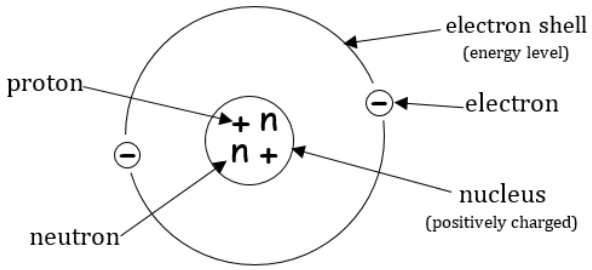
National 5 Chemistry
Unit 1.2a Periodic Table & Atomic Structure

JAB chem

		Lesson	Traffic Light		
			Red	Amber	Green
6 7	The elements of the Periodic Table are arranged in order of increasing atomic number: • Metal elements are on the left side and non-metals elements are found on the right side • Groups (columns) on the Periodic Table contain elements with same number of outer electrons, indicated by the group number on the Periodic Table		☹	😐	☺
8	Elements within the same group have the same valency and have similar chemical properties as they have the same number of electrons in their outer electron shell. Group Number: 1 2 3 4 5 6 7 0 Valency: 1 2 3 4 3 2 1 0		☹	😐	☺
9	The electron arrangement of the first 20 elements can be written. 1st Energy Level holds: 2 electrons; 2nd Energy Level holds: 8 electrons; 3rd Energy Level holds: 8 electrons; 4th Energy Level holds: 8 electrons Electrons Arrangements of the first 20 elements are found on page 6 of the data booklet		☹	😐	☺
10	Every element is made up of very small particles called atoms. • each atom has a nucleus contains protons and neutrons • electrons move around the outside of the nucleus. 		☹	😐	☺
11	**Particle** / **Location** / **Charge** / **Mass** Proton / Nucleus / +1 / 1 amu Neutron / Nucleus / Neutral / 1 amu Electron / Outside Nucleus / -1 / Approx zero		☹	😐	☺
12	The **atomic number** of an element is equal to the number of protons. Atoms are *neutral* because atoms have the same numbers of protons and electrons		☹	😐	☺
13	The **mass number** of an atom is equal to the number of protons plus neutrons		☹	😐	☺
14	Isotopes are atoms of the same element which have: ○ the *same* atomic number but a *different* mass numbers ○ the *same* number of protons but a *different* number of neutrons Most elements have more than one isotope and an element is a mixture of the different isotopes		☹	😐	☺
15a	mass number → 23, atomic number → 11, $^{23}_{11}Na$ ← symbol The number of protons, neutrons and electrons can be found from the atomic no. and mass no. Number of protons = atomic number = 11 Number of neutrons = mass number – atomic number = 23 – 11 = 12 Number of electrons = number of protons (for neutral atoms only) = 11		☹	😐	☺
15b	mass number → 18, atomic number → 8, O^{2-} ← charge, ← symbol The number of protons, neutrons and electrons can be found from the atomic no. and mass no. Number of protons = atomic number = 8 Number of neutrons = mass number – atomic number = 18 – 8 = 10 Number of electrons = number of protons – charge = 8 – (-2) = 10		☹	😐	☺
16	Relative atomic mass is the average atomic mass of all the isotopes of an element ○ RAM is rarely a whole number because it an average of different masses e.g. The RAM of Chlorine is 35.5 (The two chlorine isotopes are ^{35}Cl and ^{37}Cl) As RAM is closer to 35 than 37 there must be more ^{35}Cl atoms in sample than ^{37}Cl atoms		☹	😐	☺

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Past Paper Question Bank
Unit 1.2a Periodic Table & Atomic Structure

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Outcome	Original Specimen Paper	New Specimen Paper	Nat5 2014	Nat5 2015	Nat5 2016	Nat5 2017	Nat5 2018	Nat5 2019	Nat5 2020	Nat5 2021						
6 7								mc3								
8																
9					mc3											
10																
11	mc2	mc2			L1a(i) L1a(ii)		mc2									
12																
13																
14	L2a	L2a	L1b(ii)	mc2		L1a										
15a	L2b	L2b	L1b(i)	mc1	L5b	mc2 L1b	L6b									
15b	mc5	mc5		mc3				mc4								
16	L2c	L2c			L1b	L1c	L6a(i) L6a(ii)									
Marking Scheme	Back of Paper	Back of Paper	SQA Nat5 2014 Msch	SQA Nat5 2015 Msch	SQA Nat5 2016 Msch	SQA Nat5 2017 Msch	SQA Nat5 2018 Msch	SQA Nat5 2019 Msch								

