Location Entry Codes

UNIVERSITY OF CAMBRIDGE
International Examinations

As part of CIE's continual commitment to maintaining best practice in assessment, CIE has begun to use different variants of some question papers for our most popular assessments with extremely large and widespread candidature, The question papers are closely related and the relationships between them have been thoroughly established using our assessment expertise. All versions of the paper give assessment of equal standard.

The content assessed by the examination papers and the type of questions are unchanged.

This change means that for this component there are now two variant Question Papers, Mark Schemes and Principal Examiner's Reports where previously there was only one. For any individual country, it is intended that only one variant is used. This document contains both variants which will give all Centres access to even more past examination material than is usually the case.

The diagram shows the relationship between the Question Papers, Mark Schemes and Principal Examiner's Reports.

Question Paper	Mark Scheme	Principal Examiner's Report
Introduction	Introduction	Introduction
First variant Question Paper	First variant Mark Scheme	First variant Principal Examiner's Report
Second variant Question Paper	Second variant Mark Scheme	Second variant Principal Examiner's Report

Who can I contact for further information on these changes?
Please direct any questions about this to CIE's Customer Services team at: international@cie.org.uk

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the May/June 2009 question paper

for the guidance of teachers

0654 CO-ORDINATED SCIENCES

0654/31 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.

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

- CIE will not enter into discussions or correspondence in connection with these mark schemes.

CIE is publishing the mark schemes for the May/June 2009 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

Page 2	Mark Scheme: Teachers' version	Syllabus / er
	IGCSE – May/June 2009	0654

1 (a) (i) correct symbols including all components ;
[need not be a variable resistor] [accept if only one cell]
correct circuit including all components ;
[voltmeter in parallel with lamp only, all else in series] [1]

(ii) to vary, current/voltage/pd (across lamp) ; [1]

(iii) (R=) V/I ; [not volts/amps] [not V/A] [accept pd/I]
= 5.3 ; [2]

(iv) filament gets hot ;
resistance (of filament/lamp) is not constant ;
voltage and current are not (directly) proportional ; [2]

(b) (i) ammeter reading to right but larger than original ;

(ii) ammeter reading to left ; [1]

(iii) <u>current</u> is small ; [ignore refs to accuracy] [1]

(iv) alternator/dynamo/generator ; [1]

[Total: 11]

2 (a) (i) secretes/produces, sweat/water and minerals (onto surface of skin) ;
water/sweat evaporates ;
takes heat from skin ; [not just 'cools the skin'] [max 2]

(ii) (arteriole) dilates/gets wider ; [not if it is moving up or down]
<u>vasodilation</u> ;
(more) blood flows, to surface capillaries/near (skin) surface ;
(more) heat lost by <u>radiation</u> ; [max 3]

(b) (i) respiration (in muscles) ;
releases energy ;
(chemical) reactions/muscles, produce heat ; [max 2]

(ii) (still) sweating/arterioles (still) dilated/cooling mechanism (still) working ;
body not producing as much heat/more heat lost than heat produced ; [2]

(iii) shiny/silver, <u>radiates</u> less heat (than matt/black) ; [1]

(c) helps body to, absorb/use, calcium ;
needed for, bone growth/strong bones ;
lack can cause rickets ; [max 2]

[Total: 12]

3 **(a)** natural dyes obtained (directly) from plants or animals or rocks/
no extra chemical reactions needed to make them/
synthetic dyes are manmade/artificial ;

(b) [accept 'grease' to mean stain throughout] [accept from clear diagrams]

1 soap molecules have, hydrophobic/nonpolar, and, hydrophilic/polar, parts ;
2 soap molecules able to, dissolve/mix, in both the stain and water ;
3 nonpolar part dissolves in stain/polar part dissolves in water ;
4 soap molecules enable stain and water to mix ;
5 soap molecules reduce surface tension/help water to 'wet' the cloth ;
6 reference to <u>emulsification</u> ; [max 3]

