** nucleus ;
M electron ; [2]

(ii) idea that nucleons are sub-atomic particles / protons and neutrons in the nucleus ;
total number of these is 32 ; [2]

(b) **(i)** (covalent – no mark)
idea that non-metallic atoms are bonded / sulfur dioxide exists as molecules / sulfur dioxide is gaseous ; [1]

(ii) dissolves / reacts with (rain) water ;
rain water becomes acidic / now contains (dilute) sulfuric acid ;
acid rain falls into lake ;
water evaporates but sulfuric acid does not ;
[max 2]

(c) (i) increase temperature ;
increase surface area of magnesium / use magnesium in powder form ;
increase concentration of the acid ; [max 2]

(ii) magnesium sulfate ;
hydrogen ; [2]

[Total: 11]

10 (a) (i) as a source of energy ;
used in respiration ; [2]

(ii) remains on the teeth / encourages bacterial growth ;
causing dental decay ;
OR
causes obesity ;
leading to CHD / diabetes / arthritis ; [max 2]

(b) (i) use Benedict's solution ;
heat ;
red / orange (ppt) ; [max 2]

(ii) roughage / indigestible material / plant matter / cellulose ;
prevents constipation / promotes peristalsis / AW ; [2]

(iii) (vitamin) C ;
for skin / gums / prevents scurvy ; [2]

(c) starch / glycogen / cellulose ; [1]

[Total: 11]

11 (a) (i) convex ; [1]

(ii) focal length ; [1]

(iii) **P** drawn at focus of light rays ; [1]

(b) (i) distance between two identical points on consecutive waves labelled ; [1]

(ii) amplitude correctly labelled ; [1]

(c) (i) trumpet ; [1]

(ii) piano ; [1]

(iii) lowest 20 (Hz) ;
highest 20 000 (Hz) ; [2]

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

$\frac{1500}{200} = 7.5$;

g / cm^3 ; [3]

[Total: 12]

12 (a) (i) increase crop yield / replace nutrients (removed by crops) ; [1]

(ii) potassium ;
phosphorus ; [2]

(iii) 8 ; [1]

(b) (i) heating an ammonium salt with sodium hydroxide releases ammonia ;
ammonia turns (damp red) litmus paper blue ;
ammonia is alkaline ; [max 2]

(ii) no reaction / no observable change ;
white precipitate / solid formed / mixture goes cloudy ; [2]

(c) <u>reduces</u> soil acidity ;
by reacting with / neutralising acid in soil ;
reference to flocculation / improved drainage ;
provides calcium / improves uptake of NPK ; [max 2]

[Total: 10]