<table>
<tr><th>Nat5</th><th>Answer</th><th>% Correct</th><th>Reasoning</th></tr>
<tr><td>2015
1</td><td>A</td><td>92</td><td>Atomic number = number of protons ∴ atomic number = 26
Mass number = number of protons + number of neutrons
∴ mass number = 26 + 30 = 56</td></tr>
<tr><td>2015
2</td><td>B</td><td>88</td><td>Isotope Definition: same number of protons / atomic number; different number of neutrons / mass number
☒A W and X have different numbers of protons ∴ W and X not isotopes
☑B W and Y have same number of protons but different numbers of neutrons
☒C X and Y have different numbers of protons ∴ X and Y not isotopes
☒D Y and Z have different numbers of protons ∴ Y and Z not isotopes</td></tr>
<tr><td>2015
3</td><td>D</td><td>67</td><td>☒A Cl^- ions have an electron arrangement of 2,8,8
☒B S^{2-} ions have an electron arrangement of 2,8,8
☒C Ar atoms have an electron arrangement of 2,8,8
☑D Na^+ ions have an electron arrangement of 2,8</td></tr>
<tr><td>2016
3</td><td>D</td><td>48</td><td>☒A electrons have negligible mass so removal of electron has no effect on mass no.
☒B no change to the number of protons so atomic number is unchanged
☒C no change to the number of protons so charge of nucleus is unchanged
☑D atom X (e.g. Na 2,8,1) becomes ion X^+ (e.g. Na^+ 2,8) loses an occupied energy level</td></tr>
<tr><td>2017
2</td><td>C</td><td>90</td><td>☒A if atomic number = 24 then number of protons = 24
☒B if atomic number = 45 then number of protons = 45
☑C atomic number = no of protons = 21 and mass no.= protons+neutrons = 21+24 = 45
☒D if atomic number = 24 then number of protons = 24</td></tr>
<tr><td>2018
2</td><td>B</td><td>-</td><td><table><tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr><tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr><tr><td>Neutron</td><td>in Nucleus</td><td>0</td><td>1 amu</td></tr><tr><td>Electron</td><td>outside nucleus</td><td>-1</td><td>Approx 0</td></tr></table></td></tr>
<tr><td>2019
3</td><td>C</td><td>-</td><td>☒A All elements in group 1 have 1 electron in its outer shell
☒B All elements in group 2 have 2 electrons in its outer shell
☑C All elements in group 7 have 7 electrons in its outer shell
☒D All elements in group 8 (apart from Helium) have 8 electrons in its outer shell</td></tr>
<tr><td>2019
4</td><td>D</td><td>-</td><td>☒A This ion has a negative charge as it has more electrons than protons
☒B This atom has no charge as it has equal numbers of protons and electrons
☒C This atom has no charge as it has equal numbers of protons and electrons
☑D This ion has a 2+ positive charge as it has 2 less electrons than protons</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

