


1. Atomic Structure

1.3 Electrons, energy levels and atomic orbitals

Paper 3

Marking Scheme

Q1.

(a)(i)	$1s^2 2s^2 2p^6 3s^2 3p^6$	1
(a)(ii)		1
(a)(iii)	3 (three)	1

Q2.

(c)	full electronic configuration of Fe^{3+} $1s^2 2s^2 2p^6 3s^2 3p^6 3d^5$	1
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Q3.

(a)(i)	lowest energy state owtte examples <ul style="list-style-type: none"> • (with) lowest energy • (with) no external energy • (with) no added energy • (where) electrons are not promoted to a higher energy level • most energetically stable 	1							
(a)(ii)	[Ar] <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>↑</td><td>↑</td><td>↑</td><td></td><td></td><td></td> </tr> </table> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>↑↓</td> </tr> </table> <i>The 3 × d electrons may go in any of the d orbitals</i>	↑	↑	↑				↑↓	1
↑	↑	↑							
↑↓									
(a)(iii)	12	1							

Q4.

(b)	1 s	1
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Q5.

(a)(i)	total # 3p e ⁻	3	4	5	1
	total # unpaired e ⁻	3	2	1	1
(b)(i)	$1s^2 2s^2 2p^6 3s^2 3p^6$	1			

Q6.

(b)(i)	total e ⁻ in s subshell	6	6	6	1
	total e ⁻ in p subshell	8	9	10	

Q7.

(a)	Identify and draw the shape of highest energy orbital of Ca 4s AND 	1
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Q8.

(b)(ii)	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$	1
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Q9.

(c)	isotope	nucleon number	total number of electrons in lowest energy level	type of orbital contains the electron in the highest energy level	3
	⁷¹ Ga	M1 71	M2 2	M3 p (-orbital)	

Q10.

(a)(iii)	Li ⁺ is $1s^2$ H ⁻ is $1s^2$	1
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Q11.

(b)(i)	type of orbital	s	p	d	3
	number of orbitals	4	9	5	
(b)(ii)	4s <input type="checkbox"/> 3p <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 3s <input type="checkbox"/> <input type="checkbox"/> 2p <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> 2s <input type="checkbox"/> <input type="checkbox"/> 1s <input type="checkbox"/> <input type="checkbox"/>				2
(b)(iii)	5				1

Q12.

(c)		1
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Q13.

(a)(i)		1
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