

AS

Chemistry

Paper 1 (7404/1): Inorganic and Physical Chemistry
Mark scheme

7404
Specimen paper

Version 0.1

Section A

Question	Marking guidance	Mark	Comments
01.1	$1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$	1	
01.2	$\text{Ca} + 2\text{H}_2\text{O} \longrightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$	1	
01.3	Oxidising agent	1	
01.4	Neutralise acidic soil / test for CO_2 gas / to make mortar	1	
01.5	$\text{Ca}(\text{g}) \longrightarrow \text{Ca}^+(\text{g}) + \text{e}^-$	1	
01.6	Decrease	1	If not 'decrease', then chemical error = 0/3
	Atoms get bigger / more (energy) shells	1	
	More shielding so attraction of outer electron not as strong	1	

Question	Marking guidance	Mark	Comments
02.1	<u>Average mass of 1 atom of an element</u> 1/12 mass of 1 atom of carbon-12	1 1	
02.2	$\frac{(32 \times 91) + (33 \times 1.8) + (34 \times 7.2)}{100}$ OR $\frac{3216.2}{100}$ 32.2	1 1 1	Mark 1 for top line Mark 2 for bottom line
02.3	High voltage applied to sample (in polar solvent) Molecules lose an electron	1 1	
02.4	So they can be accelerated So they can be detected	1 1	Not deflection Allow to reflect ions

Question	Marking guidance	Mark	Comments
03.1	Enthalpy change when 1 mol of substance is formed From its elements All reactants and products in their standard states under standard conditions	1 1 1	
03.2	It's an element / by definition	1	
03.3	4 bonding pairs of electrons Repel equally	1 1	
03.4	$\Delta H = \Sigma \text{ enthalpy of products} - \Sigma \text{ enthalpy of reactants}$ $= (2 \times -680) + (6 \times -269) - (-85)$ $= -2889 \text{ (kJ mol}^{-1}\text{)}$	1 1 1	
03.5	$436 + 158 - (562 \times 2)$ -530 (M2) So for 1 mole of HF = $-265 \text{ (kJ mol}^{-1}\text{)}$	1 1 1	Mark is for the answer to mark 2 divided by 2

Question	Marking guidance	Mark	Comments
04.1	Reaction at equilibrium moves to oppose any change imposed on it	1	
04.2	Decreases Equilibrium moves to the side with fewest moles, ie left-hand side To reduce pressure	1 1 1	If not 'decrease', then chemical error = 0/3
04.3	Positive Equilibrium moves to decrease the temperature / absorb heat energy	1 1	
04.4	Products are a mixture of gases / difficult to separate gases	1	

Question	Marking guidance	Mark	Comments
05.1	Decreases Atoms get bigger / there are more (energy) levels There is more shielding so nucleus cannot attract the electrons in the covalent bond as readily	1 1 1	If not 'decrease', then chemical error = 0/3
05.2	Add a few drops of silver nitrate to each solution The chloride would give a white precipitate The bromide would give a cream precipitate Add (dilute) ammonia White precipitate dissolves / cream precipitate does not dissolve	1 1 1 1 1	
05.3	$2\text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{Na}_2\text{SO}_4 + 2\text{HCl}$ OR $\text{NaCl} + \text{H}_2\text{SO}_4 \longrightarrow \text{NaHSO}_4 + \text{HCl}$	1	
05.4	Calculate the mass of Na_2CO_3 needed ($M_r \times 0.1 / 4$) Weigh (by difference) to 3 significant figures on a balance Dissolve in distilled water Add to volumetric flask Include washings Make up to the mark with distilled water Shake flask	1 1 1 1 1 1 1	

Question	Marking guidance	Mark	Comments
06.1	$\frac{50.0}{1000} \times 0.520 = 0.0260 \text{ mol HCl}$ $\text{Mol MgCO}_3 = 0.0130$ $\text{Mass MgCO}_3 = 0.0130 \times 84.3 = 1.096 \text{ g}$ $\text{Percentage purity} = \frac{\text{mass of MgCO}_3}{\text{mass of sample}} \times 100$ $= 83.0(\%)$	 1 1 1 1	Mark consequentially to student's answer(s).
06.2	$\text{MgCO}_3 + 2\text{HNO}_3 \longrightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2\text{O} + \text{CO}_2$	1	

Question	Marking guidance	Mark	Comments
07.1	$\frac{3.65}{84.3}$ OR 0.0433 mol $T = 333 \text{ K and } P = 100\,000 \text{ Pa}$ $V = \frac{nRT}{P} = \frac{0.0433 \times 8.31 \times 333}{100\,000}$ $1.20 \times 10^{-3} \text{ m}^3$	1 1 1 1	
07.2	$\frac{3.65}{84.3}$ OR 0.0433 mol 0.0433 mol MgO Mass MgO = $0.0433 \times 40.3 = 1.74 \text{ (g)}$	 1 1	No mark here unless not given in answer to 7.1 Mark is for mol $\text{MgCO}_3 = \text{mol MgO}$
07.3	Some of the solid is lost in weighing product / solid is blown away with the gas	1	

Section B

In this section, each correct answer is awarded 1 mark.

Question	Key
8	D
9	D
10	A
11	C
12	B
13	A
14	C
15	C
16	D
17	D
18	B
19	A
20	C
21	B
22	C
