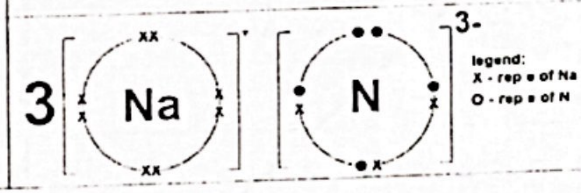
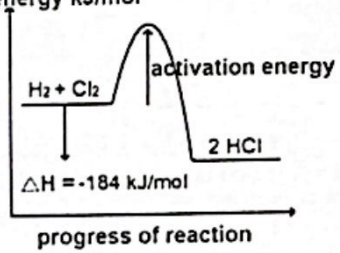
Solutions for 2019 Chemistry EOY 6092 paper 1 and paper 2

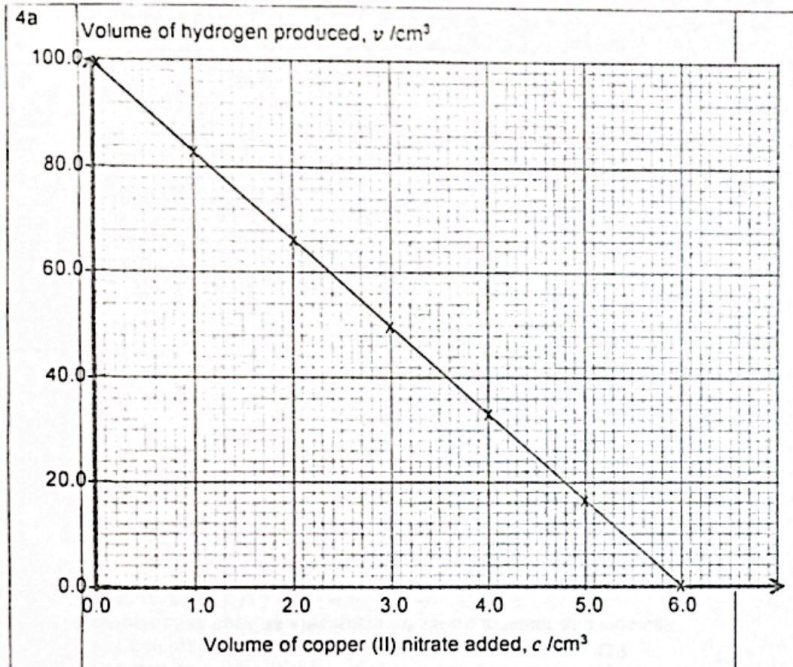
Paper 1

1. D	2. D	3. A	4. C	5. B
6. D	7. B	8. B	9. B	10. C
11. B	12. D	13. D	14. C	15. [A]
16. C	17. B	18. A	19. A	20. B
21. D	22. A	23. B	24. B	25. C
26. A	27. A	28. A	29. B	30. A
31. A	32. B	33. A	34. A	35. C
36. B	37. D	38. A	39. C	40. B

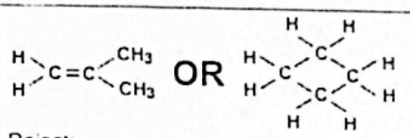
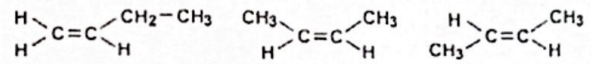
Paper 2

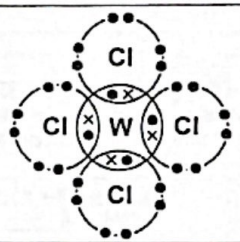
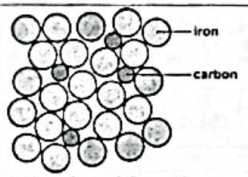
S/No.	Answers	Marks
1a	Similarity: both have 2 protons (and or 2 electrons) Differences: Helium 3 has 1 neutron while helium 4 has 2 neutrons	1 1
1bi	Helium does not form any compounds as it is a noble gas (or has fully filled outermost(valence) shell) / duplet electronic configuration. *Reject: helium can form compounds (it does not show any unusual characteristic from the answer).*	1
1bii	At extreme high pressures, particles are close together which increases the chance of effective collisions causing the reactants to react.	1
1c	Used as insulators (for cables) The ions or electrons are held in fixed lattice structures (or localized) and cannot carry electric charges to conduct electricity. OR Include uses such as electrolyte (dissolve in water and ions can conduct electricity)	1
	Total	5
2a	Ammonia it is collected by upward delivery method and dried by calcium oxide.	1 1
2b	Sodium chloride / ammonium chloride	1
2c	$Na_3N + 4HCl \rightarrow 3NaCl + NH_4Cl$	1
2d		2

