CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2013 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.

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1 **(a)** **N** labelled at either 0 s **or** 50 s ;
A labelled between 0 s and 20 s or between 40 s and 50 s ;
C labelled between 20 s and 40 s ;

(b) **(i)** maximum of 2.8 at 1.00 p.m. ;
goes up then down ;
some energy for 17 hours ;
other use of data ; [max 2]

(ii) energy input from Sun varies ; [1]

(c) **named** fossil fuel is burned ;
to release heat energy ;
heat turns water into steam ;
steam drives turbine ;
turbine drives generator ; [max 3]

(d) voltmeter in parallel with photocell ;
correct symbol ; [2]

(e) lateral inversion ;
upright ; [2]

[Total: 13]

2 **(a)** **(i)** refinery gas – bottled gas / camping gas / other correct ;
gasoline – car engine fuel / fuel for petrol engines ;
diesel – fuel for diesel engines ; [3]

(ii) carbon dioxide ;
water ; [2]

(iii) hydrocarbons react with oxygen / oxygen bonds to the hydrocarbon ; [1]

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

(ii) **A** mixture remains orange ;
B mixture changes from orange to colourless ;
some unsaturated hydrocarbons formed (during cracking) ;
unsaturated hydrocarbons react with bromine / decolorise bromine ; [4]

[Total: 11]

3 (a)

producer	consumer	herbivore	carnivore
bilberry and spruce ;	*any **two** of:* vole, Siberian jay, red squirrel, lynx, goshawk ;	*any **two** of:* vole, Siberian jay, red squirrel ;	lynx and goshawk ;

[4]

(b) loss of soil / soil erosion ;
flooding ;
carbon dioxide build up ; [max 2]

(c) muscle contraction ;
protein synthesis ;
cell division ;
passage of nerve impulses ;
maintenance of constant body temperature ;
digestion ; [max 3]

[Total: 9]

4 (a) (i) gas produced ;
temperature change ; [2]

(ii) hydrogen ;
lighted splint pops ; [2]

(iii) solution is becoming less acidic ;
because dilute hydrochloric acid is reacting / being used up ; [2]

(b) (i) the volume of gas trapped in the measuring cylinder ;
the time taken for this volume to collect ; [2]

(ii) concentration of acid ;
temperature of acid ;
surface area of magnesium ; [max 2]

[Total: 10]

5 **(a)** **(i)** infra-red ;

(ii) wavelength / frequency ;

(b) **A** is passing into a more dense medium ;
B hits at an angle greater than the critical angle ;
C is passing into a less dense medium ; [3]

(c) **(i)** 2 protons and 2 neutrons / helium nucleus ; [1]

(ii) rocks etc ; [1]

(d) alpha particles cannot pass through a thin sheet of lead / alpha particles can pass through a few centimetres of air ; [1]

(e) Geiger-Müller tube ;
photographic film ; [2]

(f)

both alpha radiation and beta radiation pass easily through the body	☐
alpha radiation damages cells in a very localised part of the body	☑
ionisation does not always kill cells- sometimes it causes them to mutate	☑
cancer occurs when a large number of cells are killed	☐
the dose of radiation received depends on the length of exposure	☑

(*all 5 boxes correct: 2 marks, 3 or 4 boxes correct: 1 mark*) ;; [max 2]

(g) electron ;
neutron ;
electron ;
proton and neutron ; [4]

[Total: 16]

6 (a)

a cell formed when the nuclei of the male and female gamete fuse	zygote ;
a male gamete	sperm ;
the organ in which sperms are made	testis ;
the place where fertilisation occurs	oviduct ;

[4]

(b) (i) 30 days ; [1]

(ii) day 25 ; [1]

(c) (i) human immunodeficiency virus ; [1]

(ii) virus passes from mother to child ;
across placenta ;
through <u>blood</u> during birth process ;
in breast milk ; [max 2]

[Total: 9]

7 (a) (i) good heat conductor ;
malleable ;
good electrical conductor ;
ductile ;
unreactive / does not react with water ;
[max 3]

(ii) transition metals ; [1]

(b) (i) alloy ; [1]

(ii) harder / stronger ; [1]

(c) (i) electrolysis ; [1]

(ii) left electrode labelled cathode ; [1]
(*reject labelling of wiring or power pack*)

(iii) copper chloride ;
gas produced is chlorine ;
elements in the compound must have been copper and chlorine ; [max 2]

[Total: 10]

8 **(a)** kinetic ;
heat and sound ;

(b) **(i)** liquid particles touching ;
gas particles not touching ;
random arrangement for both ; [3]

(ii) faster moving molecules ;
can do more work against attractive forces / can break bonds between them ;
break free / separate / turn into gas / leave liquid ;
energy / heat (from surroundings) used for this ; [max 3]

(c) $V = I \times R$;
$R = 220/3 = 73.3\ (\Omega)$; [2]

[Total: 10]

9 **(a)** **(i)**

substance	source	part of plant that absorbs it	process by which it is absorbed
carbon dioxide	*air*	leaf / stomata ;	diffusion ;
water	soil ;	root / root hairs ;	

[4]

(ii) carbon dioxide + water ;
⟶ glucose / sugar / starch / carbohydrate + oxygen ; [2]

(b) **(i)** pitchers have slippery rim (so insects fall in) ;
pitchers have downward-pointing spines (so insects can't crawl out) ; [2]

(ii) breakdown of large molecules ;
so that they can be absorbed / become soluble ; [2]

(iii) enzymes / proteases / trypsin / pepsin ; [1]

(c) **(i)** as a control / to make sure the only variable was the substance used ; [1]

(ii) (yes)
insects moved towards the piece of rim ;
use of figures from table ; [2]

[Total: 14]

10 (a) (i) *calcium carbonate*
reduce acidity / increase pH / neutralise acids ;
calcium carbonate reacts with / neutralises acids ;
releases nutrients from soil ;

potassium compounds
increase plant nutrient levels ;
potassium compounds are essential for healthy plant growth ; [max 3]

(ii) mix ash with dilute acid ;
carbon dioxide shows carbonate present ; [2]

(b) (i) 15 ; [1]

(ii) sulfuric acid ;
neutralisation ; [2]

(iii) warm solution gently ;
allow water to evaporate ;
allow solution to cool ; [max 2]

[Total: 10]

11 (a) curve goes up and then down again ;
peak between 30 and 45 °C ;
rate zero by 60 °C ; [3]

(b) (i) *skin in environmental condition **2***
blood vessel is wider ;
reference
to sweat ; [2]

(ii) hotter ; [1]

(iii) shiver / contract ;
release heat ; [2]

[Total: 8]