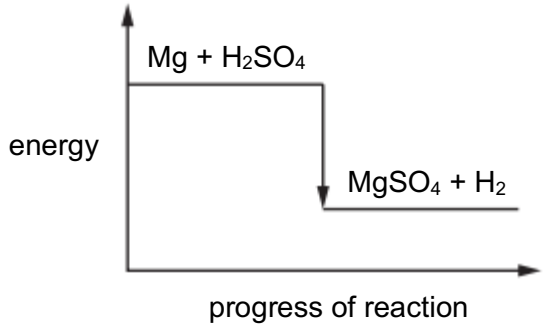
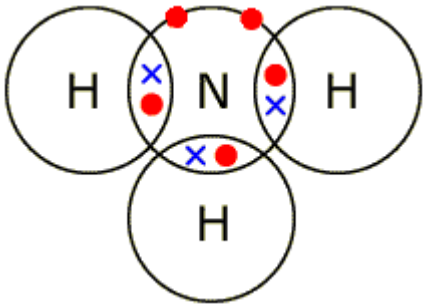
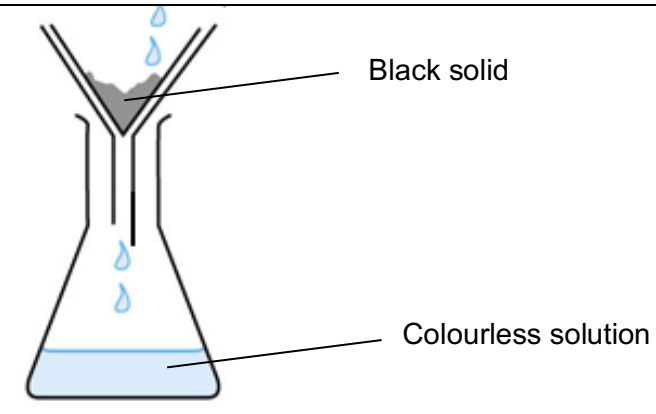
Paper 1 (MCQ)

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

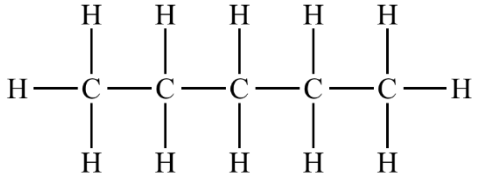
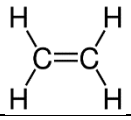
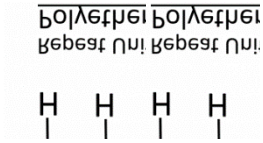
Paper 3 - Section A – 55m

Q/No.	Answer	Comments/Instructions/ Suggestions to Markers	M
1a	Carbon dioxide;		[1]
1b	acidified potassium manganate(VII);		[1]
1c	silver chloride;		[1]
1d	Methane;		[1]
2ai			[1]
2aii	Energy of the reactants is higher than the products showing that energy is transferred /released into the surroundings;		[1]
2bi	Magnesium oxide and hydrogen gas;		[1]
2bii	Silver, chromium, beryllium, magnesium;		[1]
3ai	covalent		[1]
3aii		-number of atoms -number of bonding electrons -number of non bonding electrons 3pt = 2m 1 to 2 pt = 1m	[2]
3bi	there are <u>strong electrostatic forces of attraction</u> between the ions; large amount of energy is needed to <u>overcome</u> the forces;		[2]
3bii	<u>mobile ions/ free moving ions</u> present in molten state only;		[1]
4a	78;		[1]

Q/No.	Answer	Comments/Instructions/ Suggestions to Markers	M
4b	nitrogen and oxygen under high temperatures in the car engines react to form nitrogen monoxide;		[1]
4c	in large quantities cause death / prevents blood from transporting oxygen /		[1]
4d	Carbon dioxide is released through combustion of (carbon containing) fuels / respiration / decomposition / decay; Carbon dioxide is taken in through photosynthesis / ocean uptake; If carbon dioxide released is more than carbon dioxide taken in, there will be a net increase in carbon dioxide in the atmosphere / Carbon dioxide released will be balanced by or is equal to the carbon dioxide taken in.;		[3]
5(a)	G;		[1]
5(b)	E;		[1]
5(c)	D;		[1]
5(d)	F & G;		[1]
5(e)	H;		[1]
6a		**Drawing – 1m** **Label – 1m**	[2]
6b	M – CO_2 / carbon dioxide N – $BaSO_4$ / barium sulfate O – $CuCl_2$ / copper(II) chloride P – $Cu(OH)_2$ / copper(II) hydroxide Q – $AgCl$ / silver chloride		[5]
6c	$Ba(NO_3)_2$ (aq) + SO_4^{2-} (aq) → $BaSO_4$ (s) + $2NO_3^-$ (aq) Ba^{2+} (aq) + SO_4^{2-} (aq) → $BaSO_4$ (s) $2HNO_3$ (aq) + CO_3^{2-} (aq) → $2NO_3^-$ (aq) + H_2O (*l*) + CO_2 (g) $2H^+$ (aq) + CO_3^{2-} (aq) → H_2O (*l*) + CO_2 (g) $CuCl_2$ (aq) + $2AgNO_3$ (aq) → $2AgCl$ (s) + $Cu(NO_3)_2$ (aq) Ag^+ (aq) + Cl^- (aq) → $AgCl$ (s)	formula [1] balanced equation [1] state symbols [1]	[3]

