Answers to examination-style questions

Answers	Marks	Examiner's tips
1 (a) atoms with the same number of protons and different number of neutrons	**1**	
(b) $^{37}_{17}Cl$	**2**	There have been a few questions like this over the years. It's just getting your head around the numbers – then it's just a bit of arithmetic.
(c) (i) $2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^2$	**1**	You really need to know the order of filling up the sub-levels.
(ii) $A_r = \frac{(70 \times 24.4) + (72 \times 32.4) + (74 \times 43.2)}{100}$ $= 72.4$		
(iii) magnetic field / electric field	**1**	Learn this topic well.
correct link between deflection and *m/z*	**1**	
correct link between deflection and field	**1**	
2 (a) $A_r = (64 \times 0.389) + (66 \times 0.278) + (67 \times 0.147) + (68 \times 0.186)$ $= 65.7$	**2**	% told so divide the abundance by 100
zinc / Zn	**1**	Keep going even if you think you are not getting the maths right. You may pick up method marks on the way. Blank spaces can't score at all!
(b) electron gun fires high-energy electrons	**1**	Mass spectrometer – learn well.
knocks off e^- from Q	**1**	
reasons: to allow ions to be:		
– accelerated by an electric field	**1**	
– deflected by a magnet / magnetic field	**1**	
– detected by current formed at the detector	**1**	
3 (a) relative charge = –1 relative mass ≤ 1/1800 / zero / negligible	**2**	Don't forget the minus sign for the charge on the electron.
(b) (i) protons = 24 **(ii)** neutrons = 28 **(iii)** abundance or peak height or intensity	**3**	The number of neutrons is the mass number – atomic number.
(c) (i) *reason 1*: to allow particles to be accelerated / deflected *reason 2*: generate a current in the detector **(ii)** <u>magnetic</u> field or <u>electric</u> field or electromagnet **(iii)** deflection depends on mass or *m/z*	**4**	The work on mass spectrometer needs to be well understood.

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4 **(a)** **(i)** atoms with the same number of protons and with different numbers of neutrons **(ii)** isotopes have the same electron configuration	**3**	Always learn definitions. Then they are 'easy' marks.
(b) $1s^2 2s^2 2p^6 3s^1$	**1**	This asks for all sub-levels, so **don't** use the abbreviated form using [Ne].
(c) outer e^- in (3)d sub-level	**1**	
(d) $^{15}_{7}N$	**2**	There have been a few questions like this over the years. It's just getting your head around the numbers, then it's just a bit of arithmetic.
5 **(a)** enthalpy change when 1 mole of electrons is removed / knocked out from 1 mole of <u>gaseous</u> atoms (of the same element)	**1** **1**	
(b) $Mg^+(g) \rightarrow Mg^{2+}(g) + e^-$	**2**	When you have done the equation, check that the charges balance as well.
(c) increased nuclear charge smaller atom *or* electrons enter the same level *or* similar shielding	**1** **1**	Don't forget that the number of protons / nuclear charge increases from left to right of the periodic table. Also across each period the electrons enter the same level, i.e. in Period 3 the last electrons go into the 3rd level etc.
(d) electron removed from a level of lower energy *or* e^- removed from 2p rather than from 3s less shielding	**1** **1**	Electrons are lost from the highest energy level (which contains the electrons) first.
6 **(a)** **(i)** atoms with the same number of protons / same atomic number but different number of neutrons / different mass number	**1** **1**	Don't say the same number of electrons.
(ii) *detected by:* positive ions collide with / are deflected to / are collected at the detector	**1**	Learn this.
causing current to flow / detected electrically	**1**	
abundance measured: idea that current depends on number of ions hitting detector	**1**	

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(b) $\frac{(54 \times 5.8) + (56 \times 91.6) + (57 \times 2.6)}{100}$ = 55.9	2	% told so divide the abundance by 100.
(c) **(i)** $1s^2 2s^2 2p^6 3s^2 3p^6 3d^6$	1	You really need to know the order of filling up the sub-levels.
(ii) highest occupied energy level in 3d	1	
(iii) no difference same e^- arrangement	2	