MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

0620 CHEMISTRY

0620/21

Paper 2 (Core Theory), maximum raw mark 80

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.

• Cambridge will not enter into discussions or correspondence in connection with these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2012 question papers for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level syllabuses and some Ordinary Level syllabuses.

	Page 2		1	Mark Scheme: Teachers' version	Syllabus	Paper		
				IGCSE – May/June 2012	0620	21		
1	(a)		herm beake	ometer; :r;		[1] [1]		
	(b)	to m (stea the		that heat is evenly distributed e.g. hake sure that temperature (of water) is the same aric) acid at steady rate / the heart gets to test tube water is at an even temperature (throughout) / so n parts of the water mix with cold;	at a constant rate	e / to make sure		
				/drous / white copper sulfate; s blue;		[1] [1]		
			turns allow	/drous / blue cobalt chloride; s pink / turns red; w: second mark if copper sulfate or cobalt chloride nhydrous	given without ref	erence to colour		
	(c)	(i)	48(°	C);		[1]		
		(ii)	72(°	C);		[1]		
	(d)	arra	angen	nent: close together / touching / irregular / random;		[1]		
		allo	w: irı	sliding over each other / moving slowly; regular / random love faster than solid but slower than gas		[1]		
	(e)	(i)	the r	melting point is different / 3rd box down ticked;		[1]		
		(ii)	food cool allo	suitable: e.g. / medicines / drugs / named food / medicine / cosr king / water for washing; w: relevant places or processes where purity o king / eating / cooking / surgeries / hospitals / kitche	of substances is	[1]		
		[Total: 1						
2	(a)	(i)	B; allov	w: sulfur / S ₈ / S		[1]		
		(ii)	allo	bstance containing only one type of atom; w: a substance with the same type of atoms / a ns / a substance that cannot be broken down (by ch		[1] aining the same		
	(b)	64				[1]		
	(c)	Na ₂	S			[1]		

	Page 3			Mark Scheme: Teachers' version	Syllabus	Paper	
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	(d) D; <u>ions</u> car		can	move / ions are free;		[1] [1]	
		note	e: se	cond mark dependent on first mark being correct			
	(e)	oxida	ation			[1]	
						[Total: 7]	
3	(a)	рН 3	3;			[1]	
	(b)	dip (pape	•	is) paper in the solution / acid or add litmus solutic	on to the acid / a	dd acid to litmus [1]	
			note: if another substance added e.g. add a metal or a further process e.g. boil the solution, the first mark is lost but the next two marks can still be obtained.				
		<u>blue</u>	litm	JS;		[1]	
				/ pink;		[1]	
		reje	ct: lit	mus bleaches			
		note	e: if t	he indicator is incorrect, the second two marks can	not be obtained.		
	(c)	• •		um carbonate + hydrochloric acid \rightarrow calcium chloric c: –1 per error	de + carbon dioxi	de + water [3]	
	(ii)			action of iron / making cement / making lime / neutra gas) desulfurisation / making glass / neutralising	0		
		. ,	allov	um oxide; v: calcium hydroxide / lime / milk of lime / other carl v: correct formulae	bonates	[1]	
	(d)	H ₂ (c corre		ght); alance (i.e. 2 on left);		[1] [1]	
	(e)	• •		ecular formula of ethanoic acid is C ₂ H ₄ O ₂ ; tructural formula of ethanol is:		[1] [1]	
				н н н—с—с—о—н н н			
			allov	w: OH in place of O- H			
				4 + H ₂ O;		[1]	
		. ,		· _ /		r.1	

[Total: 14]

	Page 4		Mark Scheme: Teachers' version	Syllabus	Paper
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4	lubi refi allo	ricatin nery (ow: re	→ surfacing roads; ng fraction → waxes and polishes; gases → heating; making chemicals efinery gas → making chemicals → making chemicals;		[1] [1] [1]
	(b) sub	ostanc	e containing hydrogen and carbon <u>only</u> ;		[1]
	(c) (i)		H — H H — C — H H		[1]
	(ii)	CO ₂	(on right);		[1]
		corre	ect balance (i.e. 2 on left)		[1]
		note	: balance mark dependent on CO ₂ on right		
	(iii)		two of: ly of similar (organic) compounds /		[2]
		with	similar <u>chemical</u> properties /		
		pres	ence of same functional group /		
		sam	e general formula /		
			w: compounds with a trend in physical properties w: difference of CH ₂ between one member and and	other	
	(iv)	etha	ne;		[1]
					[Total: 11]