<table>
<tr><th>Nat5</th><th>Answer</th><th>Reasoning</th></tr>
<tr><td>2014
1b(i)</td><td>79
79
118</td><td>Number of protons = atomic number = 79
Number of electrons = atomic number – charge = 79 – 0 = 79
Number of neutrons = mass no – atomic no. = 197 - 79 = 118</td></tr>
<tr><td>2014
1b(ii)</td><td>Answer from:</td><td>Same atomic number number of protons but different mass number number of neutrons</td></tr>
<tr><td>2016
1a(i)</td><td>1 |
 | 0</td><td><table><tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr><tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr><tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr><tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr></table></td></tr>
<tr><td>2016
1a(ii)</td><td>Electron | | -1</td><td><table><tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr><tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr><tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr><tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr></table></td></tr>
<tr><td>2016
1b</td><td>14.5</td><td>Relative atomic mass is the average mass of the different isotopes of the same element in a sample. As there are equal quantities of ^{14}N and ^{15}N in the sample, the RAM is halfway between 14 and 15.</td></tr>
<tr><td>2016
5b</td><td>118</td><td>Mass number = 197 (from passage) Atomic number = 79 (from data booklet)
Number of neutrons = mass number – atomic number = 197 – 79 = 118 neutrons</td></tr>
<tr><td>2017
1a</td><td>Isotopes</td><td>Same atomic number number of protons but different mass number number of neutrons</td></tr>
<tr><td>2017
1b</td><td>Different number of neutrons in each</td><td><table><tr><th>Isotope</th><th>Protons</th><th>Neutrons</th><th>Electrons</th></tr><tr><td>$^{36}_{18}Ar$</td><td>18</td><td>36-18 = 18</td><td>18</td></tr><tr><td>$^{38}_{18}Ar$</td><td>18</td><td>38-18 = 20</td><td>18</td></tr><tr><td>$^{40}_{18}Ar$</td><td>18</td><td>40-18 = 22</td><td>18</td></tr></table></td></tr>
<tr><td>2017
1c</td><td>36</td><td>Relative atomic mass is the average mass of the different isotopes of the same element in a sample. As the average mass is 36.2 of isotopes with masses of 36, 38 and 40 the mass abundant isotope must be 36 as the average is closest to 36.</td></tr>
<tr><td>2018
6a(i)</td><td>2</td><td>The two lines on the graph represent the two different isotopes of boron with mass numbers of 10 and 11.</td></tr>
<tr><td>2018
6a(ii)</td><td>10.8</td><td>$\text{ram} = \frac{(10\times20)+(11\times80)}{100} = \frac{200+880}{100} = 10.8$</td></tr>
<tr><td>2018
6b</td><td>$^{14}_{6}C$</td><td>Atomic number = number of protons = 6
Mass number = no. of protons + no. of neutrons = 6+8 = 14</td></tr>
</table>

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Past Paper Question Bank
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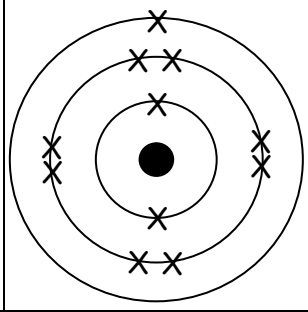
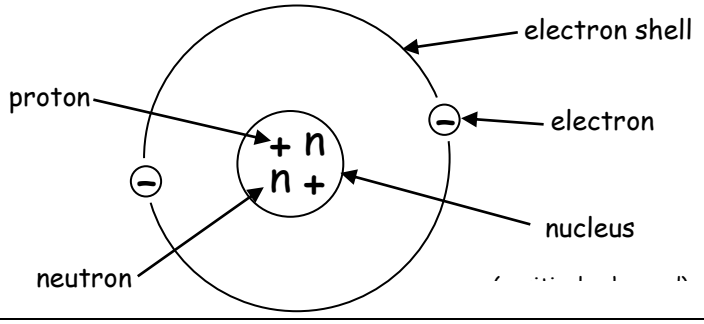
Outcome	Int2 2000	Int2 2001	Int2 2002	Int2 2003	Int2 2004	Int2 2005	Int2 2006	Int2 2007	Int2 2008	Int2 2009	Int2 2010	Int2 2011	Int2 2012	Int2 2013	Int2 2014	Int2 2015
6 7			mc1						mc3							mc1
8	L3a							mc1						L1a(ii)		mc2
9		mc2				mc4				L1b(i)			mc4			
10										L1b(ii)	L1a					
11								L1a				mc4		mc5 L4a		
12				mc3		mc5		L1b(i)	mc4		L1b(ii)					mc7
13							mc3				mc9 L1b(i)					
14	mc2	L1b		mc5			mc5	mc4	L1b(ii)	mc4			L1c(ii)		L2b(ii)	L1b
15a	mc1	L1a	mc3	mc24	mc5 L1a(i) L1a(ii)	L1b			L1b(i)	L1a		mc5	L1c(i)		L2b(i)	L1a
15b			mc6				mc7 L3c	L13a(i)	mc6		L9d		mc5	L11a		
16	L3b				L1b									L4b		
Marking Scheme	Not Published	Not Published	Not Published	SQA Int2 2003 MSch	SQA Int2 2004 MSch	SQA Int2 2005 MSch	SQA Int2 2006 MSch	SQA Int2 2007 MSch	SQA Int2 2008 MSch	SQA Int2 2009 MSch	SQA Int2 2010 MSch	SQA Int2 2011 MSch	SQA Int2 2012 MSch	SQA Int2 2013 MSch	SQA Int2 2014 MSch	SQA Int2 2015 MSch