Q/No.	Answer	Comments/Instructions/ Suggestions to Markers	M
	$CuCl_2$ (aq) + 2NaOH (aq) → 2NaCl (aq) + $Cu(OH)_2$ (s) Cu^{2+} (aq) + $2OH^-$ (aq) → $Cu(OH)_2$ (s)		
7ai	$C_nH_{2n+1}COOH$		[1]
7aii	same general formula / similar chemical properties / shows a gradation in physical property	1pt = 1m, max 2m	[2]
7b	produce hydrogen ions / H^+ in aqueous solution / water		[1]
7c	● arrangement: from quite closely packed, disorderly manner ● to far apart, disorderly manner or randomly arranged ● movement: from sliding over each other ● to move randomly at high speed or quickly	4 pt = 3m 2 to 3 pt = 2m 1 pt = 1m	[3]
7di	Mr of propanoic acid = 12 x 3 + 1 x 6 + 2 x 16 = 74		[1]
7dii	Concentration = 125 / 74 = 1.69		[1]
7diii	Concentration = 1 / 2 = 0.500		[1]
8a	Powdered marble is of smaller particle size; When particle size decreases, exposed surface area increases / surface area: volume ratio increases; Frequency of effective collisions increases; Speed of reaction will increase and affect the results;	2 pt = 1m	[2]
8bi	At a lower temperature ● reacting particles have lesser kinetic energy / less particles have energy greater than or equal to activation energy ● lower frequency of effective collision ● reaction is slower / graph or gradient is less steep	3pt = 2m 1 or 2 pt = 1m	[2]
8bii	At a lower concentration ● the same volume of acid used will produce lesser volume of gas ● lesser reacting particles per unit volume ● lower frequency of effective collision ● reaction is slower / graph or gradient is less steep	4 pt = 3m 2 or 3 pt = 2m 1pt = 1m	[3]
8ci	Mole of CO_2 = 100 / 24000 = 1/240 ; Mr of $CaCO_3$ = 40 + 12 + 16 x 3 = 100 Mass of $CaCO_3$ = 1/240 x 100 = 0.417 g ;		[2]
8cii	Mass of $CaCO_3$ = 0.417 x 2 = 0.834 g ;		[1]

Paper 3 - Section B – 10m (2 choose 1 question)

Q/No.	Answer	Comments/Instructions/ Suggestions to Markers	M
9(a)	Ca: 2,8,8,2; 2 valence electrons hence in Group 2; 4 electron shells hence in Period 4;	3pt = 2m 1 or 2 pt = 1m	[2]
9(bi)	Hydrogen		[1]
9(bii)	OH^-		[1]
9(biii)	Add Universal Indicator into the solution; Compare the resulting colour with a pH chart to determine the pH;		[2]
9(c)	Bubbles of gas observed; Violent reaction with potassium and calcium reacts readily; Potassium floats on water and calcium sinks;	**A: K – lilac flame seen / catches fire**	[3]
9(d)	Argon has completely filled valence shell and is unreactive		[1]
10(ai)	Cracking naphtha is essential to match the demand for fractions ; containing smaller molecules from the refinery process;		[2]
10(aii)	Hydrocarbon X  Hydrocarbon Y 	**1m each**	[2]
10(aiii)	Bromine water / aqueous bromine / bromine solution; X – remains reddish brown; Y – turns colourless;	3pt = 2m 1 or 2 pt = 1m	[2]
10(aiv)		correct partial drawing with at least 2 carbon [1] two repeating units [1]	[2]
10(bi)	Polyunsaturated contain hydrocarbon chains with two or more carbon-carbon double bonds in each chain		[1]
10(bii)	The carbon-carbon double bond gets broken / become single bond / hydrogen are added across the double bond		[1]

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