	Page 5			Mark Scheme: Teachers' version	Syllabus	Paper		
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5	(a)	low	lower the test tube (into the HC l) / mix the reactants / mix the zinc and hydrochloric acid;					
	(b)	 (i) all points plotted correctly including the 0-0 point; note: -1 per error 						
			curv	e of best fit drawn;		[1]		
		(ii)	beca	ause the reaction has finished / reaction has stopped	d / reaction is con	nplete; [1]		
		the hydrochloric acid has been used up / hydrochloric acid is limiting / the lim reagent has been used up; reject: the zinc has been used up / the zinc and hydrochloric acid have been used u						
	(c)	concentration; increases; decreases; speed; (1 mark each)						
	(d)	filter (off excess zinc) / decant (off solution); note: if no filtration or decantation no further marks can be scored						
		heat filtrate to crystallisation point / evaporate some of the water / heat for a little while filtrate in a warm place / leave on the windowsill;				ttle while / leave [1]		
		dry crystals with filter paper; allow: dry in oven below 100°C				[1]		
		[Total: 1						
6	(a)	 (i) lithium + water → lithium hydroxide + hydrogen note: -1 per error 		[2]				
		• •		+ $2H_2O \rightarrow 2NaOH + H_2$ w : equations doubling or halving all species		[1]		

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- (b) 2 marks for order of reactivity:
 - order of reactivity is potassium > sodium > lithium / implication of rate of bubble formation or some other observation clearly shows the order is potassium > sodium > lithium;

note: reactivity increases down group / only two of the elements are named but they are in correct order of reactivity e.g. potassium is more reactive than sodium = 1 mark

[3]

[1]

[1]

3 marks for observations:

any 3 of:

- float on surface (with any of the 3 elements)
- bubbles given off / effervescence (with any of the 3 elements)
- fizzes / sound heard (with any of the 3 elements)
- Na / K go into a ball OR Na / K melt **ignore:** Li goes into ball or melts

allow: they go into a ball

- move across the surface of the water) (with any of the 3 elements)
- K (bursts into) flame
- lilac / violet flame for K

allow: Na (bursts into) flame / yellow flame

- Na / K spits / explodes (when gets very small) allow: pops or sparks (for Na or K)
- Li / Na / K disappears / gets smaller

(c) (i)	anode: E; electrolyte: A;	[1] [1]
(ii)	+ electrode: chlorine / Cl ₂ ; – electrode: sodium / Na; reject: ions / chloride	[1] [1]
(iii)	graphite;	[1]
(d) ar • •	y two of: shiny (when cut) conduct heat conduct electricity malleable / soft / easy to cut ductile	[2]
		[Total: 15]
(a) (i)	sulfur + oxygen \rightarrow sulfur <u>di</u> oxide (sulfur + oxygen \rightarrow sulfur oxide / sulfur trioxide) = 1 mark	[2]
(ii)	SO_2 oxidised to SO_3 / 1st box ticked;	[1]

- O_3 reduced to O_2 / 3rd box ticked;
- **(iii)** H₂O;

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Page 7	Mark Scheme: Teachers' version	Syllabus	Paper				
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(b) any 3 of;			[3]				
· ·	uric acid) reacts (with calcium carbonate)						
	ralisation (reaction)						
•	released / CO ₂ released						
	ble substances formed (on reaction)						
 build 	lings eroded / (surface) crumbled / damaged / pit	ted /					
	correct word or symbol equation = 2 marks utralisation reaction = 2 marks						
damage	harms) organisms in lakes / forest death / defo s plants / irritation of throat or lungs / reference to	asthma;	s / kills plants / [1]				
	allow: kills (or harms) animals or fish in lakes or rivers / kills corals. allow: leaches soil minerals						
allow: le							
	kills animals / fish in the sea / kills fish unqualified						
•	acidifies soil / acidifies lakes						
-	waars away / aradas carbonata rocks / aradas sa	il					

ignore: wears away / erodes carbonate rocks / erodes soil

ignore: destroys plants / animals

[Total: 9]