Int2	Answer	% Correct	Reasoning
2000 1	A	67	No. of protons = atomic number = 23 No. of neutrons = mass number – atomic number = 51-23 = 28 No. of electrons = atomic number - charge = 23 – 0 = 23
2000 2	D	55	Isotopes: Same atomic number but different mass number; Same number of protons but different number of neutrons
2001 2	A	90	☑A Sodium is in group 1 and has an electron arrangement of 2,8,1 ☒B Phosphorus is in group 5 has an electron arrangement of 2,8,5 ☒C Chlorine is in group 7 has an electron arrangement of 2,8,7 ☒D Argon is in group 0 has an electron arrangement of 2,8,8
2002 1	A	87	Element: Aluminium, Hydrogen, Iodine, Magnesium Date of Discovery: 1825, 1766, 1811, 1808
2002 3	B	77	Number of neutrons = mass number – atomic number = 35-17 = 18
2002 6	D	67	☒A Chlorine atoms have 17 electrons ∴ Chloride Cl^- ions have 18 electrons ☒B Sulphur atoms have 16 electrons ∴ Sulphide S^{2-} ions have 18 electrons ☒C Argon atoms have 18 electrons ☑D Sodium atoms have 11 electrons ∴ Sodium Na^+ ions have 10 electrons
2003 3	B	71	Atoms are neutral when: total positive charge = total negative charge ∴ In neutral atoms: number of protons = number of electrons

2003 5	C	75	Isotopes: Same atomic number but different mass number Same number of protons but different number of neutrons
2003 24	A	81	Atomic number = number of protons = 26 Mass number = number of protons + number of neutrons = 26+30 = 56
2004 5	A	66	In neutral atoms: number of protons = number of electrons Number of protons = atomic number = 26 = number of electrons
2005 4	B	89	☒A Halogens (group 7) have 7 electrons in their outer shell ☑B Noble gases have a full outer electron shell ∴2,8,8 is a Noble Gas (Argon) ☒C Alkali metals (group 1) have 1 electron in their outer shell ☒D Transition Metals (block between groups 2+3) do not have a full outer shell
2005 5	D	58	Atoms of the same element must have the same atomic number and same number of protons. Isotopes of the same element have the same number of protons but can have different numbers of neutrons (hence a different mass number)
2006 3	C	80	Mass number → 23 Na Mass number = no of protons + neutrons Atomic number → 11 Atomic number = no of protons
2006 5	B	82	Isotopes: Same atomic number but different mass number Same number of protons but different number of neutrons
2006 7	D	66	☒A Chlorine atoms have electron arrangement 2,8,7 ∴ Cl^- is 2,8,8 ☒B Sulphur atoms have electron arrangement 2,8,6 ∴ S^{2-} is 2,8,8 ☒C Argon atoms have electron arrangement 2,8,8 ☑D Sodium atoms have electron arrangement 2,8,1 ∴ Na^+ is 2,8
2007 1	B	92	☒A Fluorine is in group 7 and is in a different group from Argon (group 0) ☑B Krypton and argon are both in Group 0 and have similar chemical properties ☒C Potassium is in group 1 and is in a different group from Argon (group 0) ☒D Zinc is a transition metal and is in a different group from Argon (group 0)
2007 4	D	65	☒A Isotopes have different nuclei as they have different numbers of neutrons ☒B Isotopes have different mass numbers due to different numbers of neutrons ☒C Isotopes have different numbers of neutrons ☑D Isotopes have same number of protons but different numbers of neutrons
2008 3	C	95	☒A ammonia is a compound with the formula NH_3 ☒B carbon dioxide is a compound with the formula CO_2 ☑C fluorine is a diatomic element with the formula F_2 ☒D methane is a compound with the formula CH_4
2008 4	D	81	☒A number of electrons = no of protons in neutral atoms ☒B number of neutrons = mass number – atomic number ☒C number of protons = number of electrons in a neutral atom ☑D number of protons = number of electrons in a neutral atom
2008 6	A	76	Charge on ion = number of protons – number of electrons = 19 –18 = +1
2009 4	B	89	☒A Isotopes have same number of protons but W=17 protons and X=11 protons ☑B Isotopes have same number of protons but different number of neutrons ☒C Isotopes have same number of protons but X=11 protons and Y=17 protons ☒D Isotopes have same number of protons but Y=17 protons and Z=18 protons

