Year 10 Summer 2025 REVISION MARK SCHEME

Q1.

Question number	Answer	Notes	Marks
(a) (i)	particles should be close together and should fill from the bottom of the box, most particles should touch with a minimum of 2 random rows of particles	ALLOW particles filling the whole box IGNORE the size of the particles REJECT a regular arrangement	1
(ii)	solid		1
(b)	solid to liquid **melting** solid to gas **sublimation**	 ALLOW subliming	2
(c)	An explanation that links the two points. M1 (particles / molecules have) more (kinetic) energy M2 can overcome / break the (intermolecular) forces/forces (between water molecules)	 ALLOW hot water has more (kinetic) energy ALLOW (particles / molecules) move faster IGNORE vibrate more ALLOW can overcome / break the bonds (between water molecules) OR to break away from one another OR to escape more easily IGNORE references to collisions, activation energy or rate of reaction	2
			Total for question = 6

(**Q01 4CH1/1C, Jan 2023**)

Q2.

Question number	Answer	Notes	Marks
(a)	<table><tr><th></th><th>Electron</th><th>Proton</th><th>Neutron</th></tr><tr><td>Relative mass</td><td>0.0005</td><td>1</td><td>1</td></tr><tr><td>Relative charge</td><td>–1</td><td>+1</td><td>0</td></tr></table> ALLOW - +	All 4 correct 2 marks 2 or 3 correct 1 mark	2
(b) (i)	**B (3)** A is incorrect as 2 is not the atomic number of P C is incorrect as 4 is not the atomic number of P D is incorrect as 7 is the mass number of P		1
(ii)	**B (16)** A is incorrect as 8 is the atomic number of U C is incorrect as 18 is not the mass number of U D is incorrect as 26 is not the mass number of U		1
(iii)	S	**ALLOW** nitrogen/N/N_2	1

(c) (i)	An explanation that links the following two points **M1** (Q and R have) same number of protons/ both have 5 protons **M2** (but) different numbers of neutrons/ (Q has) 5 neutrons and (R has) 6 neutrons/R has an extra neutron	 **IGNORE** same number of electrons **IGNORE** references to atomic and mass numbers	2
(ii)	**M1** $20.6 \times 10 + 79.4 \times 11$ **OR** 1079.4 **M2** $\frac{20.6 \times 10 + 79.4 \times 11}{100}$ **OR** $\frac{1079.4}{100}$ **OR** 10.794 **M3** 10.8	 **ALLOW** ecf if incorrect mass numbers used 10.8 without working scores 3 10.79/10.794 without working scores 2 Use of 5 and 6 = 5.8 scores 2 Use of 15 and 16 = 15.8 scores 2 Use of 5 and 5 =5.0 scores 1	3
			Total 10

(**Q02 4CH1/1C, Nov 2023**)

Q3.

Question number	Answer	Notes	Marks
(a)	crystallisation simple distillation filtration	 REJECT distillation	3
(b)	(the box contains) (2) different substances /elements	IGNORE type of particle REJECT compounds	1
(c)	Any two from: M1 D contains 3 food dyes M2 food colouring D contains A and C M3 food colouring D does not contain B / food colouring D contains another dye (which is not A. B or C)		2
(d) (i)	4		1
(ii)	11		1
			Total for question = 8

(**Q02 4CH1/1CR, June 2023**)

Q4.

Question number	Answer	Notes	Marks
(a)	**Type of bonding** **Type of structure** (X) covalent simple molecular (Y) **M1** covalent **M2** giant (covalent)	 **ALLOW** giant molecular /giant covalent lattice **ACCEPT** macromolecular	4
	(Z) **M3** ionic **M4** giant (ionic) <u>lattice</u>	**ALLOW** (ionic) lattice **IGNORE** 'giant' alone	
(b)	An explanation that links the following points **M1** (X has) weak intermolecular forces / weak forces between molecules **M2** (so) little energy needed to overcome the forces/separate the molecules / the forces require little energy to break	 **ALLOW** weak intermolecular bonds / weak bonds between molecules **IGNORE** less energy **REJECT** any reference to weak covalent bonds or covalent bonds being broken or ionic bonds for both marks. **REJECT** intermolecular forces between atoms/bonds for both marks	2
			Total 6