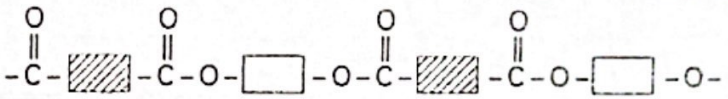
	Total	6
3a	Energy change for bond formation (making) Enthalpy change is negative indicates less energy is absorbed for breaking H-H and Cl-Cl than energy released for making H-Cl 6 underlined phrase 2 marks, 3 underlined phrase 1 mk. No ½ mark	1 1 1
3b	energy kJ/mol  Shape + formulae + correct direction for Ea and ΔH – 2 mks. Every 2 correct- 1 mk. No double arrows and no ½ mark	2
3c	No. of moles of $Cl_2 = \frac{14.2}{71} = 0.2$ mol Energy change = 0.2 x (-184) = - 36.8 kJ	1 1
3d	Oxidation state of hydrogen increases from 0 in H_2 to +1 in HCl. It is oxidized. Oxidation state of chlorine decreases from 0 in Cl_2 to -1 in HCl. It is reduced. When both oxidation and reduction takes place together, it is a redox reaction. 3 points – 2 mk; 2 points - 1 mk and no ½ mark	2
	Total	9

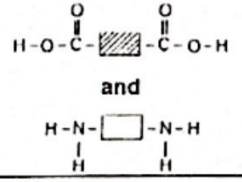
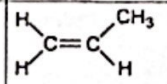
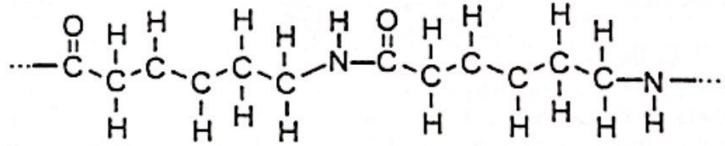
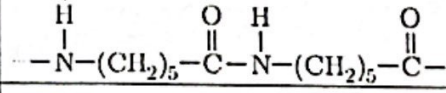
4a		
4b	Zinc. To ensure all the acid fully reacted (and will not form acidic salt).	1
4ci	As the volume of copper (II) nitrate added increases, the volume of hydrogen gas produced decreases.	1
4cii	Zinc is more reactive than copper and it will displace copper from its solution. There is less amount (or mass) of zinc to react with acid to produce hydrogen.	1 1
4di	$Zn + 2\ HNO_3 \rightarrow Zn(NO_3)_2 + H_2$	1
4dii	Volume of hydrogen gas = 100cm³ (when 0 cm³ of copper (II) nitrate is added. Number of moles of $H_2 = \frac{0.1}{24} = 0.004166$ mol Number of moles of zinc = 0.004166 mol Mass of zinc to be used = 0.004166 x 65 = 0.2707 g = 0.271 g (3s.f)	1 1

4e	By using powder, this increases the surface area to volume ratio. There are more reacting surfaces for H^+ ions to collide onto. This increases the frequency of effective collision and increases the rates of reaction. *Note: reject acid molecules.* 4 points 2 mks; 2 points 1 mk; no ½ mark	1 1
	Total	11
5ai	Carbon monoxide is produced due to incomplete combustion of petrol (or carbon containing fuel). Oxides of nitrogen is produced due to high temperature in engines	1 1
5aii	Nitrogen and carbon dioxide Note: Accept oxygen as it is indicated in the passage.	1
5b	Petroleum is **heated** in a furnace and it **vaporizes.** The vapour rises up the fractionating column and is **separated according to boiling points.** Fractions with **shorter chains have lower boiling points** such as petrol is **distilled near to the top** of the fractionating column. *Note: need to mention how petrol is obtained.* *Fractions are obtained near to the top, not by speed*	1 1 1
	Total	6
5ci	$N_2 + 3\ H_2 \rightleftharpoons 2\ NH_3$	1
5cii	From the equation, gases are entering the reactor in the ratio of **1 molecule of nitrogen to 3 molecules of hydrogen.** According to Avogadro's Law, it states that **equal volumes of gases at the same temperature and pressure contain equal numbers of molecules,** which is the proportion demanded by the equation	1 1
5ciii	When ammonium nitrate dissolves in water, the **forces of attraction between water molecules and ammonium nitrate is strong enough to pull ammonium nitrate** from the lattice structure.	1 1
5civ	% of nitrogen in ammonium nitrate = $\frac{2(14)}{14+4+14+3(16)} \times 100\% = 35\%$ % of nitrogen in urea = $\frac{2(14)}{12+16+2(14+2)} \times 100\% = 33.3\%$ This shows that urea contains more mass of nitrogen. Note: need to include the justification statement.	2
	Total	7

