Answers to examination-style questions

Answers	Marks	Examiner's tips
1 (a) relative mass / relative charge		This is just easy learning stuff. Make sure you put the – and + signs for the electron and proton though, i.e. not just 1.
proton: 1, +1	**1**	
electron: 1/1800, –1	**1**	
(b) ^{38}Ar	**2**	
(c) (i) $1s^22s^22p^6$	**1**	Remember the order of filling up the levels. Remember that ions have the noble gas arrangement.
(ii) *any two from*: more protons / atomic number / proton number / bigger nuclear charge; Al^{3+} smaller (size) than Na^+ / e^- closer to nucleus / more attraction for e^- from / e^- pulled more strongly by Al^{3+}	**2**	This type of question is common so learn the points well. Remember that the 3+ ions have more pulling power and why.
2 (a) (i) assume it is corrosive so wash hands if spilt on skin, etc.	**1**	Think of sensible reasons.
(ii) $21.7 \times 10^{-3} \times 0.150 = 3.255 \times 10^{-3}$ (mol)	**1**	Mass = vol. in dm^3 × conc. Don't forget to convert the titre into dm^3.
(iii) in 25 cm^3 = $(3.255 \times 10^{-3}) / 2$ $= 1.63 \times 10^{-3}$ (mol)	**1**	Half the no. of moles of acid as in the equation.
in sample $= 1.63 \times 10^{-2}$	**1**	Multiply by 10 since titre done on 25 cm^3 but sample is 250 cm^3
(iv) $M_r = 1.92 / 1.63 \times 10^{-2}$	**1**	mass = M_r × mole
$= 117.9 = 118$	**1**	
(b) (i) simplest ratio of atoms of each element (in a compound)	**1**	Learn this definition. It's not just simplest ratio of atoms, it must have 'of each element'.
(ii) C: $\frac{49.31}{12}$, H: $\frac{6.85}{1}$, O: $\frac{43.84}{16}$	**1**	Divide by the A_r
4.11, 6.85, 2.74; 1.5, 2.5, 1		
ratio 3, 5, 2 or $C_3H_5O_2$	**1**	Work out the M_r of the empirical formula first and then see how many times it goes into the actual M_r of the compound.
$= C_3H_5O_2 \times 146 / 73 = C_6H_{10}O_4$	**1**	

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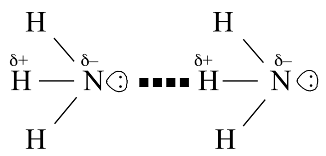
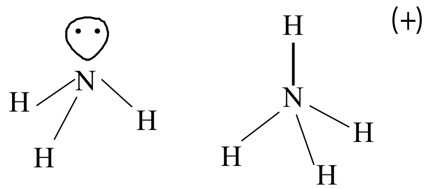
(c) (i) $pV = nRT$	1	Learn this
$= \frac{pV}{RT} = \frac{100\,000 \times 352 \times 10^{-6}}{8.31 \times 298}$	1 1	Don't forget the units needed for the ideal gas equation
moles CO_2 = 0.0142 (mol)	1	
(ii) get rid of CO_2 by reacting with CaO	1	Just learn this.
(iii) moles $NaHCO_3$ = 0.0142 × 2 (= 0.0284 (mol))	1	Look at the equation. There were twice as many moles of $NaHCO_3$ to decompose to give 1 mole of CO_2
mass $NaHCO_3$ = 84 × 0.0284	1	
= 2.38–2.39 g	1	mass = M_r × mole
3 (a) (i) difference in electronegativity / F more electronegative than H	1	Remember it's the difference in electronegativity that is needed not just the electronegativity values.
bonding electrons drawn towards F	1	State which way the electrons flow.
(ii) NH_3	1	Electronegativity increases across the period.
(iii) N has smallest electronegativity of N, O and F NH_3 has smallest electronegativity difference	1	
(b) (i) hydrogen bonding	1	Don't just put hydrogen.
(ii) 		
1 pair of charges shown on both molecules	1	
lone pair on both molecules	1	
hydrogen bond between lone pair and H atom	1	A diagram is asked for so you must do that and make sure all the charges, lone pairs, etc. are shown. (If this is asked for as just writing then you need to know the 3 points well.)
(c) (i) dative / co-ordinate	1	Learn this.
(ii) 	4	

