

- 1 (a) (i) same number of protons and electrons [1]
- (ii) all have the same number of protons / same proton number / same atomic number [1]
- (iii) same number of protons / same proton number / same atomic number; [1]  
different number of neutrons / different nucleon number / different mass number; [1]
- (b) 2, 8, 5 [1]
- (ii) non-metal because it accepts electrons / needs 3e to complete outer energy level /  
because it is in Group V or 5e in outer shell [1]  
note: need both non-metal and reason for one mark

Question	Answer	Marks																
2(a)	<table border="1" data-bbox="750 294 1585 541"> <thead> <tr> <th>particle</th> <th>relative mass</th> <th>relative charge</th> </tr> </thead> <tbody> <tr> <td>proton</td> <td></td> <td>+</td> </tr> <tr> <td>neutron</td> <td></td> <td>nil</td> </tr> <tr> <td>electron</td> <td>1/1840</td> <td></td> </tr> </tbody> </table>	particle	relative mass	relative charge	proton		+	neutron		nil	electron	1/1840		3				
particle	relative mass	relative charge																
proton		+																
neutron		nil																
electron	1/1840																	
2(b)(i)	<p><b>M1</b> atom(s) of the same element;  <b>M2</b> with different number of neutrons;</p>	2 1 1																
2(b)(ii)	<p><b>M1</b> (both have) the same number of electrons;  <b>M2</b> in the outer shell;</p>	2 1 1																
2(c)	<table border="1" data-bbox="712 828 1621 1137"> <thead> <tr> <th>particle</th> <th>number of protons</th> <th>number of neutrons</th> <th>number of electrons</th> </tr> </thead> <tbody> <tr> <td><math>{}^7_3\text{Li}</math></td> <td></td> <td>4</td> <td>3</td> </tr> <tr> <td><math>{}^{34}_{16}\text{S}^{2-}</math></td> <td>16</td> <td>18</td> <td>18</td> </tr> <tr> <td><math>{}^{41}_{19}\text{K}^+</math></td> <td>19</td> <td>22</td> <td>18</td> </tr> </tbody> </table>	particle	number of protons	number of neutrons	number of electrons	${}^7_3\text{Li}$		4	3	${}^{34}_{16}\text{S}^{2-}$	16	18	18	${}^{41}_{19}\text{K}^+$	19	22	18	5
particle	number of protons	number of neutrons	number of electrons															
${}^7_3\text{Li}$		4	3															
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${}^{41}_{19}\text{K}^+$	19	22	18															

Question	Answer	Marks																				
3(a)(i)	<u>number of protons</u> in one atom of an element;	<b>1</b>																				
3(a)(ii)	<b>M1</b> <u>number of protons and neutrons</u> in one atom of an element; <b>M2</b> in one atom of an element;	<b>2</b> 1 1																				
3(b)	<table border="1" data-bbox="819 485 1485 749"> <tbody> <tr> <td data-bbox="819 485 936 545">A</td> <td data-bbox="936 485 1048 545">6</td> <td data-bbox="1048 485 1160 545">6</td> <td data-bbox="1160 485 1272 545">6</td> <td data-bbox="1272 485 1485 545"><math>^{12}_6\text{C}</math></td> </tr> <tr> <td data-bbox="819 545 936 606">B</td> <td data-bbox="936 545 1048 606">12</td> <td data-bbox="1048 545 1160 606">12</td> <td data-bbox="1160 545 1272 606">12</td> <td data-bbox="1272 545 1485 606"><math>^{24}_{12}\text{Mg}</math>;</td> </tr> <tr> <td data-bbox="819 606 936 666">C</td> <td data-bbox="936 606 1048 666">8</td> <td data-bbox="1048 606 1160 666">10;</td> <td data-bbox="1160 606 1272 666">8;</td> <td data-bbox="1272 606 1485 666"><math>^{16}_8\text{O}^{2-}</math></td> </tr> <tr> <td data-bbox="819 666 936 749">D</td> <td data-bbox="936 666 1048 749">11</td> <td data-bbox="1048 666 1160 749">10</td> <td data-bbox="1160 666 1272 749">13</td> <td data-bbox="1272 666 1485 749"><math>^{24}_{11}\text{Na}^+</math> 11, 24; Na;+;</td> </tr> </tbody> </table>	A	6	6	6	$^{12}_6\text{C}$	B	12	12	12	$^{24}_{12}\text{Mg}$ ;	C	8	10;	8;	$^{16}_8\text{O}^{2-}$	D	11	10	13	$^{24}_{11}\text{Na}^+$ 11, 24; Na;+;	<b>6</b>
A	6	6	6	$^{12}_6\text{C}$																		
B	12	12	12	$^{24}_{12}\text{Mg}$ ;																		
C	8	10;	8;	$^{16}_8\text{O}^{2-}$																		
D	11	10	13	$^{24}_{11}\text{Na}^+$ 11, 24; Na;+;																		