(**Q03 4CH1/1C, June 2023**)

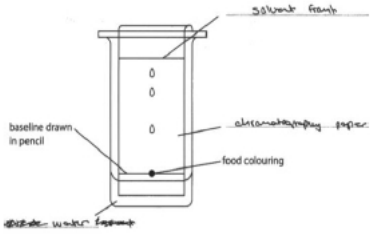
Q5.

Question number		Answer	Notes	Marks
(a)	(i)	24		1
	(ii)	M1 $12 \times 8 + 1 \times 10 + 14 \times 4 + 16 \times 2$ M2 194	correct answer of 194 scores 2 No ECF	2
	(iii)	$C_4H_5N_2O$	**ALLOW** atoms in any order	1
(b)	(i)	(simple) distillation	**REJECT** fractional distillation	1
	(ii)	A description that refers to two of the following points M1 (the condenser/X) **cools** the (ethanol) vapour M2 so it **condenses OR** forms **liquid** (ethanol)		2

(c)		M1 calcium bromide is a giant (ionic) lattice/structure M2 with many/strong electrostatic attractions between (oppositely charged) ions	**ALLOW** many/strong ionic bonds No **M2** if covalent bonds or IMF given here	5
		M3 caffeine has a simple molecular structure	**ALLOW** simple covalent structure	
		M4 caffeine has weak intermolecular forces /weak forces between molecules	**REJECT** weak forces between bonds	
		M5 more energy is needed to break the electrostatic attractions (in calcium bromide) than to overcome the intermolecular forces (in caffeine) OWTTE	No **M5** if reference to breaking covalent bonds No **M5** if reference to incorrect bonds	
				Total 12

(**Q04 4CH1/1C, June 2024**)

Q6.

Question number	Answer	Notes	Marks
(a) (i)	clockwise from bottom left M1 solvent M2 solvent front M3 chromatography paper  Diagram 1	 ALLOW water ALLOW paper ALLOW chromatogram	3
(ii)	pencil is not soluble / insoluble	ACCEPT pencil will not dissolve ALLOW pencil will not run (up the chromatogram)	1
(b) (i)	**B (W and Y)** A is not the correct answer because W and X do not have a spot at the same height C is not the correct answer because X and Z do not have a spot at the same height D is not the correct answer because Y and Z do not have a spot at the same height		1
(ii)	M1 distance moved by the dye from 1.1 to 1.4 (cm) distance moved by the solvent 6.5 (cm) M2 distance moved by the dye ÷ distance moved by the solvent and correctly evaluated	 e.g. 0.17 / 0.18 / 0.2(0) / 0.22 ALLOW any number of sig figs as long as it is correctly rounded. ALLOW ECF from M1	2
			total for question = 7

(**Q05 4CH1/1CR, June 2024**)

Q7.

Question number	Answer	Notes	Marks
(a) (i)	An explanation that links the following two points **M1** They will not dissolve/diffuse into the solvent (at the bottom of beaker) OWTTE **M2** so that the dyes can travel up the paper	**ALLOW** dye in place of spot throughout question 5 **ALLOW** water	2
(ii)	An explanation that links the following two points **M1** E and H **M2** as the dye is/both have a spot at the same level/travelled the same distance/same Rf value	 **M2** dep on **M1**	2
(iii)	An explanation that links the following two points **M1** The student can only be certain about G containing one dye as only one spot **M2** As F is insoluble/not moved (so you cannot tell how many dyes it has) OWTTE		2
(b)	**M1** distance from baseline to solvent level in mm = 65 **M2** distance from baseline to spot/dye in mm = 39 **M3** (R_f value = 39 ÷ 65 =) 0.6	 **ACCEPT** any value between 38 and 41 inclusive **ACCEPT** any value between 0.57 and 0.64 **M3** not awarded if value is incorrectly rounded	3 **Total 9**

(**Q05 4CH1/1C, June 2024**)

Q8.