6a	C: ethene / C_2H_4	E:ethane/ C_2H_6	4
	D: dibromoethane / $C_2H_4Br_2$ Accept if student name it as structural formula.	F:chloroethene/ C_2H_3Cl	
6bi	$C_{15}H_{32} \rightarrow 4C_2H_4 + C_3H_8 + C_4H_8$ Conditions 600°C with Al_2O_3/SiO_2 as catalyst		1
6bii	 OR Reject: 		1
	Total		6
7ai	Gas G: $2H^+ (aq) + 2e^- \rightarrow H_2 (g)$ Gas H: $2Cl^- (aq) \rightarrow Cl_2 (g) + 2e^-$ Gas I: $4OH^- (aq) \rightarrow O_2 (g) + 2H_2O (l) + 4e^-$		1 1 1
7aii	At the beginning, there is a large concentration of Cl-, it is discharged preferentially as compared to OH-. Hence chlorine is obtained As the electrolysis proceeds, there are lesser concentration of Cl-, OH- ions is preferentially discharged. Hence oxygen is obtained.		1 1
7aiii	Electrolysis of acid will give acidic fumes which is corrosive / irritates breathing system / harmful for health.		1
7bi	Aqueous silver nitrate / aqueous silver sulfate		1
7bii	Concentration of silver solution remains unchanged		1
7biii	$Ag (s) \rightarrow Ag^+ (aq) + e^-$ Silver electrode dissolves/becomes smaller		1 1
	Total		10

8 ai	X High melting point / high density/ formed coloured compounds/have formed ions of multiple valencies Any 2 correct evidences Accept Z.	2
8 aii	Y Formed ions of charge +1 / low density/ low melting point	2
8 b	$2 Y + 2 HCl \rightarrow 2 YCl + H_2$	1
8 c	Z becomes smaller / colour of solution changes from blue to colourless / reddish brown (pink) solid deposited	1
8di	 **Legend** •- rep e of Cl ×- rep e of W	2
8dii	 Note: size of C << Fe Number of C should be less than 5 as the indicated percentage of C is "small amount".	1
	Atoms of different sizes disrupt the orderly arrangement and prevent layers from sliding.	1
	Total	10
Either 9		
ai	Glucose reacts with yeast in air tight container at 37°C to form ethanol. The mixture of ethanol undergoes fractional distillation to obtain pure ethanol.	1 1

aii	As a solvent / as alcoholic beverage rej: perfume / alcohol without explaining further	1
bi	$C_2H_5ONa + CH_3CH_2COCl \rightarrow NaCl + CH_3CH_2COOC_2H_5$	1
bii	Ethyl propanoate	1
biii	Terylene	1
		2
ci	Carboxylic acid	1
cii	Iron will corrode/react with the acids.	1
	Total	10

OR				
9a		Nylon	Poly(propene)	
	structure	macromolecule		
	Types of polymerisation	condensation	addition	
	monomers	 and		
	linkages	amide	c-c long chain	
	• Both nylon and poly(propene) have macromolecular structures. • Nylon is made by many monomers of dicarboxylic acid and diamine (accept structures) while poly(propene) is made by many monomers of propene (accept structures) • Nylon is made by the process of condensation polymerization while poly(propene) is made by the process of addition polymerisation • Nylon is joined by amide linkages while in poly(propene), it is joined by the opening of the double bond to form a long carbon chain. Note: accept tabulation.			1 2 1 1 1
9bi	 Accept condensed formula= 			2
9bii	Polypropene will not have any visible observation with dilute acids Nylon will have a hole/corrode/damage with dilute acids. Reject: "react", as it is used in the question.			1 1
	Total			10