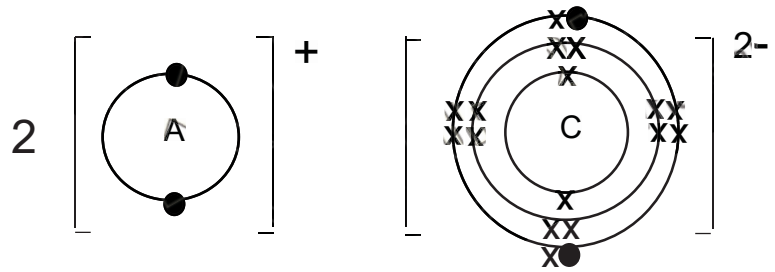
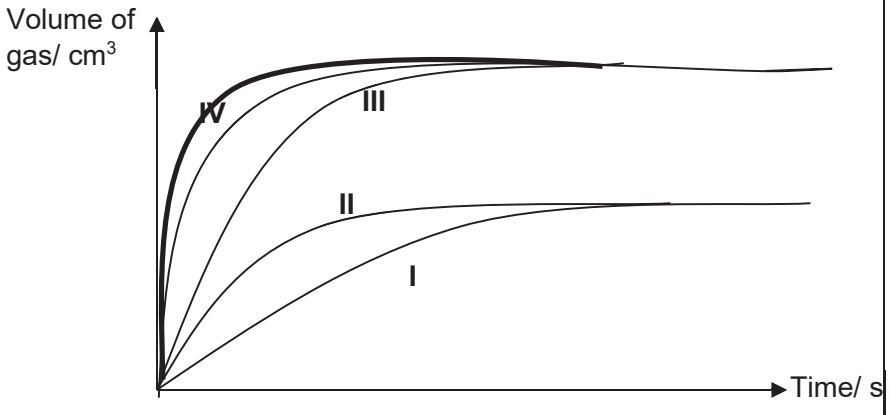
Bendemeer Secondary School
2019 Preliminary Exam
Science (Chemistry)
Answer Scheme

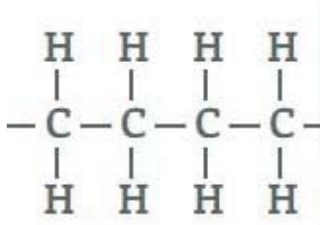
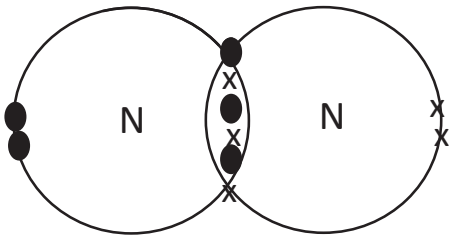
Paper 1

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

Paper 3

Qn	Answer	Mks	Marker's Comments
1	(a) sodium oxide/ potassium chloride (b) nitrogen (c) chlorine (d) argon (e) brass	1 1 1 1 1	
2	(a) Electronic structure of C is 2.8.6. It gains 2 electrons during reactions. Non-metals gain electrons during reactions.	1	
	(b) silicon	1	
	(c) A	1	
	(d)  	2	
	(e) High melting point. It is an **ionic compound** with **giant ionic structure**. A lot of energy is needed to overcome **the strong electrostatic forces of attraction between the oppositely charged ions.**	½ ½ 1	
3	(a) Mg Ni Sn Cu Ag	2 (3 correct 1m)	
	(b) Magnesium dissolves/ Blue solution turns colourless/ pink solid formed.	Any 2	
	(c) (i) Magnesium/ calcium/ zinc	1	

