

**END-OF-YEAR EXAMINATIONS 2025
SECONDARY THREE EXPRESS
SCIENCE (CHEMISTRY)
ANSWER SCHEME**

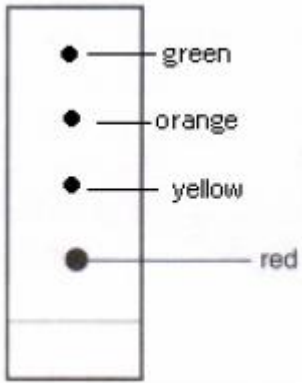
Paper 1

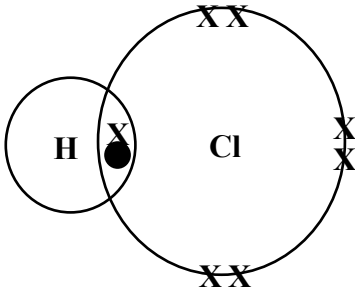
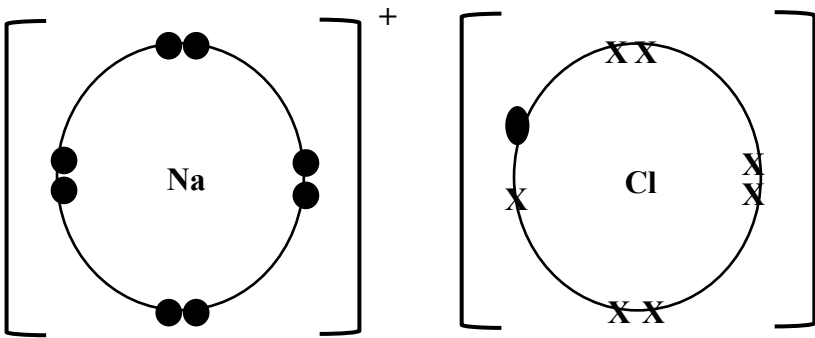
1	A	11	D
2	C	12	D
3	C	13	A
4	B	14	B
5	C	15	D
6	D	16	B
7	B	17	D
8	C	18	C
9	A	19	B
10	D	20	C

Paper 3

Overall -1M for no unit, -1M for wrong spelling, -1M for presentation eg: using pen for graph, not using ruler

Qn	Answer	Remarks
1a	Argon [1]	
1b	aluminium oxide [1]	
1c	sulfur dioxide [1]	
1d	Ammonia OR calcium oxide [1]	
1e	aluminium oxide [1]	
2a	The heat taken in is used to <u>overcome the attractive forces between the ethanol particles [1]</u> to change the particles from being <u>closely packed to far apart / from sliding past one another to moving at high speed in any or all directions [1]</u> .	R: "particles" were not mentioned in the discussion.
2b	The <u>liquid insecticide in the container takes in heat energy from the surrounding [1]</u> through the nozzle to <u>overcome the attractive forces between the liquid insecticide particles [1]</u> to change from <u>closely packed arrangement to being far apart / from sliding past one another to moving at high speed in any or all directions [1]</u> .	R: "particles" were not mentioned in the discussion.
2c	1. Gaseous particles spaced are far apart, 2. with <u>big space for them to move closer together</u> , 3. Air can thus be compressed. (credit awarded only if pt 1/2 given) 4. In water, the liquid particles are closely packed, 5. with <u>little space for particles to move closer to one another</u> . 6. Water cannot be compressed. (credit awarded only if pt 4/5 given) 6 points – 3 m 4 points – 2 m 2 points – 1m	Reject: <u>particles/space can /cannot be compressed</u> Note: No full credit if idea of "particles can / cannot move closer together" is missing.
3a	T [1] It has an electronic configuration of 2,8,8. So its <u>valence shell are fully filled [1]</u> , so it does not gain or lose or share electrons.	
3b	P and R [1] They have the <u>same number of protons, but different number of neutrons.[1]</u> P has 22 neutrons, whereas R has 20 neutrons.	