Question number	Answer	Notes	Marks
(a) (i)	$AlCl_3$ $ZnSO_4$ $(NH_4)_3N$	ALLOW formula in reverse NOT molecular formula Penalise symbol letters/size of subscripts once only	3
(ii)	aluminium sulfate	ALLOW aluminium sulphate	1
(b)	M1 magnesium loses electrons M2 chlorine gains electrons M3 magnesium loses two electrons and two chlorines each gain one electron	ALLOW magnesium gives/transfers electrons to chlorine for M1,M2 NOT chloride gains electrons M3 assumes M1,M2 ALLOW correct ionic equations	3
(c) (i)	M1 two electrons between each nitrogen and hydrogen atom M2 two non-bonding electrons	 M2 dep on M1	2
(ii)	M1 (electrostatic) forces of attraction between shared pair(s) of electrons M2 and the nuclei	 REJECT nucleus (must be plural) REJECT intermolecular forces for both marks	2
		Total = 11	

(**Q06 4CH1/1C, Nov 2024**)

Q9.

Question number	Answer	Notes	Marks
(a)	M1 (electrostatic) attraction between (two) nuclei M2 and shared/bonding pair(s) of electrons **OR** M1 (electrostatic) attraction between shared/bonding pair(s) of electrons M2 and (two) nuclei	nuclei must be plural ALLOW nucleus of both/two atoms nuclei must be plural	2
(b)	An explanation that links the following three points M1 diamond is a giant covalent structure/giant lattice structure M2 there are (many) strong covalent bonds (which need to be broken) M3 large amount of (heat/thermal) energy needed to break the covalent bonds	 IGNORE giant molecule **IGNORE** more energy no **M2** or **M3** if reference to intermolecular forces/ions in diamond	3
(c)	An explanation that links the following two points M1 (graphite has) delocalised electrons M2 (electrons) are mobile/move/flow	 Ignore free electrons **M2** dep on mention of electrons Ignore carry charge 0 marks if reference to ions in graphite or atoms moving	2
(d)	M1 (number of atoms =) $60 \times 6.0 \times 10^{23}$ M2 3.6×10^{25}	correct answer without working scores 2 answer must be in correct standard form to 1 decimal place	2
			Total 9

(**Q08 4CH1/1C, Nov 2023**)

Q10.

Question number	Answer	Notes	Marks
(a) (i)	Any 2 from **M1** effervescence/bubbles/fizzing **M2** moves **M3** floats **M4** disappears/ gets smaller **M5** melts/forms a ball/forms a sphere **M6** white trail	 moves on surface scores **M2** and **M3** **ALLOW** dissolves **IGNORE** heat produced **IGNORE** flame	2
(ii)	An explanation that links the following two points **M1** (the phenolphthalein) turns pink **M2** (because) OH^- ions/hydroxide ions are present	Mark independently **ALLOW** an alkaline solution /an alkali is produced **REJECT** red or purple **IGNORE** metal oxide forms	2
(b) (i)	An explanation that links the following two points **M1** (to remove) any other ions/chemicals/ impurities/substances/elements (that may be on the wire) **M2** (so that) they do not interfere with/mask the colour of the flame/change the flame colour		2
(ii)	**C** (red) A is incorrect as lithium ions do not give a lilac flame B is incorrect as lithium ions do not give an orange flame D is incorrect as lithium ions do not give a yellow flame		1

(c) (i)	**M1** potassium ion K^+ **M2** aluminium ion Al^{3+} **M3** sulfate ion SO_4^{2-} All three correct 2 marks Any two correct 1 mark	 **ALLOW** Al^{+3} **ALLOW** SO_4^{-2}	2
(c) (ii)	**M1** (mass of water =) 23.7 – 12.9 **OR** 10.8 **M2** (moles of $KAl(SO_4)_2$ =) 12.9 ÷ 258 **OR** 0.05(00) **M3** (moles of water =) 10.8 ÷ 18 **OR** 0.6(00) **M4** (x = 0.6 ÷ 0.05 =) 12	correct answer of 12 without working scores 4 **ALLOW** ecf on incorrect mass of water answer to **M4** must be a whole number **ACCEPT** alternative methods	4 **Total 13**

(**Q06 4CH1/1C, June 2024**)

Q11.

