

# **Mark Scheme for June 2010**

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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 should be read in conjunction with the published question papers and the Report on the Examination.

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Question			Expected Answers	Marks	Additional Guidance
1	a	i	S waves are shear AND P waves are push-pull AW S-waves are transverse AND P waves are longitudinal	2	
		ii	Outer core is liquid Molecules need to be touching / bonded together for shear waves to be propagated OWTTE	2	
	b	i	X: refraction	1	
		ii	Y: reflection	1	
	c		Lower mantle has lower density Wave is bent towards normal AW is travelling slower in outer core	2	
	d	i	Converts km to m Correct calculation ( $=3780000 / 9000 = 420 = 7$ minutes)	1 1	
		ii	May take a less curved route Density may be higher (so speed is greater)	1	
	e	i	Have high densities and sink to centre	1	
		ii	Pressure is very high	1	
			<b>Total</b>	<b>13</b>	

Question			Expected Answers	Marks	Additional Guidance
2	a	i	$\delta^-$ on N, $\delta^+$ on one H polarity of all three bonds shown (ecf)	2	
		ii	(yes) two ends of molecule Have different charges AW presence of lone pairs Increases negative charge on N	2	
		iii	Shows $\delta^+$ and $\delta^-$ atoms attracting (e.g. by use of dotted line 180° bond angle 2 <sup>nd</sup> ammonia molecule drawn accurately	3	
		iv	<b>H-bonds are relatively strong forces / increase force of attraction</b> <b>More energy needed to break bonds between molecules</b>	2	
		v	Dipole-dipole type (AW gives specificn example e.g. permanent dipole-permanent dipole) AW Van der Waals forces	1	
	b	i	(Ammonia is best) High shc means a lot of energy is required to make bonds vibrate This energy is released when liquid cools	1	
		ii	Energy transferred from equator to poles by ocean currents These (polar) areas have milder / warmer climates AW water cools down slowly / warms up slowly Coastal areas have milder / more temperate climate / warmer winters	2	<b>e.g. Gulf Stream</b> <b>e.g. UK has warmer climate</b>  <b>NOT just warmer climates</b>
	c		Density of ice is less than that of liquid water So it floats on top of liquid water Explanation by open structure Diagram or description of arrangement of molecules in ice	4	
			<b>Total</b>	<b>17</b>	

Question			Expected Answers	Marks	Additional Guidance
3	a	i	At 80 + 260 days (i.e. where day length = 12)	1	
		ii	<b>At 0/360 and 180</b>	1	
		iii	Rapid change: autumn / spring AND Slow change: summer / winter	1	
		iv	Low latitude / close to equator	1	
		v	Inverse shape to Philadelphia All details accurate e.g. amplitude, position of maximum + minimum points	1 1	
	b	i	Pendulum / spring / water wave	1	<b>NOT tide heights</b>
		ii	Amplitude = 3.8 hours Period = 365 days	1 1	
			<b>Total</b>	<b>9</b>	

Question			Expected Answers	Marks	Additional Guidance
4	a	i	Wind direction Rotation of the earth	2	
		ii	Water is returning from Antarctic region	1	
	b	i	Ocean currents “reverse” Gives example e.g. cold Peru current disappears OR Warm water spreads E towards S.America	2	
		ii	Changes in weather / gives examples e.g. S.America is wetter Fish populations disappear from Peru current	1	
	c	i	Any label close to the coast of Antarctica	1	
		ii	Ice is forming Only pure water forms ice Salt is left behind Increases density of water Dense water sinks	4	
			<b>Total</b>	<b>11</b>	

Question			Expected Answers	Marks	Additional Guidance
5	a	i	Metal atoms / ions arranged regularly / in a lattice Delocalised electrons between atoms / ions Metal <u>ions</u> AND electrons labelled correctly	3	
		ii	Electrons are free to move When a p.d. is applied	2	
	b	i	Ions arranged alternating and regularly Shown as 3-d Labels Cu <sup>+</sup> and Cl <sup>-</sup>	3	
		ii	Ions are not free to move (when solid) When structure is melted ions are free to move	2	
			<b>Total</b>	<b>10</b>	

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