

The periodic table

Mark scheme

1.	(a)	(i)	Y or 2,8,8 or Argon or Ar <i>All correct gains 3 marks</i>	3	
		(ii)	W or 2,5 <i>3 correct gains 1 mark</i>		
		(iii)	X or 2,7 or fluorine or F <i>2 or 1 correct gains 1 mark</i>		
		(iv)	Z or 2,8,8,1 or potassium or K <i>N.B. number of ticks on script must equal number of marks</i>		
	(b)		1 and 2 (both needed) <i>do not credit if any other group listed</i> <i>'transition metals' neutral</i> <i>allow alkali metals and alkali earth metals</i>	1	
					[4]
2.	(a)	(i)	elements	1	
		(ii)	atomic weight	1	
		(iii)	atomic (proton) number	1	
	(b)	(i)	transition metals	1	
		(ii)	has a higher melting point is harder	1	
					[6]
3.	(a)		B	1	
	(b)		eg link between Li, Na, K, (Rb, Cs) or Mg, Ca, (Sr, Ba) or F, Cl, Br, I <i>allow any <b>two</b> elements in the same group (in both Newland's and the modern periodic table)</i>	1	
			linked appropriate comment about that link eg similar physical / chemical properties or similar specific reactions or same number of outer electrons <i>if no elements identified, allow 1 mark for a general comment about elements <b>in the same column</b> having similar properties</i> <i>"every eighth element has similar properties" = 1 mark</i>	1	
	(c)		any <b>two</b> from: <ul style="list-style-type: none"> <li>• no gaps for undiscovered elements or elements still being discovered</li> <li>• some boxes have 2 elements</li> <li>• metals and non-metals in same column / mixed up / some elements in the same column had different properties</li> <li>• pattern for first 16 or so elements only</li> <li>• any sensible suggestion about misplaced elements eg copper in group 1 metals</li> </ul>	2	

	(d) alkanes are not elements <b>or</b> alkanes are compounds <i>ignore molecule / molecular</i>	1	
			[6]
4.	(a) (i) undiscovered elements owtte	1	
	(ii) they would be in the wrong group / have the wrong / different properties / don't fit the pattern owtte <i>allow atomic weights may have been wrong</i>	1	
	(b) (i) any three from:	3	
	<ul style="list-style-type: none"> <li>• elements arranged in proton / atomic number order <i>ignore mass number / atomic weight / neutrons throughout</i></li> <li>• group: elements in the same group / column have same number of outer electrons owtte</li> <li>• group: number of shells increase down group</li> <li>• period: elements in the same period / row have the same number of shells / energy levels</li> <li>• period: number of protons / electrons increase across period</li> <li>• atomic number: link of atomic number to number of protons</li> <li>• atomic number gives number of electrons</li> </ul>		
	(ii) it would mean splitting a proton / electron <b>or</b> implication of splitting proton / electron	1	
	(c) must be a comparison		
	(outer) electron closer (to nucleus) <i>accept fewer (electron) shells / energy levels</i> <i>fluorine is the smaller/est</i>	1	
	stronger/est attraction (to nucleus) owtte <i>do <b>not</b> allow magnetic / intermolecular forces</i>	1	
	<b>or</b> less screening (by inner electrons) electron gained more easily <i>need some indication of <u>outer</u> electron shell somewhere in explanation otherwise max of 2 marks</i>	1	
			[9]
5.	chlorine atom smaller than bromine atom / has fewer shells / chlorine is higher in the group than bromine so it is more reactive	3	
	the outer electron / extra electron is more strongly attracted with chlorine than bromine / bromide (owtte) /more shielding with bromine / less shielding with chlorine		
	an extra electron is more easily gained by chlorine <b>or</b> chlorine can take an electron from bromide ion ( <i>not</i> bromine) <i>for 1 mark each</i>		
			[3]

6.	(a)	same number of electrons in outer shell/ 1 / an electron in outer shell / lose <u>one</u> electron <i>for 1 mark</i>	1	
	(b)	(i) C <i>for 1 mark</i>	1	
		(ii) E <i>for 1 mark</i>	1	
	(c)	(i) $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$ symbols must be correct correct multiples / fractions accepted Balancing mark is independent <i>formulae gains 1 mark</i> <i>balancing gains 1 mark</i>	2	
		(ii) Assume 'it' means potassium potassium more reactive / vigorous / faster reaction / violent (can be awarded in either section) potassium atom larger than sodium / higher outer energy level / outer shell further from nucleus / more shells (not just more electrons) electron in outer shell is less strongly attracted / greater shielding outer electron more easily lost <i>for 1 mark each</i>	4	
				[9]
7.	(a)	Mendeleev arranged known elements in order of mass or properties <i>reject explanation in terms of electrons and / or atomic number</i> gaps in Periodic Table / group 1	1 1	
	(b)	does not last long enough to experiment / very little of it <i>allow it has a short half-life</i>	1	
	(c)	(i) (much) more violent <i>accept more reactive</i>	1	
		(ii) since outer electron / or shell further from nucleus <i>do not credit lower down group larger / more shells neutral</i> therefore more easily lost <i>accept screening by inner electrons</i>	1 1	
				[6]