(c) **(i)** $(Ca(HCO_3)_2 \rightarrow CaCO_3 + CO_2 + H_2O$;;
[$CaCO_3$ + both for 2 marks]
[$CaCO_3$ + one for 1 mark] [2]

(ii) reference to the need for charge balance between positive and negative ions in a compound ;
(calcium hydrogencarbonate Ca:HCO_3 is 1:2 so charge on HCO_3 must be) 1– ; [2]

[Total: 8]

4 **(a)** **(i)** 5.1 (± 0.1) ; [1]

(ii) (directly) proportional ; [accept if described in correct numbers] [1]

(b) alpha stopped by/beta not stopped by, paper/few cms of air ; [1]

(c) **(i)** protons and neutrons both go down (by two) ;
alpha particle is 2 protons and 2 neutrons ; [2]

(ii) different, numbers of protons/atomic number ;
[reject if also neutrons] [ignore electrons] [1]

(iii) gamma emission does not change any particles (protons/neutrons)/is just a wave/is just energy ; [1]

(iv) time taken for half atoms to decay/time taken for count rate to decrease by half ; [1]

(v) 3 half-lives ;
12 days ; [2]

[Total: 10]

5 **(a)** **(i)** 3 pairs of legs/6 legs ;
wings ;
one pair of antennae ;
body divided into, head and thorax and abdomen/3 parts ; [max

(ii) **B** arachnids ;
C crustacea ; [2]

(b) **(i)** brown body gg ;
green body Gg and GG ; [2]

(ii) (parents genotypes) Gg x Gg ;
(gametes) G and g G and g ;
(offspring) GG Gg Gg gg ;
indication of which ones are brown and which are green ; [4]

(c) discontinuous, because there are, distinct categories/only two types ; [1]

(d) may kill other, insects/animals ; [ignore 'damage crops']
may harm humans ; [ignore just 'humans may breathe it in']
some pesticide, wasted/lands on undesired areas ; [2 max]

[Total: 13]

6 **(a)** Q labelled as anode ;
chloride ions are negative/are Cl^-, and attracted to positive electrode ; [2]

(b) **(i)** 0.01 ; [1]

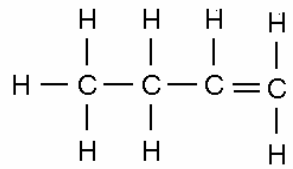
(ii) 2 x 0.01 moles of sodium hydroxide produced (use of equation) ; [allow ecf]
M_r of sodium hydroxide 23 + 16 + 1 = 40 ;
mass of sodium hydroxide = 40 x 0.02 = 0.8 g ; [unit required] [3]

(c) **(i)** $Cl_2 + 2KBr \rightarrow 2KCl + Br_2$;; [formulae then balanced] [2]

(ii) 1 shared pair ;
all other outer shell electrons on both atoms ; [2]

(iii) bromine colour change from orange to colourless ;
if hydrocarbon is unsaturated ; [max 2]

(iv)



;; (or correct isomer)
4 x C and 8 x H ;
correct bonds between carbons ; [2 single and one double] [2]

[Total: 14]

7 **(a)** seedling, **B**/**E**/with no tip ;
did not grow ;

(b) receptor at tip ;
seedling **F**/the ones with tip covered, did not grow towards the light/grew straight up ;

effector just behind the tip/part way up seedling/in stem/in shoot/on side ;
this is the part (of shoot **D**) that bent (towards the light) ; [4]

(c) auxin produced in the tip of the shoot ;
diffuses/moves, downwards ;
collects on the shady side ;
makes shady side grow faster ; [max 3]

[Total: 9]

8 **(a)** **(i)** = 5000 N ; [1]

(ii) 20 N/cm^2 ;
change of 10 N/cm^2 for each 10 m depth ; [2]

(b) **(i)** (momentum =) m x v = 1.2 x 10 (= 12 kg m/s) ; [1]