Question number	Answer	Notes	Marks
(a) (i)	M1 so all the nitric acid reacts/is neutralised AND M2 therefore the solution only contains magnesium nitrate OR M3 if acid is still present it will contaminate the crystals OWTTE	 ALLOW so the excess magnesium can be removed by filtration	2
(ii)	M1 moles of Mg that reacts = 0.0250 ÷ 2 **OR** 0.0125 M2 mass of Mg that reacts = 0.0125 x 24 **OR** 0.3 (g) M3 mass of Mg remaining = 0.45 (g) OR M1 moles of Mg = 0.0250 ÷ 2 **OR** 0.0125 M2 moles of Mg remaining = 0.75 ÷ 24 – 0.0125 **OR** 0.03125 – 0.0125 **OR** 0.01875 M3 mass of Mg remaining (= 0.01875 x 24) = 0.45 (g)	 ALLOW M1 × 24 ALLOW 0.75 - M2 ALLOW 0.03125 – M1 ALLOW M2 x 24 Correct answer without working scores 3 0.15 (g) scores 2	3
(iii)	M1 filter off the excess magnesium M2 heat the solution until crystals first start to form M3 leave the solution to cool (and crystallise) M4 pour/filter off excess liquid (to obtain crystals) M5 leave (crystals) to dry	 ALLOW heat until the solution is saturated / heat until crystals form on the end of a glass rod /heat to evaporate some of the water IGNORE washing ALLOW any method of drying that avoids excess heat e.g. filter paper, a desiccator, a warm oven If heated to dryness only M1 can be scored If solution is not heated only M1, M4 and M5 can be scored	5
(b)	M1 tangent drawn (at 40 s) M2 change in volume of hydrogen ÷ change in time M3 correct answer between 2.75 and 3.75 (cm^3/s) inclusive	 If no tangent drawn allow 1 mark for 240 ÷ 40 = 6 (cm^3/s)	3
			Total for question = 13

(**Q11 4CH1/1C, Jan 2023**)

Q12.

Question number	Answer	Notes	Marks
(a) (i)	nitrogen	**ALLOW** N_2 **IGNORE** N	1
(ii)	argon	**ALLOW** Ar	1
(iii)	carbon dioxide	**ALLOW** CO_2/H_2O(g)/water vapour/CH_4/methane	1
(b) (i)	brown/red-brown/orange-brown	**ALLOW** orange **IGNORE** red **ALLOW** rusty/rust coloured (looks like)rust/rusted	1
(ii)	**M1** (change in length of column =) 84 – 69 **OR** 15 (mm) **M2** $\frac{15 \times 100}{84}$ = 17.86/17.9 (=18)	 **M2** subsumes **M1** Working must be shown to score **M2** **Ecf for M2 eg 18/84 x100 =21.4** **REJECT** 17.85/17.8 as wrongly rounded	2
(iii)	not all the oxygen in the sample of air had reacted with the iron wool OWTTE /not enough iron wool	**ALLOW** there is water vapour in the column of air/changes in temperature / pressure / location **ALLOW** Reaction incomplete/reaction too slow	1
			Total 7

(**Q02 4CH1/1CR, Jan 2023**)

Q13.