	(ii) $M + Fe(NO_3)_2 \rightarrow Fe + M(NO_3)_2$	1	
	(iii) Oxidation state of M increases from 0 in M to +2 in $M(NO_3)_2$. Hence M is oxidised. Oxidation state of Fe decreases from +2 in $Fe(NO_3)_2$ to 0 in Fe. Hence Fe is reduced. There is both oxidation and reduction taking place at the same time. Hence this is a redox reaction.	1 1	
4	(a) (i) $25/1000 \times 0.5 = 0.0125$	1	
	(ii) $NH_4OH : H_3PO_4$ 3 : 1 (from equation) 0.0125 : **0.00417**	1	
	(iii) Concentration = Mole/vol = 0.00417/ (33.5/1000) = **0.124 mol/dm^3**	1 1	
	(bi) $2(NH_4)_3PO_4 + 3Ca(OH)_2 \rightarrow Ca_3(PO_4)_2 + 6NH_3 + 6H_2O$ Ammonium phosphate will react with calcium hydroxide instead of fertilizing the soil.	1 1	
	(ii) $H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$	1	
5	(a) Ammonium chloride and water	1	
	(b) **Heat is taken in** from the surroundings when dissolving ammonium chloride in water. It is an **endothermic** process.	½ ½	
6	(a) R	1	
	(b) (i) P	1	
	(ii) P forms white precipitate when barium chloride is added, indicating that sulfate ions are present. P has no visible reaction when silver nitrate is added, indicating the absence of chloride ions.	1	
	(c) S	1	
7	(a) $CaCO_3 + 2HCl \rightarrow CaCl_2 + CO_2 + H_2O$	1	
	(b) Experiment A: curve I Experiment B: curve III Experiment C: curve II Experiment D: curve IV	½ m each	
	(c)  	1	

	(d) Temperature of acid.	1	
8	(a) (i) Cracking	1	
	(ii) Test: Add aqueous bromine Result with C_8H_{18}: No reaction with aqueous bromine Result with C_4H_8: Decolourises aqueous bromine	1 ½ ½	
	(b) (i) paraffin	1	
	(ii) $C_{18}H_{38} \rightarrow 6C_2H_4 + \mathbf{C_6H_{14}}$	1	
	(c) (i) "Non-biodegradable" means that the polymer cannot be broken down into simpler substances by air and bacteria.	1	
	(ii) 	1	
9	(a) W: ethanol, C_2H_5OH X: ethene, C_2H_4 Y: ethane, C_2H_6 Z: dibromoethane, $C_2H_4Br_2$	1 1 1 1	
	(b) $C_2H_4 + H_2O \rightarrow C_2H_5OH$ Conditions: 300°C, 60 atm, phosphoric (V) acid as catalyst	1 1	
	(c) $C_2H_5OH + O_2 \rightarrow CH_3COOH + H_2O$ Ethanol can be oxidised by atmospheric oxygen or by potassium manganite(VII) to ethanoic acid.	1 1	
	(d) Number of mole of W, C_2H_5OH = 0.42/ (2x12+5+16+1) = 0.00913 Volume of W, C_2H_5OH = 0.00913 x 24 = **0.219 dm^3**	1 1	
10	(a) (i) $2NaN_3$ (s) → 2Na (s) + $3N_2$ (g)	2	
	(ii) 	2	
	(iii) Number of moles of NaN_3 = 130/(23+3x14) = 2 NaN_3 : N_2 2 : 3 Volume of N_2 that should be produced from 130 g of NaN_3 = 3 x 24 = 72 dm^3	1 1 1	

	The volume of nitrogen gas produced is 60 dm^3 instead of 72 dm^3. Hence the thermal decomposition of sodium azide has not been efficient.		
	(b) The reaction is cracking. $C_{20}H_{42} \rightarrow 10C_2H_4 + H_2$ Under heat and catalyst, the alkane molecules are cracked into smaller ones which are more useful.	1 1 1	
11	(a)(i) Halogens		
	(ii) Experiment 1: reddish-brown solution decolourises and purple/black solid seen formed. Br_2 (aq) + 2KI (aq) → 2KBr (aq) + I_2 (s) Experiment 2: reddish-brown solution formed. Cl_2 (aq) + 2KBr (aq) → 2KCl (aq) + Br_2 (l) Experiment 3: No reaction *(no need state symbols for equations)*	½ ½ ½ ½ 1	
	(iii) iodine, bromine, chlorine **Reactivity decreases** down the group as it gets **harder for the atom to gain 1 more electron** down the group.	1 ½,½	
	(b)(i) hydrochloric acid and magnesium/ magnesium carbonate/ magnesium oxide/ magnesium hydroxide	½ ½	
	(ii) Add excess magnesium/ magnesium carbonate/ magnesium oxide/ magnesium hydroxide to hydrochloric acid. Filter to remove excess magnesium/ magnesium carbonate/ magnesium oxide/ magnesium hydroxide as the residue. Heat filtrate to obtain a saturated solution of magnesium chloride. Cool to form crystals of magnesium chloride. Dry magnesium chloride crystals in between 2 pieces of filter papers.	1 ½ ½ ½ ½	