Question	Answer	Marks									
4(a)	B = 17; C = 18; D = 2,8; 2 / 2;	4									
4(b)	Substance that cannot be broken down into anything simpler/substance that cannot be broken down (by chemical means)/substance containing <b>atoms</b> with the same atomic number or proton number;	1									
4(c)	<table border="1" data-bbox="360 485 1196 671"> <thead> <tr> <th data-bbox="360 485 638 571">number of protons</th> <th data-bbox="638 485 918 571">number of neutrons</th> <th data-bbox="918 485 1196 571">number of electrons</th> </tr> </thead> <tbody> <tr> <td data-bbox="360 571 638 619">31</td> <td data-bbox="638 571 918 619"></td> <td data-bbox="918 571 1196 619"></td> </tr> <tr> <td data-bbox="360 619 638 671">31</td> <td data-bbox="638 619 918 671"></td> <td data-bbox="918 619 1196 671"></td> </tr> </tbody> </table> <p data-bbox="360 681 600 783"> <b>M1</b> column one;  <b>M2</b> column two;  <b>M3</b> column three; </p>	number of protons	number of neutrons	number of electrons	31			31			3
number of protons	number of neutrons	number of electrons									
31											
31											



Question	Answer	Marks
5a)(i)	<sup>+</sup> /sodium <b>and</b> O <sup>2</sup> /oxide;	1
5a)(ii)	<sup>2+</sup> /calcium;	1
5a)(iii)	/phosphorus;	1
5(a)(iv)	/silicon;	1
5(b)(i)	<ul style="list-style-type: none"> <li>• <i>number of protons</i> = 29;</li> <li>• <i>number of neutrons</i> = 35;</li> <li>• <i>number of electrons</i> = 27;</li> </ul> <p>three correct = [2]; two correct = [1]</p>	2
5(b)(iii)	<p><i>number of nucleons</i> = 45;</p> <p><i>number of charged particles</i> = 42;</p>	1 1
5(c)(i)	have same proton number / same element / same atomic number; different number of neutrons / nucleons / mass number;	1 1
5(c)(ii)	m            /Mg;	1
5(c)(iii)	any two from: <ul style="list-style-type: none"> <li>• treating cancer or radiotherapy;</li> <li>• biological tracer;</li> <li>• thickness (of paper or foil);</li> <li>• (checking for) leaks / cracks (in pipes);</li> <li>• (carbon) dating;</li> <li>• (generating) energy / electricity;</li> <li>• smoke detectors;</li> <li>• fill levels in packages;</li> <li>• sterilising surgical instruments;</li> </ul>	2

Question	Answer	Marks	Guidance
6	${}_{19}^{39}\text{K}$ ; 26p 26e 30n All three for 1 mark; ${}_{3}^{7}\text{Li}^{+}$ numbers and symbol; charge +; 31p 28e 39n All three for 2 marks, any two for 1 mark; ${}_{34}^{79}\text{Se}^{2-}$ numbers and symbol; charge 2 ;	<b>8</b>	

7 (a) Atoms of the same element / atoms with same proton number / atoms with same atomic number [1]

different neutron number / nucleon number / mass number [1]

(b)

particle	of protons	number of electrons	number of neutrons	nucleon number	symbol or formula
A					
B				23 (1)	Na(1) <sup>+</sup> (1)
C		10(1)			
D	13 (1)		15 (1)		

[7]

[Total:9]



8 (a) A, D, E (1)

same number of protons and electrons / electrically neutral (1) [2]

(b) C (1)

more electrons than protons /  $36e^-$  and  $34p^+$  / it has gained electrons (1) [2]

(c) B, F (1)

[1]

(d) they have same number of protons (1)

different number of neutrons / neutron number (1) [2]

[Total: 7]