3ci	S^{2+} [1]	
3cii	SBr_2 [1]	
4a	C [1]	
4b	E [1]	
4c	B [1]	
4d	A [1]	
5a	stage 1: $C + O_2 \rightarrow CO_2$ [1] stage 2: $C + CO_2 \rightarrow 2CO$ [1]	
5bi	<u>Average mass</u> [1] of one molecule of a substance when compared with <u>1/12 of the mass of a carbon-12 atom.</u> [1]	
5bii	$Mr \text{ of } Fe_2O_3 = (56 \times 2) + (16 \times 3) = 160$ [1]	
5biii	No. of mol of $Fe_2O_3 = 320 / 160$ $= 2 \text{ mol}$ [1]	Allow ecf
5biv	Volume of gas = 6×24 $= 144 \text{ dm}^3$ [1]	Allow ecf
6ai	Fractional distillation [1]	
6aii	Filtration [1]	
6aiii	Simple distillation [1]	
6bi	Paper Chromatography / Chromatography [1]	
6bii	Four different dyes [1]	
6biii	 3 correct spots [1m] and correctly labelled [1m]	
7a	Hydrogen ion / H^+ [1]	

7bi	No. of moles of NaOH $= 0.06 / 40$ $= 0.0015 \text{ mol}$ [1]	
7bii	No. of moles of $\text{C}_4\text{H}_6\text{O}_5 = (0.0015 \div 2) \text{ mol} = 0.00075 \text{ mol}$ [1] $M_r \text{ of } \text{C}_4\text{H}_6\text{O}_5 = [4(12) + 6(1) + 5(16)] = 134$ [1] Mass of $\text{C}_4\text{H}_6\text{O}_5 = 0.00075 \times 134$ $= 0.1005 \text{ g}$ [1]	Allow ecf
7biii	$n \text{ C}_4\text{H}_4\text{O}_5\text{Na}_2 = 0.00075 \text{ mol}$ [1] $M_r \text{ of } \text{C}_4\text{H}_4\text{O}_5\text{Na}_2 = [4(12) + 4 + 5(16) + 2(23)] = 178$ [1] mass of $\text{C}_4\text{H}_4\text{O}_5\text{Na}_2$ produced $= 0.00075 \times 178$ $= 0.1335 \text{ g}$ $= 0.134 \text{ g}$ [1]	Allow ecf
8ai	Hydrogen chloride: covalent bonding sodium chloride: ionic bonding [1]	
8aii	 [1] for correct sharing of electrons [1] for correct number of unshared electrons Minus [1] if draw all electrons	
8aiii	 [1] for correct arrangement of electrons [1] for correct number of ions and charges Minus [1] if draw all electrons	

8bi	There are <u>strong electrostatic forces of attraction between the sodium and chloride ions [1]</u> in the crystal lattice. For hydrogen chloride, there are <u>weak intermolecular forces of attraction between the hydrogen chloride molecules [1]</u> . <u>Therefore</u> , <u>more energy is required to overcome [1]</u> the stronger forces of attraction for sodium chloride, compared to that in hydrogen chloride.	
8bii	In the <u>solid state</u> , the ions are held tightly in their <u>fixed positions [1]</u> . When in <u>molten state</u> , the presence of <u>free, mobile ions [1]</u> allow them to conduct electricity.	
9a	A: condenser [1] B: fractionating column [1]	
9b	the glass beads <u>help to increase the surface area for condensation of vapour [1]</u> <u>Vapours with not enough energy / has not yet reached its boiling point will condense and go back into the mixture of liquids [1]</u> OR • <u>large surface area for condensation of vapours [1]</u> • <u>higher boiling vapours condense more readily and flows back into the flask as liquid while the lower boiling vapours continue to rise up the column [1]</u>	
9ci	The amount of distillate collected will be <u>lesser [1]</u> .	
9cii	Apparatus A is not fully filled with cold water, so there <u>will not be maximum</u> condensation of vapour [1].	
9d	Ensure smooth boiling [1]	
9ei	$\text{CaCO}_3 + 2 \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2\text{O} + \text{CO}_2$ [1] for correct chemical formula [1] for correct balanced chemical equation	
9eii	Gas Syringe [1]	
10a	4.5 mS [1] Reason: This is because nitric acid has the <u>same concentration of H⁺ ions concentration as hydrochloric acid. [1]</u>	
10b	Sulfuric acid has <u>two hydrogen atoms</u> in its formula while nitric acid and hydrochloric acid <u>each has only hydrogen atom</u> in its formula. [1] Hence sulfuric acid produces more /twice the hydrogen ions when dissolved in water. [1]	
10ci	$\text{Ca}(\text{OH})_2 (\text{aq}) + \text{H}_2\text{SO}_4 (\text{aq}) \rightarrow \text{CaSO}_4 (\text{s}) + 2\text{H}_2\text{O} (\text{l})$	

	1m for formula; 1 m for balanced & ss	
10cii	Lesser H ⁺ ions present / lesser ions are present. [1]	
10di	Name: carbon dioxide [1] Test: gas forms white precipitate in limewater [1]	
10dii	Water [1]	