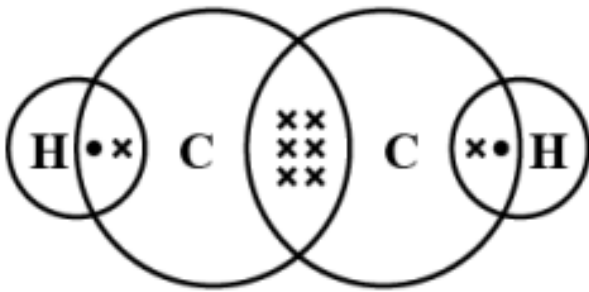


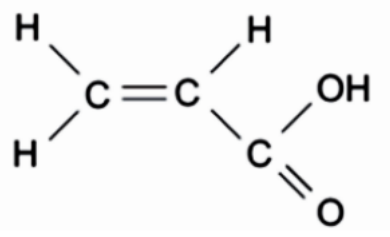
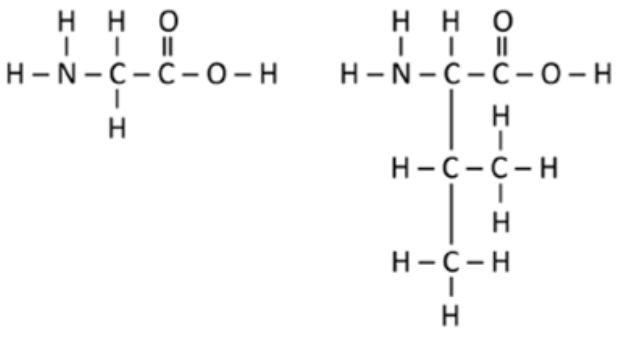
2025 CCHY S4 Chemistry Preliminary Examination P2 Marking Scheme

Qn	Marking point	Marks
1(a)	Al or Fe	1
(b)	N or O	1
(c)	Fe	1
(d)	Ca	1
(e)	C	1
(f)	O or N	1
	Total	6
2(a)	Alkaline	1
	Concentration of hydroxide ions is higher than concentration of hydrogen ions <i>Reject amount</i>	1
(b)	Sodium sulfate, Na ₂ SO ₄	2
	Sodium bicarbonate, NaHCO ₃	
	Potassium sulfate, K ₂ SO ₄	
	Potassium bicarbonate, KHCO ₃	
	Magnesium sulfate, MgSO ₄	
	Magnesium bicarbonate, Mg(HCO ₃) ₂	
	Calcium sulfate, CaSO ₄	
	Calcium bicarbonate, Ca(HCO ₃) ₂	
	<i>Any two of the above</i>	
(c)	Heating to remove all the water/ evaporate to dryness <i>Reject heating/ crystallisation</i>	1
	Total	5
3(a)	X: concentrated ammonia Y: concentrated hydrochloric acid	1
	Mr of ammonia= 17 Mr of HCl= 36.5 Relative molecular mass of ammonia is lower than hydrogen chloride	1
	Ammonia (gas from X) will diffuse faster and travel a longer distance [answer can be of gas from Y]	1
(b)	Region P: blue	1
	Region R: red	1

Qn	Marking point	Marks
(c)	A neutral salt formed	1
Total		6
4(a)	How: lithium atom loses 1 valence electron to form a positively charged ion	1
	How: chlorine atom gains 1 valence electron to form a negatively charged ion	1
	Why: to achieve the full valence shell of a noble gas	1
(b)	Describe: radius of lithium atom decreases when it forms an ion	1
	Explain: Lithium atom loses 1 electron shell when it forms an ion	1
(c)	Observation: no visible change/ no observable change/ solution remains reddish brown	1
	Explain: bromine is less reactive than chlorine thus no displacement reaction takes place	1
Total		6
5(a)(i)	Catalytic converter converted the harmful pollutants, CO, NO and unburnt hydrocarbons into harmless CO₂ and H₂O	1
(ii)	The excess CO₂ produced will lead to global warming and thus will lead to extreme weather events	1
(b)	The rate of photosynthesis to absorb CO₂ cannot catch up	1
	with the rate of CO₂ being released during the combustion of fossil fuels and animals respiration	1
(c)	The amount of CO₂ absorbed by the sugar cane during photosynthesis	1
	is equal to	1
	the amount of CO₂ released when ethanol burned as fuel	1
	Thus there is net zero change in atmospheric CO ₂	
Total		7
6(a)	They formed coloured compounds	1
	They form compounds with variable oxidation state	1
(b)(i)	$2\text{Cr (s)} + 6\text{H}^+ \text{(aq)} \rightarrow 2\text{Cr}^{3+} \text{(aq)} + 3\text{H}_2 \text{(g)}$	1: correct balance eqn