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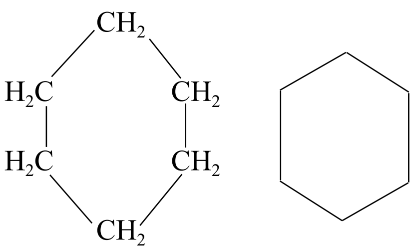
(iii) pyramidal / (distorted) tetrahedral / (trigonal) pyramid	1	
(iv) 109(½)°	1	Although these are both based on a tetrahedron you should learn the shapes of just the atoms in each case. Learn the bond angles and in this case realise that it's a regular tetrahedron in NH_4^+ since it has 4 bonds.
4 (a) zeolite *or* aluminosilicate *or* pumice *or* porous pot *or* Al_2O_3 *or* aluminium oxide *or* ceramic	1	The most common answer is zeolite.
(b) $C_{10}H_{22} \rightarrow C_3H_6 + C_7H_{16}$	1	
or $C_{10}H_{22} \rightarrow 2C_3H_6 + C_4H_{10}$		
or $C_{10}H_{22} \rightarrow 3C_3H_6 + CH_4$		Just make sure your equation balances.
(c) can be made into a polymer	1	
(d) (i) catalytic (cracking)	1	
(ii) excess / plentiful /lots of oxygen or O_2 or air	1	This is not just a good supply of oxygen, etc. It must be excess.
(iii) CO_2 given off which contributes to the greenhouse effect	1	This includes HSW and you need to think how to express yourself clearly. Don't waffle. There will not be enough space to do that.
need to burn less (alkanes as) fuels	1	
(iv) 	1	You do not need to show the C–H bonds on the hexagon structure.
(v) $C_6H_{12} + 3O_2 \rightarrow 6C + 6H_2O$	1	Make sure the equation balances.
(e) (i) $\frac{1}{2}N_2 + \frac{1}{2}O_2 \rightarrow NO$ *or* $N_2 + O_2 \rightarrow 2NO$	1	
spark *or* high temperature *or* 2500 °C ≤ *T* ≤ 4000 °C	1	Don't write just heat.
(ii) platinum *or* Pt *or* rhodium *or* Rh *or* palladium *or* Pd	1	
(iii) $CO + NO \rightarrow CO_2 + \frac{1}{2}N_2$ *or* $2CO + 2NO \rightarrow 2CO_2 + N_2$	1	

Answers	Marks	Examiner's tips
5 **(a)** Na has less protons / smaller nuclear charge	**1**	
same shielding as Mg so outer electrons pulled in less to nucleus	**1**	When writing these free response answers make sure you do not refer to 'it'. This is very unclear and generally if the answer is ambiguous it will not score. Write the Na … or Mg …, etc. Be specific in your answer.
(b) $Na(g) \rightarrow Na^{+}(g) + e^{-}(g)$	**2**	One mark for equation and one for state symbols
first electron taken from a neutral atom but second electron removed from a +ve ion	**1**	
which requires more energy	**1**	A + ion has greater attraction for an electron.
(c) *diagram*: Na^{+} and Cl^{-} ions correctly placed in 3D (min. 8 ions although the 8th one can be hidden)	**2**	Look up this cubic arrangement if you cannot remember it and learn to draw the cube containing the ions.
opposite – ion / electrostatic attractions	**1**	You need to refer to the fact that there are
are strong / difficult to overcome	**1**	+ and – ions that attract.
conducts only when molten or in aqueous solution	**1**	This is all learning.
as ions can move	**1**	When writing these free response answers do not refer to 'it'.
6 **(a)** ionisation	**1**	
by an electron gun	**1**	
deflection	**1**	
by a magnetic field / (electro)magnet	**1**	These marks are straightforward learning and can be achieved easily.
(b) $\frac{(188 \times 1.5)+(189 \times 2.5)+(190 \times 3.0)+(192 \times 4.5)}{11.5}$	**1**	
	1	In this case you need to add up all the abundances on the *y*-axis for the denominator.
= 190.3	**1**	
Z = Os	**1**	Read off your number against the A_r (top number.) from periodic table.

Nelson Thornes is responsible for the solution(s) given and they may not constitute the only possible solution(s).