

**MARK SCHEME for the May/June 2009 question paper  
for the guidance of teachers**

**0608 21<sup>ST</sup> CENTURY SCIENCE**

**0608/05**

Paper 5 (Comprehension and Practical),  
maximum raw mark 60

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Page 2	Mark Scheme: Teachers' version	Syllabus
	IGCSE – May/June 2009	0608

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### Key to abbreviations

ecf error carried forward

Question	Expected Answers	Mks	Additional Guidance
<b>Section A</b>			
1	(a)		a substance can be broken down by the activities of living organisms/bacteria
	(b)	(i)	raw material ethene is from crude oil; crude oil is non-renewable/will run out; these bags are not easy to recycle
		(ii)	raw material for poly(hydroxybutyrate) comes from plants; more plants can be grown; raw material for poly(propene) comes from crude oil
		(iii)	for: they will decompose (quickly); (most) decomposition products are non-polluting; they will not cause litter / will not fill landfill sites / will not harm animals; against: they may not decompose quickly enough / they may decompose slowly in landfill; they may produce some harmful breakdown products; their use may lead to shortage of/increase price of food crops; they are not easy to recycle
	(c)		they may have an interest that results in bias / they may be employed by polymer manufacturers; they may use the same data in a different way; they may have fixed ideas that they are reluctant to change
	(d)	(i)	$n \begin{array}{c} \text{H} \quad \text{CH}_3 \\   \quad   \\ \text{C}=\text{C} \\   \quad   \\ \text{H} \quad \text{H} \end{array} \longrightarrow \left[ \begin{array}{c} \text{H} \quad \text{CH}_3 \\   \quad   \\ -\text{C}-\text{C}- \\   \quad   \\ \text{H} \quad \text{H} \end{array} \right]_n$ <p>one mark deducted for each error</p>
			allow three or more monomers joined allow full structural formulae

	(ii)	$\begin{array}{c} \text{CH}_3 \quad \text{O} \\   \quad \quad    \\ \text{HO}-\text{HC}-\text{CH}_2\text{C}-\text{OH} \end{array}$ <p>one mark deducted for each error</p>	2	allow full structural formula
	(iii)	energy used to make polymer; environmental impact of making polymer; environmental impact of disposal	2	Any two allow detailed descriptions
(e)	(i)	polymers have long chains; chains are held together by strong forces; strong forces need a lot of energy to break them;	3	
	(ii)	change/increase/decrease chain length; cross-link/change/increase/decrease cross-linking; add/increase/decrease plasticizer; change/increase/decrease crystallinity	2	Any two
f	(i)	so that the force measured was not affected by the size of the plastic sample; so that the only variable was the type of plastic	2	
	(ii)	83 to 87	1	
	(iii)	5	1	accept 135
	(iv)	450/5; = 90	2	allow one mark for 97.5
	(v)	the mean for poly(ethene) does not lie within the range for the new plastic / the mean for the new plastic does not lie within the range for poly(ethene)	1	do not allow: the ranges do not overlap
		<b>Total</b>	<b>30</b>	

Section B					
2	(a)		use tongs to handle sources; ensure sources are replaced in box when not in use; do not point at anyone; hold well away from any person	2	Any two
	(b)		perform with no absorber and then repeat with different absorbers in position; record count in a certain time / measure background / repeat measurements for each material	2	If ratemeter rather than scaler-timer is used, candidate should record range of readings and estimate average (take median)
	(c)	(i)	virtually all absorbed by paper; this was alpha radiation; small 'residue' due to contaminated source/background count	2	Any two
		(ii)	small amount absorbed by paper, and most by aluminium; this was beta radiation; small 'residue' due to contaminated source/background count if not credited in (ii)	2	Any two
	(d)		radioactive sources get weaker with time/nuclei get 'used up' as they change; has halved twice, so half-life is 5 years.	2	
			<b>Total</b>	<b>10</b>	
3	(a)		further it travels means slower reaction time	1	
	(b)		position of ruler at start; distance from fingers to ruler; size / mass / shape of ruler; lighting in room	2	accept any reasonable suggestion
	(c)	(i)	11.9; 11.2;	2	
		(ii)	gives a more reliable estimate / rules out outliers/anomalies / one measurement could be a mistake;	1	reject answers based on accuracy
	(d)		difficult to have clear start point; ruler may not fall straight; person may not be ready when ruler dropped; fingers move on ruler so difficult to read measurement; ruler scale is not easy to read	2	Any two  accept any reasonable suggestion

	(e)	(i)	there is reaction time involved in starting and stopping the clock	1	
		(ii)	light gate / computer / video	1	
			<b>Total</b>	<b>10</b>	
4	(a)		ruler / clamp / stand	1	
	(b)	(i)	4.8	1	
		(ii)	it is an outlier / it is far different from the others; using this result will give an unreliable estimate of the stretch	1 1	
	(c)	(i)	all plots within +/- 1/2 small square = 2 one incorrect plot = 1	2	≥ 2 errors = 0 ecf for their values
		(ii)	smooth straight (ruled) line within +/- 1/2 small square of all points	1	
	(d)	(i)	read from candidate's graph, expect 3.2	1	allow ecf for poor graph in (c)
		(ii)	read from candidate's graph, expect 1.5	1	
	(e)		as amount/% of additive rises amount that polymer stretches rises / positive correlation between amount/% of additive and stretch of polymer	1	
			<b>Total</b>	<b>10</b>	