Qn	Marking point	Marks
		1: correct state symbol
(ii)	Cr was <u>oxidized</u> as it <u>lost electrons</u> to form Cr³⁺/Cr₂(SO₄)₃ .	1
	H⁺ / Hydrogen ion / H₂SO₄ was <u>reduced</u> as H ⁺ <u>gained the electrons</u> to form H₂	1
(c)	Order of metal in increasing reactivity: Iron, Chromium, Manganese	1
	Observation in set up A: Green solution turns pink, grey/silvery solid forms	1
	Observation in set up B: Green solution turns violet, grey/silvery solid forms.	1
	Observation in set up C: No visible / observable change / pale pink solution remains pink	1
	Total	10
7(a)	Rate of reaction increases with increasing concentration of acid	1
	as there is more reacting particles per unit volume	1
	and there is an increase in frequency of effective collision between the reacting particles	1
(b)	6 min/ 9 min	1
(c)	No	
	Both are monobasic acids and no of moles of acids used are the same	1
	thus final volume of gas produced will be the same	1
(d)	No of moles of HCl = 0.5 x 18.50/ 1000 = 0.00925 mol	1
	No of moles of NaOH= 0.00925 mol	1
	Concentration of NaOH = 0.00925/ [20.0/ 1000] = 0.4625 mol/dm ³	1
	Concentration of NaOH = 0.4625 x (23 + 16 + 1) = 18.5 g/dm ³	1
	Total	10
8(a)	P ₄	1
(b)	White phosphorus: simple molecular	1

Qn	Marking point	Marks
	Black phosphorus: giant covalent	
(c)	White phosphorus has a lower melting point than black phosphorus	1
	as little energy is absorbed to overcome the weak forces of attraction between the molecules	1
	And in black phosphorus, a lot of energy is absorbed to overcome the strong covalent bond between the P atoms	1
(d)	It cannot conduct electricity in any state	
(e)	Layers of atoms can be peeled easily as it has weak forces of attraction between the layers of atoms	1
Total		8
9(a)	Boiling point increases as number of carbon atoms increases	1
	Strength of the intermolecular forces of attraction increases as the molecules become larger/ molecular mass increases	1
	Thus more energy absorbed to overcome the forces of attraction	1
(b)		1: correct no of shared electrons 1: correct no of atoms
(c)(i)	C_nH_{2n-2}	1
(ii)	C_6H_{10}	1
(iii)	81 °C (accept any temp equal to or greater than 70 °C)	1
(d)	No of moles of calcium carbide= $500 / [40 + 2(12)] = 7.8125 \text{ mol}$	
	No of moles of ethyne= 7.8125 mol	1
	Volume of ethyne= $7.8125 \times 24 = 187.5 \text{ dm}^3$	1
(e)	Add aqueous bromine/ bromine solution/ bromine water to both sample	1
	Sample which turns from reddish brown to colourless/ decolourises slower contains alkyne	1

Qn	Marking point	Marks
(f)		1
	Total	12
10(a)	Positive terminal	1
	$2\text{Cl}^- \rightarrow \text{Cl}_2 + 2\text{e}^-$	1
(b)	Describe: Bubbles of gas/ efferevescence	1
	Explain: H⁺ will be preferentially discharged at electrode 1 to produce hydrogen gas	1
(c)	State: Electrolyte will change from green to purple/ blue	1
	Explain: Caesium hydroxide will be left behind in the electrolyte and it is an alkali	1
(d)(i)	From Zinc to Copper	1
(ii)	$\text{Cu}^{2+} + 2\text{e}^- \rightarrow \text{Cu}$	1
(iii)	State: Copper	1
	Explain: copper is reduced as oxidation state decreases from +2 in Cu^{2+} to 0 in Cu	1
	Total	10
11(a)		2

Qn	Marking point		Marks
(b)(i)	H H H H -C- -C- -C- -C- H CH₃ H CH₃		1
(ii)	Addition polymers	Condensation polymers	2
	Poly(propene)	Protein	
	Monomers are linked to form one large molecule, poly(propene) with no loss of atoms.	Monomers are linked to form one large molecule, protein with the elimination of a small molecule, water.	
	Poly(propene) is formed from monomers that are unsaturated.	Protein is formed from monomers that contain the amine and carboxyl functional group.	
	Poly(propene) contain monomers are linked together with C-C bond.	Proteins contains monomers that are joined with the amide linkage.	
	Any 2 differences		
(iii)	Mr of propene= 12(3) + 6(1)= 42		1
	Number of repeating units= 5000/ 42 = 119.0476		1
	Minimum no= 120		
(iv)	Durable/ Tough/ Does not tear easily Any reasonable answers		1
(v)	Equation: C ₁₆ H ₃₄ → 4C ₃ H ₆ + C ₄ H ₁₀		1
	Condition: High temperature of 600°C Catalysts – Aluminium oxide and/or Silicon dioxide		1
	Total		10