2010 9	C	86	☒A mass = (1x12) + (2x16) = 12+32 = 44amu ☒B mass = (1x14) + (2x18) = 14+36 = 50amu ☑C mass = (1x12) + (1x16) + (1x18) = 12+16+18 = 46amu ☒D mass = (1x14) + (1x16) + (1x18) = 14+16+18 = 48amu
2011 4	D	72	<table><tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr><tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr><tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr><tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr></table>
2011 5	A	88	Atomic number = number of protons = 26 Mass number = number of protons + number of neutrons = 26 + 30 = 56
2012 4	D	81	☒A lithium has a mass number of 7 and oxygen has a mass number of 16 ☒B lithium has an atomic number of 3 and oxygen has a atomic number of 8 ☒C lithium has 1 outer electron (group 1) and oxygen has 6 outer electrons (group 6) ☑D Lithium (2,1) and oxygen (2,6) both have 2 occupied energy levels (electron shells)
2012 5	C	40	☒A Fluorine forms negative ions as it is a non-metal. ☒B lithium atoms (2,1) forms lithium Li^+ ions with electron arrangement of 2 ☑C sodium atoms (2,8,1) forms sodium Na^+ ions with electron arrangement of 2,8 ☒D Neon is a Noble Gas (group 0) and already has an electron arrangement of 2,8
2013 5	C	92	<table><tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr><tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr><tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr><tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr></table>
2015 1	C	94	☒A water is a compound of hydrogen and oxygen with formula H_2O ☒B methane is a compound of carbon and hydrogen with formula CH_4 ☑C fluorine is a diatomic element with formula F_2 ☒D ammonia is a compound of nitrogen and hydrogen with formula NH_3
2015 2	C	93	☒A zinc is a transition metal ∴ different chemical properties to group 0 argon ☒B potassium is in group 1 ∴ different chemical properties to group 0 argon ☑C krypton and argon have same chemical properties as they are both in group 0 ☒D chlorine is in group 7 ∴ different chemical properties to group 0 argon
2015 7	D	84	☒A the number of protons + neutrons is the mass number (not the atomic number) ☒B the number of neutrons is independent of the number of protons and electrons ☒C the number of neutrons is independent of the number of protons and electrons ☑D atoms are neutral as number of protons = number of electrons

Int2	Answer	Reasoning
2000 3a	In same group of periodic table	Elements in the same group of the periodic table have the same chemical properties e.g. alkali metals (group 1) and noble gases (group 0)
2000 3b	Answer to include:	The relative atomic mass is the average mass of all the different isotopes of strontium. Each isotope has a mass which is a whole number.
2001 1a	<table><tr><td>19</td></tr><tr><td>20</td></tr><tr><td>19</td></tr></table>	No. of protons = atomic number = 19 No. of neutrons = mass number – atomic number = 39-19 = 20 No. of electrons = atomic number - charge = 19 – 0 = 19
2001 1b	Same no. of protons but different no. of neutrons	<table><tr><td rowspan="2">Isotopes</td><td>Same atomic number but different mass number</td></tr><tr><td>Same number of protons but different number of neutrons</td></tr></table>

