UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

International General Certificate of Secondary Education

MARK SCHEME for the October/November 2006 question paper

0652 PHYSICAL SCIENCE

0652/03 Paper 3 (Extended Theory), 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 instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began.

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.

The grade thresholds for various grades are published in the report on the examination for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses.

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

CIE is publishing the mark schemes for the October/November 2006 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

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International Examinations

General Rules.

Apply unit penalty only once per question.

+ marks can only be scored if the previous mark has been scored.

In calculations, if the working/equation has not been asked for, and the answer is correct, then **all** the marks for that section must be scored.

Words in brackets preferable but not obligatory

1	**(a)**		one arrow upwards,	**1**	
			one arrow downwards	**1**	
			2.5N	**1**	
			2.5N or same as previous one	**1**	**4**
	(b)		through the origin and linear to start with	**1**	
			curves upwards	**1**	
			limit of proportion clearly marked at beginning of curve	**1**	**3**
	(c)	**(i)**	mgh implied or seen	**1**	
			0.2 J	**1**	
		(ii)	½ mv^2 implied or seen	**1**	
			equated to candidate's answer in (i)	**1**	
			1.3 m/s	**1**	**5**
					Total 12
2	**(a)**	**(i)**	haematite	**1**	
		(ii)	carbon burns/reacts with oxygen (producing carbon dioxide)	**1**	
			carbon dioxide is reduced by / reacts with more carbon making carbon monoxide	**1**	
		(iii)	$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$		
			all formulae correct,	**1**	
			equation balanced	**+1**	**5**
	(b)		mass of iron(III) oxide in ore = 1 x 80/100 = 0.8 tonne	**1**	
			Fe_2O_3 = 112 + 48 = 160	**1**	
			mass of iron = 0.8 x112/160	**1**	
			= 0.56	**1**	**4**
					Total 9
3	**(a)**	**(i)**	reflection	**1**	
		(ii)	0.5 ± 0.1 (cm)	**1**	
			2.5 cm ± 0.5 from candidate's figure	**1**	
		(iii)	$v = f\lambda$ seen or implied	**1**	
			5.0 cm (ecf)	**1**	**5**
	(b)	**(i)**	diffraction	**1**	
		(ii)	amount of diffraction/spreading/curvature depends on slit width	**1**	
			larger slit less diffraction etc. (or vv)	**1**	**3**
					Total 8

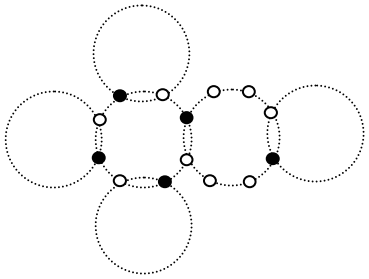
4	**(a)**	**(i)**	copper	**1**		
		(ii)	$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$			
			(all formulae correct,	**1**		
			equation balanced	**+1**		**3**
	(b)		magnesium, aluminium, iron, copper	**3**		**3**
			(1 mark each for: A*l* after Mg; Fe after A*l*; Cu after iron)			
	(c)	**(i)**	A*l* is covered with a layer of aluminium oxide	**1**		
			which protects the metal from contact with oxygen/water/air	**1**		
		(ii)	coat with zinc/galvanise OR mix with chromium	**1**		
			to stop air/water reaching it/ to form stainless steel	**1**		**4**
			sacrificial layer			
						Total 10
5	**(a)**	**(i)**	electromagnetic induction	**1**		
		(ii)	stronger magnets (not bigger)	**1**		
			faster rotation	**1**		
			more turns in the coil	**1**		
		(iii)	change of flux (linkage) induces current			
			each side cuts field upwards then downwards			
			thus current induced in opposite directions ANY 2	**1 + 1**		**6**
	(b)	**(i)**	diode or l.e.d shown	**1**		
			complete circuit with output terminals shown/load resistor included	**+1**		
		(ii)	opposite directions	**1**		**3**
						Total 9
6	**(a)**	**(i)**	diamond has a higher melting point			
			diamond is harder			
			diamond does not conduct electricity, graphite does ANY 2	**1 + 1**		
		(ii)	<u>melting point & hardness</u> <u>conduction</u>			
			diamond strong covalent bonds diamond all electrons tightly bound	**1**		
			graphite weak (van der Waals) graphite has mobile/free electrons			
			forces between layers	**1**		**4**
	(b)	**(i)**	sea of electrons between particles/atoms/ions	**1**		
			which move to produce the electric current	**1**		
		(ii)	particles/atoms/ions are in sheets/layers	**1**		
			that can slide over each other	**1**		**4**
	(c)	**(i)**	alloy is less malleable	**1**		**1**
		(ii)	new atoms are different size to original/layers/arrangement of atoms			
			disrupted	**1**		
			layers in alloy do not slide across each other as easily	**1**		**2**
						Total 11

7	**(a)**	**(i)**	evaporation at all temperatures – boiling at specific temperature	**1**	
			evaporation at surface – boiling in body of liquid	**1**	
			boiling the molecules have more energy than evaporation/higher energy molecules escape	**1**	**3**
	(b)		liquid molecules much closer together or vv	**1**	
			intermolecular forces therefore much greater in liquids or vv	**1**	**2**
	(c)		warms the room	**1**	**1**
	(d)	**(i)**	P = VI seen or implied	**1**	
			I = 0.5 (A)	**1**	
		(ii)	R = V/I seen or implied	**1**	
			440 (Ω)	**1**	
			Both units correct	**1**	**5**

Total 11

8	**(a)**	**(i)**	a family of compounds with similar properties/characteristics/reactions	**1**	
			due to the presence of the same functional group/general molecular formula/of form $C_nH_{(2n+1)}OH$	**1**	**2**
	(b)	**(i)**	ethene is reacted with steam	**1**	
			at high pressure/using a catalyst	**+1**	
		(ii)	$C_2H_4 + H_2O \rightarrow C_2H_5OH$	**1**	
		(iii)	fermentation/accept good description	**1**	
		(iv)	solvent/fuel	**1**	**5**

(c)



four covalent bond pairs of electrons shown on the carbon atom	**1**	
two covalent bond pairs of electrons shown on the oxygen atom	**1**	
four extra electrons shown on oxygen atom	**1**	**3**

(electrons do not need to be distinguished in any way)

Total 10