1. Atomic Structure

1.1 Particles in the atom and atomic radius

Paper 3

Marking Scheme

Q1.

Question	Answer	Marks
(a)	Mg^{2+} 24 12 10 Al^{3+} 27 13 10 4 correct = 2 marks 2 or 3 correct = 1 mark 0 or 1 correct = 0 marks	2
(b)	**M1** it / Al^{3+} is smaller (compared to Mg^{2+}) **M2** greater nuclear attraction for remaining electrons **M3** same shielding effect AND greater nuclear charge	3

Q2.

(b)(ii)	(across a period) • increase in nuclear charge • similar shielding • (so) increase in nuclear attraction for bonding / outer / valence electrons **OR** bonding / outer / valence electron(s) are more strongly attracted to nucleus Two correct for one mark, three correct for two marks	2

Q3.

(d)(i)	number of protons: 12 number of neutrons: 13	1
(d)(ii)	$1s^2 2s^2 2p^6 3s^2$	1

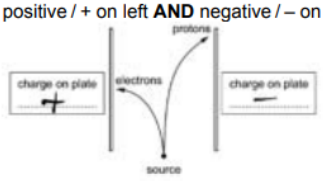
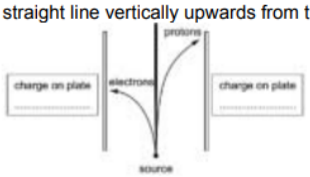
Q4.

Question	Answer	Marks
(a)(i)	columns 1 & 3 identical *isotope* / *No of p's* / *No of n's* / *No of e's* ^{69}Ga 31 38 31 ^{71}Ga 31 40 31	1
	• √ √	1

Q5.

(b)	NH_4^+	11 p^+ **AND** 10 e^-	1
	CO_3^{2-}	30 p^+ **AND** 32 e^-	1
	PO_4^{3-}	47 p^+ **AND** 50 e^-	1

Q6.

Question	Answer	Marks
(a)(i)	positive / + on left **AND** negative / – on right 	1
(a)(ii)	straight line vertically upwards from the source 	1

Q7.

(a)(v)	**M1** (anions have) same number of electrons (but increasing proton number) **M2** increasing proton number / nuclear charge AND increasing attraction of nucleus for (outer) electrons **OR** (outer) electrons attracted more (strongly) to the nucleus AND because of increasing proton number / nuclear charge	2

Q8.

(a)(i)	increasing attraction between nucleus and (outer) electrons	1
	increasing nuclear charge with similar shielding / (electrons in) same (outer) shell	1
(a)(ii)	(ions of Na to Si have) lost outer shell / outer electrons OR atoms have one more shell than (corresponding) ions OR effective nuclear charge is greater for the ion	1

(a)(iii)	(P to Cl form ions by) gaining electrons (to the same outer shell / p sub-shell)	1
	Increased repulsion between electrons in same / outer shell / p sub-shell	1