2004 1a(i)	$^{81}_{35}Br$	Mass number ⟶ ^{81} Atomic number ⟶ $_{35}$Br
2004 1a(ii)	46	No. of protons = atomic number = 35 No. of neutrons = mass number – atomic number = 81 – 35 = 46 No. of electrons = atomic number - charge = 35 – 0 = 35
2004 1b	Equal percentage of 79 and 81 present	If relative atomic mass closer to 79 than 81 — More 79 present than 81 If relative atomic mass half way between to 79 and 81 — Equal amounts of 79 and 81 If relative atomic mass closer to 81 than 79 — More 81 present than 79
2005 1b	9 | F | 19 | -1	Atomic number = no. of protons = 9 Atomic Number = 9 ∴ Element is Fluorine Mass number = no. of protons + no of neutrons = 9+10 = 19 Charge = no. of protons – no. of electrons = 9-10 = -1
2006 3c	26 30 23	Number of protons = atomic number = 26 Number of neutrons = mass – atomic number = 56 -26 = 30 Number of electrons = no of protons – charge = 26 – (+3) = 23
2007 1b(i)	2	Atomic number = no. of protons = 2
2007 13a(i)	2 or 2,0	Lithium atoms have an electron arrangement of 2,1 (p1 data booklet) Lithium ions attain a full outer shell by losing 1 electron $Li \rightarrow Li^+ + e^-$ $2,1 \rightarrow 2$
2008 1b(i)	29 | 34 29 | 36	No of protons = atomic number (lower number) No of neutrons = mass number (upper no.) – atomic number (lower no.)
2008 1b(ii)	Isotopes	Isotopes: Same atomic number but different mass number Same number of protons but different number of neutrons
2009 1a	11 13	No. of protons = atomic number = 11 = 11 No. of neutrons = mass number – atomic number = 24 – 11 = 13 No of electrons = atomic number - charge = 11 – 0 = 11
2009 1b(i)		Sodium has an electron arrangement of 2,8,1 (p7 data booklet) • inner shell holds a maximum of 2 electrons • next shell holds a maximum of 8 electrons next shell has one electron (but can hold a maximum of 8)
2009 1b(ii)	Positive nucleus attracts electrons	The positively charge nucleus is attracted to the negatively charges electrons spinning around the nucleus.
2010 1a	Nucleus	

2010 1b(i)	8	Mass number = no. of protons + no. of neutrons = 3 + 5 = 8
2010 1b(ii)	number of protons equals number of electrons	Atoms are electrically neutral because the number of positive protons equals the number of negative electrons.
2010 9d	2,8	Particle: Magnesium atom; Mg^{2+} ion Electron Arrangement: 2,8,2; 2,8
2012 1c(i)	$^{11}_{5}B$	Mass N° → 11 Atomic N° → 5 Mass number = protons + neutrons = 5+6 Atomic number = no of protons =5
2013 1a(ii)	Same group in Periodic Table	Elements in the same group of the periodic table have similar chemical properties e.g. alkali metals in group 1, noble gases in group 0
2013 4a	1 2 1	Number of protons = atomic number = 1 Number of neutrons = mass no – atomic no. = 3 - 1 = 2 Number of electrons = atomic number – charge = 1 – 0 = 1
2013 4b	1	Relative atomic mass is the average mass of the isotopes in a sample. If r.a.m. = 1 them the majority of the sample must also have a mass of 1
2013 11a	2,8,8	$Ca \longrightarrow Ca^{2+} + 2e^-$ 2,8,8,2 (Calcium atom) → 2,8,8 (Calcium ion)
2014 2b(i)	79 79 118	Number of protons = atomic number = 79 Number of electrons = atomic number – charge = 79 – 0 = 79 Number of neutrons = mass no – atomic no. = 197 - 79 = 118
2014 2b(ii)	Answer from:	Same: atomic number / number of protons — but different: mass number / number of neutrons
2015 1a	126	No. of neutrons = mass number – atomic number = 210 – 84 = 126
2015 1b	Answer from:	Same: atomic number / number of protons — but different: mass number / number of neutrons

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Past Paper Question Bank

Unit 1.2a Periodic Table & Atomic Structure

Outcome	2000 Credit	2001 Credit	2002 Credit	2003 Credit	2004 Credit	2005 Credit	2006 Credit	2007 Credit	2008 Credit	2009 Credit	2010 Credit	2011 Credit	2012 Credit	2013 Credit		
6 7																
8																
9				18a												
10																
11									15a							
12																
13																
14	10b			11a(i)			9a(i)			9b		11b(i)				
15a	10a						9a(iii)		15b(i)	9a		11b(ii)		10a(i) 10a(ii)		
15b				11c		13b		10b								
16	10c			11a(ii)		13a(i) 13a(ii)	9a(ii)	10a		9c				10b		

