## **CHAPTER 8 PERIODICITY**

1 The following table gives the melting points of some elements in Period 3.

Element	Na	Al	Si	Р	S
Melting point / K	371	933	1680	317	392

(a)	State the type of structure shown by a crystal of silicon. Explain why the melting point of silicon is very high.	
		(3 marks
	(Extra space)	
(b)	State the type of structure shown by crystals of sulfur and phosphorus. Explain why the melting point of sulfur is higher than the melting point of pho	osphorus.
		(3 marks

(c)	Draw a diagram to show how the particles are arranged in aluminium and explain why aluminium is malleable.  (You should show a minimum of six aluminium particles arranged in two dimensions.)
	(3 marks)
(d)	Explain why the melting point of aluminium is higher than the melting point of sodium.
	(3 marks)
2	Trends in physical properties occur across all Periods in the Periodic Table.  This question is about trends in the Period 2 elements from lithium to nitrogen.
(a)	Identify, from the Period 2 elements lithium to nitrogen, the element that has the largest atomic radius.
	(1 mark)
(b) (i)	State the general trend in first ionisation energies for the Period 2 elements lithium to nitrogen.
	(1 mark)

(ii)	Identify the element explain your answer.		ates from	this gene	ral trend,	from lithiu	um to nitro	ogen, and
	Element							
	Explanation							
								(3 mark
	Identify the Period 2	element	that has th	ne followi	ng succes	ssive ionis	sation ene	ergies.
		First	Second	Third	Fourth	Fifth	Sixth	
	Ionisation energy /kJ mol <sup>-1</sup>	1090	2350	4610	6220	37 800	47 000	
	Draw a cross on the			he melting	g point of	nitrogen.		
		5000						
		4500						$\dashv$
		4000					<b>k</b>	-
		3500						
		3000						
	Melting point/K	2500			×			
		2000						_
		1500		×				_
		1000						
		500	×					
		0 L	ithium	Beryllium	n Boron	n Car	bon N	litrogen

(1 mark)

(e)	Explain, in terms of structu	re and bonding, why the melting point of carbon is high	gh.
		(3	marks)
3 (a)	question.	ctron configuration and ionisation energies to answer ws the <b>second</b> ionisation energies of some Period 3	this
	<b>↑</b>		
	Second ionisation	* ]. *	
	energy/kJ mol <sup>-1</sup>	*	
(:)	Duning an iVI on the discussion	Mg Al Si P S	
(i) (ii)	Write the full electron config		1 mark)
(iii)		the process that occurs when the <b>second</b> ionisation e	1 mark) energy
	of aluminium is measured.		
		(*	1 mark)
(iv)	Give <b>one</b> reason why the <b>s</b> ionisation energy of alumin	<b>econd</b> ionisation energy of silicon is lower than the <b>s</b> ium.	econd
			 1 mark)

The following table gives the successive ionisation energies of an element in the first second of the firs	First Second Third Fourth Fifth Sixt Ionisation energy 786 1580 3230 4360 16 100 19 80 dentify this element.  Explain why the ionisation energy of every element is endothermic.  Explain the Period 2 show periodic trends.  Identify the Period 2 element, from carbon to fluorine, that has the largest at dius. Explain your answer.	Reason						
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		dentify the Period 2 eleadius. Explain your an	ement, fr	om carbon	to fluorir			
		dentify the Period 2 eleadius. Explain your and Element	ement, fr	om carbon	to fluorir			

(b)	State the general trend in first ionisation energies from carbon to neon. Deduce the element that deviates from this trend and explain why this element deviates from the trend.
	Trend
	Element that deviates
	Explanation
	(4 marks)
(c)	Write an equation, including state symbols, for the reaction that occurs when the first ionisation energy of carbon is measured.
	(1 mark)
(d)	Explain why the second ionisation energy of carbon is higher than the first ionisation energy of carbon.
	(1 mark)
(e)	Deduce the element in Period 2, from lithium to neon, that has the highest second ionisation energy.
	(1 mark)