(ii) (velocity =) momentum/mass *or* momentum = mv ;
12 = 4 xv_2/any suitable substitution ;
v_2 = 3 m/s ; [3]

(c) **(i)** v = fλ *or* v/f ;
λ = 1500 / 39 000 = 0.038 m ; [2]

(ii) 10 to 25 Hz – 20 000 to 25 000 Hz ; [both values within these ranges] [1]

(iii) distance travelled = area under graph/working (shown on graph) ;
= 15 + 30 = 45 m ; [2]

[Total: 12]

9 **(a)** magnesium sulfate + hydrogen ; [1]

(b) 1 reaction is fast at first/reaction is slowing down/reaction eventually stops ;
2 acid (concentration) is decreasing/reactants are being used up/magnesium surface area is decreasing ;
3 reactions occur when particles collide/ref. to successful collisions ;
4 frequency of collisions between particles is decreasing ; [3 max]

(c) *metal diagram shows*
regular lattice ;
all atoms same diameter ;

alloy diagram shows
atoms of different diameters ;
reference to the disrupted lattice in alloy resisting movement of atoms ; [4]

(d) **W** is a positive ion/positively charged ;
because it contains more protons than electrons ;
X is a negative ion/negatively charged ;
because it has more electrons than protons ;
opposite charges attract ; [max 3]

[Total: 11]

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2 **(a)** **(i)** idea blood <u>pulses</u> through them/pressure <u>changes</u> ;
allows, stretch/recoil/expansion ;
prevents bursting ; [2 max]

(ii) would slow down blood movement ;
blood at high pressure ;
(so) no tendency to flow backwards ; [2 max]

(b) **(i)** correct ref. to respiration ;
(to provide energy) for muscle contraction ;
to supply oxygen to other muscles ;
by moving blood around the body faster ; [3 max]

(ii) (muscles) had been respiring anaerobically ;
extra oxygen needed to break down lactic acid ; [2]

(c) sprinters respire anaerobically/long distance runners respire aerobically ;

sprinters: so does not matter that less oxygen available ;
thin air provides less friction/air resistance ;

long distance runners short of oxygen ; [2 max]

(d) to make haemoglobin which transports oxygen ; [1]

[Total: 12]

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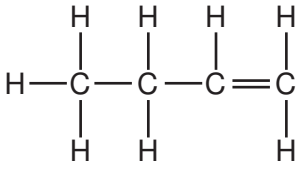

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diffuses/moves, downwards ;
collects on the shady side ;
makes shady side grow faster ; [max 3]

[Total: 9]

8 **(a)** **(i)** constant/steady/uniform/0.4 ms^{-2} ;
acceleration ;

(ii) ½ x 30 x 12 ;
= 180 m ; [2]

(b) (KE =) ½ mv^2 ;
= ½ x 60 x 10 x 10 = 3000 J ; [2]

(c) **(i)** (acceleration/deceleration = change in) speed/time = 12/10 ;
= 1.2 m/s^2 ; [2]

(ii) (force =) mass x acceleration ;
= 60 x 1.2 = 72 N ; [2]

(d) on graph – initial acceleration steeper/steady speed higher ;
greater acceleration/greater top speed by 38 s ;
[explanation must match what is shown on graph] [2]

[Total: 12]

9 **(a)** glowing splint relights ; [1]

(b) **(i)** 2.5 ; [1]

(ii) 1 the lower the concentration of H_2O_2 solution the lower the rate/v.v. ;
2 reference to (direct) proportionality/use of data to illustrate this ;
3 reaction occurs when molecules collide/ref. to successful collisions ;
4 ref. to collisions with catalyst ;
5 the higher the concentration the higher the frequency of collision ; [4 max]

(iii) use known mass of MnO_2;
after experiment separate MnO_2 ;
show mass not changed ;
re-use MnO_2 in identical experiment and show same results/
show reaction slower without MnO_2 ; [max 2]

(c) **(i)** **P S** ;
same protons ; [2]

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

[Total: 11]