<table>
<tr><th>SG Credit</th><th>Answer</th><th>Reasoning</th></tr>
<tr><td>2000C
10a</td><td>
<table>
<tr><th>Atom</th><th>protons</th><th>neutrons</th></tr>
<tr><td>^{28}Si</td><td>14</td><td>14</td></tr>
<tr><td>^{29}Si</td><td>14</td><td>15</td></tr>
<tr><td>^{30}Si</td><td>14</td><td>16</td></tr>
</table>
</td><td>
<table>
<tr><th>Particle</th><th>Location</th><th>Charge</th><th>Mass</th></tr>
<tr><td>Proton</td><td>in nucleus</td><td>+1</td><td>1 amu</td></tr>
<tr><td>Neutron</td><td>in nucleus</td><td>0</td><td>1 amu</td></tr>
<tr><td>Electron</td><td>outside nucleus</td><td>–1</td><td>approx zero</td></tr>
</table>
</td></tr>
<tr><td>2000C
10b</td><td>isotopes</td><td>
<table>
<tr><td rowspan="2">Isotopes</td><td>Same atomic number but different mass number</td></tr>
<tr><td>Same number of protons but different number of neutrons</td></tr>
</table>
</td></tr>
<tr><td>2000C
10c</td><td>^{28}Si</td><td>Relative (average) Atomic Mass (28.11) is closest to 28 so ^{28}Si must be the most common isotope.</td></tr>
<tr><td>2003C
11a(i)</td><td>isotopes</td><td>
<table>
<tr><td rowspan="2">Isotopes</td><td>Same atomic number but different mass number</td></tr>
<tr><td>Same number of protons but different number of neutrons</td></tr>
</table>
</td></tr>
<tr><td>2003C
11a(ii)</td><td>^{35}Cl</td><td>More ^{35}Cl isotope in sample as average 35.5 is closer to 35 than 37</td></tr>
<tr><td>2003C
11c</td><td>
<table>
<tr><th>Particle</th><th>Number</th></tr>
<tr><td>proton</td><td>17</td></tr>
<tr><td>neutron</td><td>18</td></tr>
<tr><td>electron</td><td>18</td></tr>
</table>
</td><td>no. of protons = atomic number (bottom number)
no. of neutrons = mass number – atomic number
no. of electrons = number of protons - charge</td></tr>
<tr><td>2003C
18a</td><td>2,8,1</td><td>Magnesium atoms have an electron arrangement of 2,8,2.
Mg^+ ions have lost one electron so have electron arrangement of 2,8,1</td></tr>
<tr><td>2005C
13a(i)</td><td>2</td><td>^6Li and ^7Li isotopes present in sample</td></tr>
<tr><td>2005C
13a(ii)</td><td>6.9</td><td>$\text{r.a.m.} = \frac{6\times10 + 7\times90}{100} = \frac{60 + 630}{100} = \frac{690}{100} = 6.9$</td></tr>
<tr><td>2005C
13b</td><td>
<table>
<tr><th>Particle</th><th>Number</th></tr>
<tr><td>proton</td><td>3</td></tr>
<tr><td>neutron</td><td>4</td></tr>
<tr><td>electron</td><td>2</td></tr>
</table>
</td><td>no. of protons = atomic number (bottom number)
no. of neutrons = mass number – atomic number
no. of electrons = number of protons – charge</td></tr>
<tr><td>2006C
9a(i)</td><td>Isotopes</td><td>
<table>
<tr><td rowspan="2">Isotopes</td><td>Same atomic number but different mass number</td></tr>
<tr><td>Same number of protons but different number of neutrons</td></tr>
</table>
</td></tr>
<tr><td>2006C
9a(ii)</td><td>1</td><td>1.1 is nearer 1 than 2 so more ^1H present than ^2H</td></tr>
<tr><td>2006C
9a(iii)</td><td>
<table>
<tr><th>Atom</th><th>protons</th><th>neutrons</th></tr>
<tr><td>^1_1H</td><td>1</td><td>0</td></tr>
<tr><td>^2_1H</td><td>1</td><td>1</td></tr>
</table>
</td><td>no of protons = atomic number (bottom number)
no. of neutrons = mass number – atomic number</td></tr>
<tr><td>2007C
10a</td><td>Equal proportions of each isotope</td><td>The relative (average) atomic mass is an average. Average of 107 and 109 = $^{(107+109)}/_2$ = 108 if isotope masses 107 and 109 are equal.</td></tr>
<tr><td>2007C
10b</td><td>
<table>
<tr><th>Particle</th><th>Number</th></tr>
<tr><td>proton</td><td>47</td></tr>
<tr><td>neutron</td><td>60</td></tr>
<tr><td>electron</td><td>26</td></tr>
</table>
</td><td>No. of protons = atomic number = <u>47</u> (½ mark)
No. of neutrons = mass number – atomic number = 107 – 47 = <u>60</u> (½ mark)

