

Question 3 (Answer: C)

- For a neutral atom, electrons = protons, and neutrons = nucleon number – protons.
- Na: $23 - 11 = 12$ neutrons; Na^+ has one electron fewer, so 10.
- O: $16 - 8 = 8$ neutrons; O^{2-} has two electrons more, so 10.

Question 5 (Answer: B)

- Neutrons = nucleon number – proton number.
- W: $40 - 20 = 20$. X: $41 - 20 = 21$. Y: $37 - 18 = 19$. Z: $37 - 17 = 20$.
- So W and Z both have 20 neutrons – charge makes no difference to the neutron count.

Question 5 (Answer: C)

- Mass number counts protons *and neutrons*, not protons twice.
- Al^{3+} has lost three electrons, so its configuration is 2, 8, not 2, 8, 3.
- The common isotope of hydrogen is the only atom with no neutron at all.

Question 3 (Answer: D)

- The nucleons are the particles in the nucleus: protons and neutrons.
- So the nucleon number is the total of the two together.
- Protons alone is the *proton* number, and electrons are not in the nucleus at all.

1(a)	<table><tr><td>particle</td><td>relative mass</td><td>relative charge</td></tr><tr><td>proton</td><td>1</td><td></td></tr><tr><td>neutron</td><td>1</td><td>0 / nil</td></tr><tr><td>electron</td><td></td><td>– 1</td></tr><tr><td colspan="2">✓(1)</td><td>✓(1)</td></tr></table>	particle	relative mass	relative charge	proton	1		neutron	1	0 / nil	electron		– 1	✓(1)		✓(1)
particle	relative mass	relative charge														
proton	1															
neutron	1	0 / nil														
electron		– 1														
✓(1)		✓(1)														
1(b)(i)	M1 atoms of the same element that have the same number of protons M2 but different numbers of neutrons															
1(b)(ii)	they have the same number of electrons and therefore the same electronic configuration															
1(c)	M1 22 M2 16 and 18 M3 50 and 22 and to the left of the symbol M4 Ti M5 2+															
1(d)	nucleon number															
1(e)	M1 mol Ar = $2.0 \div 40 = 0.05$ (mol) M2 number of atoms = $0.05 \times 6.02 \times 10^{23} = 3.01 \times 10^{22}$															

Question 3 (Answer: A)

- Zinc's proton number is 30, and a neutral atom has the same number of electrons.
- Its relative atomic mass is 65, so neutrons = $65 - 30 = 35$.
- Protons and electrons must be equal in an atom, which rules out the other rows.

Question 4 (Answer: B)

- 2, 8, 8 means 18 electrons altogether.
- Argon has 18, and Cl^- has $17 + 1 = 18$.
- Al^{3+} has 10 and Na^+ has 10, so both are 2, 8 instead.

2(a)	<table><tr><td>M1 charge (1)</td><td>M2 mass(1)</td></tr><tr><td>-1</td><td></td></tr><tr><td></td><td>1</td></tr><tr><td>+1</td><td>1</td></tr></table> 1 mark for each correct column	M1 charge (1)	M2 mass(1)	-1			1	+1	1	
M1 charge (1)	M2 mass(1)									
-1										
	1									
+1	1									
2(b)(i)	<table><tr><td>electron</td><td>neutron</td><td>proton</td></tr><tr><td>19</td><td>20</td><td>19</td></tr><tr><td>18</td><td>22</td><td>19</td></tr></table> 1 mark for each correct column	electron	neutron	proton	19	20	19	18	22	19
electron	neutron	proton								
19	20	19								
18	22	19								
2(b)(ii)	M1 $(41 \times 10) + (39 \times 90) = 3920$ (1) M2 $(3920 \div 100) = 39.2(1)$									
2(b)(iii)	aluminium has only 1 isotope which has nucleon number 27									
2(c)	M1 Ar (1) M2 P^{3-} or S^{2-} or Cl^- (1)									

Question 4 (Answer: B)

- S^{2-} has $16 + 2 = 18$ electrons, that is 2, 8, 8.
- Argon also has 18 electrons, so it matches.
- A calcium *atom* has 20 and O^{2-} has 10, so only one of the three matches.