Question number	Answer	Notes	Marks
(a) (i)	(hydrated) iron(III) oxide / Fe_2O_3	**IGNORE** iron oxide **REJECT** iron(II) oxide	1
(ii)	**D** oxidation A is incorrect as it is not a combustion reaction B is incorrect as it is not a decomposition reaction C is incorrect as it is not a neutralisation reaction		1
(iii)	zinc	**ALLOW** Zn	1
(b) (i)	$Fe + H_2SO_4 \rightarrow FeSO_4 + H_2$	**ALLOW** multiples and fractions **IGNORE** state symbols even if incorrect	1
(ii)	(squeaky) pop with lighted splint/lit with a (Bunsen) flame	**IGNORE** just 'burns with a squeaky pop' **REJECT** use of glowing splint	1
(c) (i)	displacement	**ACCEPT** redox /oxidation **and** reduction	1
(ii)	pink-brown /pink (solid)	**ACCEPT** pink / brown / orange alone or in combinations eg orange-brown **ALLOW** red-brown **REJECT** red **IGNORE** copper	1
(d)	iron is less reactive/lower in the reactivity series (than magnesium) ORA	**IGNORE** just 'iron is not reactive enough' with no comparison	1
			Total 8

(**Q02 4CH1/1C, June 2023**)

Q14.

Question number	Answer	Notes	Marks
(a) (i)	M1 water M2 oxygen	ALLOW moisture / H_2O ALLOW air / O_2 answers can be in either order	2
(ii)	oxidation	ALLOW oxidisation / oxidising / redox	1
(b) (i)	M1 paint acts as a barrier / layer M2 which prevents air / oxygen / water getting to / reacting with the iron		2
(ii)	galvanising	ALLOW galvanisation IGNORE sacrificial protection	1
(iii)	M1 zinc is more reactive than iron M2 (therefore) is oxidised / reacts with oxygen / loses electrons more readily / in preference to / instead of iron	ALLOW corrodes instead of iron REJECT zinc rusts	2
(c) (i)	M1 aluminium is more reactive than iron / ORA M2 because aluminium displaces iron (from iron(III) oxide)		2
(ii)	M1 iron(III) oxide (is the oxidising agent) M2 iron(III) oxide donates oxygen to aluminium	ALLOW iron oxide / iron ions / Fe^{3+} ions throughout ALLOW (iron(III) oxide / iron ions / Fe^{3+} ions) takes electrons from aluminium ALLOW (iron(III) oxide / iron ions / Fe^{3+} ions) causes aluminium to be oxidised	2
			Total for question = 12

(**Q05 4CH1/1CR, June 2023**)

Q15.

Question number	Answer	Notes	Marks
(a) (i)	(thermal) decomposition		1
(ii)	**M1** amount of $PbCO_3 = \frac{5.34}{267} = 0.02(00)$ (mol)	Correct answer without working scores 2	2
	M2 mass of PbO = 0.02(00) x 223 = 4.46 (g)	**ACCEPT** alternative methods	
(b) (i)	**M1** diagram showing delivery tube going into test tube containing liquid	REJECT if sealed with a bung	2
	M2 limewater labelled		
(ii)	(limewater) turns cloudy/milky	**ALLOW** white precipitate	1
		(ii) dep on mention of limewater in either (i) or (ii)	

(c)	An explanation that links six of the following points		6
	M1 silicon dioxide has a giant (covalent) structure		
	M2 covalent bonds are (very) strong		
	M3 (in silicon dioxide) many covalent bonds need to be broken		
	M4 a large amount of energy/more energy is required to break the bonds in silicon dioxide	No **M3 or M4** if reference to intermolecular forces in silicon dioxide	
	M5 carbon dioxide has a simple molecular structure/is a simple molecule		
	M6 the forces between the molecules/intermolecular forces (in carbon dioxide) are weak	No **M6 or M7** if any reference to weak covalent bonds or breaking of covalent bonds in carbon dioxide Accept bonds between molecules weak	
	M7 very little energy/less energy is needed to overcome the forces between the molecules/intermolecular forces (in carbon dioxide)	A statement such as 'more energy is needed to break the bonds in silicon dioxide than to overcome the forces between the molecules/intermolecular forces (in carbon dioxide)' scores **M4** and **M7**	
			Total 12

(**Q08 4CH1/1CR, Jan 2023**)

Q16.