No of electrons in neutral atom – no. of protons = atomic number = 47
1+ ion has one less electron than proton ∴no. of electrons = <u>46</u> (1 mark)</td></tr>
</table>

2008C 15a

(i) 1
(ii) Electron or e

Particle	Location	Charge	Mass
Proton	in nucleus	+1	1 amu
Neutron	in nucleus	0	1 amu
Electron	outside nucleus	–1	approx zero

2008C 15b(i)

Particle	Number
proton	90
neutron	144

No of protons = atomic number = 90

No of neutrons = mass no. – atomic no. = 234 – 90 = 144

2009C 9a

10	10
10	11
10	12

Number of Protons = atomic number (lower number)

Number of Neutrons = mass number – atomic number
(top number) (lower number)

2009C 9b

Isotopes

Isotopes	Same atomic number but different mass number
	Same number of protons but different number of neutrons

2009C 9c

20

The average atomic mass = 10.2 from masses of 10,11 and 12. The most common type of atom must be 10 as average 10.2 is closest to 10

2011C 11b(i)

isotopes

Isotopes	Same atomic number but different mass number
	Same number of protons but different number of neutrons

2011C 11b(ii)

8	10
8	8

Number of Protons = atomic number (lower number)

Number of Neutrons = mass number – atomic number
(top number) (lower number)

2013C 10a(i)

$^{63}_{29}Cu$

mass number → 63
atomic number → 29 Cu

2013C 10a(ii)

34

Number of neutrons = mass number – atomic number = 63 – 29 = 34

2013C 10b

64

The relative atomic mass is the average of the masses of the different isotopes

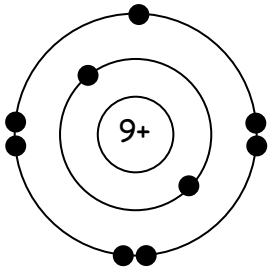
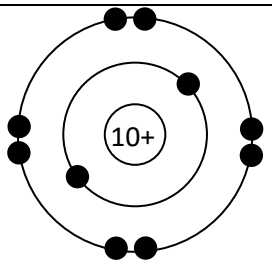
$$\text{relative atomic mass} = \frac{63+65}{2} = 64$$

Nat5
Traffic Lights

Past Paper Question Bank

Unit 1.2a Periodic Table & Atomic Structure

Outcome	2000 General	2001 General	2002 General	2003 General	2004 General	2005 General	2006 General	2007 General	2008 General	2009 General	2010 General	2011 General	2012 General	2013 General		
6 7																
8						10a(ii)										
9		8a					10b(i)									
10							10a						10a			
11																
12		8b								10a		9a				
13																
14																
15a																
15b																
16																

SG General	Answer	Reasoning
2001G 8a		The 1st shell can hold a maximum of 2 electrons The 2nd shell can hold a maximum of 8 electrons.
2001G 8b	no. of protons equals no. of electrons	Atoms are neutral because they have an equal number of positive charges (protons) and number of negative of negative charges (electrons)
2005G 10a(ii)	same chemical properties (or same no. of outer electrons)	All elements in the same group have the same chemical properties and the same number of outer electrons
2006G 10a	nucleus	nucleus is positively charged because it contains positive protons and neutral neutrons
2006G 10b(i)		Electrons will form 4 pairs of electron in outer shell of neon to give electron arrangement 2,8
2009G 10a	12 Metal 17 Non-metal	Atomic Number: number of protons in an atom Metals are found on the left hand side of STEPS on Periodic Table
2011G 9a	Number of positive charges equal the number of negative charges	Atoms are neutral because: Number of protons (Positive charges) = number of electrons (Negative charges)
2012G 10a	Nucleus	The nucleus at the centre of an atom is positively charged and contains protons and neutrons