UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the NOVEMBER 2004 question paper

0652 PHYSICAL SCIENCE

0652/03 Paper 3 (Extended), maximum raw mark 80

This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which Examiners were initially instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began. Any substantial changes to the mark scheme that arose from these discussions will be recorded in the published *Report on the Examination*.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the *Report on the Examination*.

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

CIE is publishing the mark schemes for the November 2004 question papers for most IGCSE and GCE Advanced Level syllabuses.

Grade thresholds taken for Syllabus 0652 (Physical Science) in the November 2004 examination.

	maximum mark available	minimum mark required for grade:			
		A	C	E	F
Component 3	80	43	31	19	14

The threshold (minimum mark) for B is set halfway between those for Grades A and C.
The threshold (minimum mark) for D is set halfway between those for Grades C and E.
The threshold (minimum mark) for G is set as many marks below the F threshold as the E threshold is above it.
Grade A* does not exist at the level of an individual component.

November 2004

INTERNATIONAL GCSE

MARK SCHEME

MAXIMUM MARK: 80

SYLLABUS/COMPONENT: 0652/03

PHYSICAL SCIENCE
Paper 3 (Extended)

UNIVERSITY of CAMBRIDGE
International Examinations

Question1

(a)	**(i)**	ratio 4.8/32 seen or else molar mass of **X** = 32 g		**1**	
		0.15 (no unit penalty)		**1**	
	(ii)	0.15		**1**	
	(iii)	0.15		**1**	
	(iv)	relative molecular mass = 82		**1**	
		mass formed = 12.3 g (unit penalty)		**1**	
(b)		$Na_2XO_3 + 2H_2O$	both formulae correct	**1**	
			balanced	**1**	
(c)		X is sulphur (or S) because it has a relative atomic mass of 32		**1**	**[9]**

Question 2

case A		zero		**1**	
		zero		**1**	
case B		3.3 J		**1**	
		4.7 W		**1**	
case C		1.5 J		**1**	
		2.1(4) W		**1**	
		equations W = F s and P = W/t score two when seen anywhere		**2**	**[8]**

Question 3

(a)	**(i)**	Na	**1**	
	(ii)	Si	**1**	
	(iii)	Si	**1**	
	(iv)	S	**1**	
	(v)	Cl	**1**	
(b)		weak (attractive) forces	**1**	
		little energy needed to separate particles	**1**	
(c)		sodium has 1 electron in outer shell, aluminium has 3	**1**	
		attraction between electron and nucleus is weaker for sodium	**1**	
	Or	single electron lost more easily		
	Or	comment about extra protons in nucleus of Al meaning stronger force		**[9]**

Question 4

(a)	diagram showing vibrating molecules	**1**	
	mention of vibration	**1**	
	mention of molecular collisions	**1**	
	mention of kinetic/potential/vibrational energy passed from molecule to molecule	**1**	
	mention of conduction	**1**	
		Max 4	
(b)	strip loses heat	**1**	
	to surroundings	**1**	
	when heat received = heat given out thermal equilibrium established	**1**	
(c)	temperatures would be lower/strip cooler	**1**	
	more heat given out (per unit time)	**1**	
	black better radiator of energy (thermal radiation/i.r.)	**1**	**[10]**

Question 5

(a)	**(i)**	carbon – two shells with 2.4 pattern	**1**	
		oxygen – two shells with 2.6 pattern	**1**	
	(ii)	two double bonds between carbon and oxygen	**1**	
		8 electrons around each symbol	**1**	
	(iii)	double bonds need more energy to break than single bonds	**1**	
		bonds must be broken to start the reaction	**1**	
		carbon dioxide contains only double bonds	**1**	
		each atom has noble gas configuration	**1**	
			Max 2	
(b)		CO_2 – simple covalent with weak forces	**1**	
		MgO – ionic lattice with strong forces between ions	**1**	
		[compensation CO_2 covalent and MgO ionic]		
		reject *ionic bond is stronger than covalent bond*		**[8]**

Question 6

(a)	diffraction	**1**	
(b)	correct wavelength marked at any point	**1**	
(c)	wavelength measured and correctly scaled (0.2 m)	**1**	
	c = fλ or substituted values including candidate's value for λ	**1**	
	correct speed with candidate's value in appropriate units (0.6 m/s) (unit penalty)	**1**	
(d)	evidence of use of barrier (either plane or curved)	**1**	
	incident and reflected waves seen	**1**	
	correct reflection for barrier given (constant λ)	**1**	
	evidence of means of changing depth	**1**	
	incident and refracted waves shown	**1**	
	correct refraction with reduced λ over shallowest water	**1**	**[11]**

Question 7

(a)	**(i)**	reaction between nitrogen and oxygen	**1**	
		at high temperature	**1**	
	(ii)	incomplete combustion (of hydrocarbon fuel)	**1**	
(b)		sulphur dioxide or trioxide, "lead", lead compounds not sulphur or CO_2	**1**	
(c)		acid rain	**1**	
		reacts with buildings/limestone (not *corrode*)	**1**	
(d)		$2NO + 2CO \longrightarrow N_2 + 2CO_2$		
		all formulae correct	**1**	
		correct formulae correctly balanced	**1**	**[8]**

Question 8

(a)	**(i)**	step down	**1**	
	(ii)	$N_s/N_p = V_s/V_p$	**1**	
		6/220 or 0.027 (**or** 220/6, if clearly $N_p:N_s$)	**1**	
(b)	**(i)**	P = IV or substituted values	**1**	
		0.3	**1**	
		A	**1**	
	(ii)	R=V/I or substituted values	**1**	
		20 Ω [or ecf = 6/**6(b)(i)**]	**1**	
	(iii)	lamp has lower resistance	**1**	
		cold	**1**	
		as its temperature rises resistance increases or explanation in terms of electron collisions	**1**	**[11]**

Question 9

(a)	**(i)**	hydrochloric acid or any soluble chloride	**1**	
	(ii)	no more precipitate (formed on addition)	**1**	
	(iii)	filter	**1**	
		wash residue (not filtrate) with water	**1**	
(b)		filter funnel and filter paper seen	**1**	
		reasonable diagram with correct labels	**1**	**[6]**