Question number	Answer	Notes	Marks
(a) (i)	$2PbS + 3O_2 \rightarrow 2PbO + 2SO_2$ M1 formulae of O_2 and SO_2 M2 rest of equation correctly balanced	 M2 dep on M1 ALLOW multiples/fractions	2
(ii)	(sulfur dioxide causes) acid rain / breathing problems	ALLOW named breathing problems such as asthma ALLOW other effects of acid rain such as killing fish, damage to stonework, killing plants	1
(iii)	M1 (moles lead(II) oxide) = 892 000 000 ÷ 223 OR 4 000 000 moles M2 (moles of carbon dioxide) = 2 000 000 M3(mass of carbon dioxide) = 88 (tonnes)	ALLOW calculations done in megamoles throughout ALLOW M1÷2 88 (tonnes) scores 3 marks	3

(iv)	any 5 from: lead(II) sulfide M1 giant ionic structure/lattice M2 strong (ionic) bonds OR strong electrostatic forces (between oppositely charged) ions M3 which take a lot of energy to break / overcome sulfur dioxide M4 simple molecular/covalent structure M5 weak intermolecular forces OR weak forces between molecules M6 which take little energy to overcome	 REJECT molecules/covalent bonds/ intermolecular forces for all three marks M3 dep on M2 REJECT ions/ionic bonds for all 3 marks ALLOW molecules NOT particles/atoms NOT weak IMF between atoms M6 dep on M5	5
(b)	M1 90.7÷207 and 9.30÷16 M2 0.438 (moles of lead) and 0.581 (moles of oxygen) M3 ratio of moles = 1:1.33 M4 empirical formula is Pb_3O_4	NOT atomic numbers ALLOW 9.30÷32 for ecf Answer must be 2sf or more ALLOW 1.3 ALLOW ecf from ratio shown to produce formula	4
		Total = 15	

(**Q11 4CH1/1C, Nov 2024**)

Q17.

Question number	Answer	Notes	Marks
(a)	the gas also contains air (displaced from the conical flask)		1
(b)	M1 a catalyst provides an alternative (reaction) pathway / route M2 of lower activation energy		2
(c)	M1 add hydrogen peroxide solution (to the conical flask) and add one of the catalysts M2 record the time taken to collect a fixed volume of gas OR record the volume of gas collected in a fixed time AND any 2 from M3 repeat with the same volume / same concentration of hydrogen peroxide solution M4 (repeat at) same temperature M5 use same mass / same surface area of each catalyst AND M6 the most effective catalyst produces the greatest volume of gas per unit time OR takes the least time to produce a fixed volume of oxygen	 ALLOW record the time when no more gas produced ALLOW same amount ALLOW same amount ALLOW the least time taken to complete the reaction is the most effective catalyst	5
(d)	M1 steeper curve starting at the origin M2 same volume of oxygen produced		2
			Total for question = 10

(**Q06 4CH1/1CR, June 2023**)

Q18.

Question number	Answer	Notes	Marks
(a)	carbon dioxide/a gas escapes/is lost/released (through the cotton wool)	NOT carbon dioxide/gas is given off/produced NOT wrong named gas	1
(b)	M1 the concentration (of hydrochloric acid) is highest M2 so there are more collisions per unit time	ALLOW there is a greater surface area of marble chips ALLOW greater amount of hydrochloric acid/reactants ALLOW more particles ALLOW more frequent collisions REJECT references to greater (kinetic) energy for both marks	2
(c)	the hydrochloric acid has been used up OWTTE	NOT acid is saturated IGNORE acid is a limiting factor	1
(d) (i)	any two from: (same) mass of marble chips (same) surface area of marble chips (same) concentration of hydrochloric acid (same) volume of hydrochloric acid	 ALLOW (same) amount of marble chips ALLOW (same) size marble chips NOT same amount of acid	2 3
(ii)	M1 rate of reaction increases M2 particles have more energy OR more particles have energy greater than (or equal to) the activation energy M3 so more successful collisions per unit time	 ALLOW particles move faster ALLOW more frequent successful collisions	
		Total = 9	

(**Q08 4CH1/1C, Nov 2024**)