Past Papers Advanced Higher Chemistry

2018 Marking Scheme

Grade Awarded	Mark Required		% candidates achieving grade
	(/130)	%	
A	88+	67.7%	31.5%
B	73+	56.2%	27.6%
C	59+	45.4%	23.2%
D	52+	40%	8.1%
No award	<52	<40%	9.6%

Section:	Multiple Choice	Extended Answer	Project
Average Mark:	18.8 /30	39.3 /70	19.1 /30

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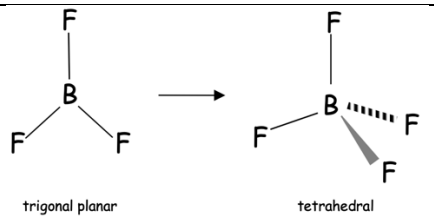
MC Qu	Answer	% Pupils Correct	Reasoning
1	A		☑A Beta particles which are electrons emitted from the nucleus ☒B Gamma rays are a form of electromagnetic radiation with wavelength & frequency ☒C Infrared is a form of electromagnetic radiation with wavelength & frequency ☒D ultraviolet is a form of electromagnetic radiation with wavelength & frequency
2	D		☒A s-block is found in groups 1+2 of the periodic table ☒B p-block is found in groups 2 through to group 0 of the periodic table ☒C d-block is found between groups 2+3 of the periodic table (transition metals) ☑D f-block is the two groups at the bottom of periodic table (Actinides and Lanthanides)
3	A		The d-orbital shown (d_{xy}) in the question will hold a maximum of two electrons.
4	D		
5	B		Ni atom: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8\ 4s^2$ ∴ Ni^{2+} ion: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^8$ ☒A Ni^{2+} ions have 8 electrons in the 3d shell as 4s electrons are removed before 3d ☑B The six electrons occupy the three lower 3d orbitals after 3d splits into 2 levels ☒C The ligands in the complex split the 3d orbitals into two levels. ☒D Ni^{2+} ions have 8 electrons in the 3d shell as 4s electrons are removed before 3d
6	C		☒A Oxidation number of Mn in MnO_4^- = +7 ☒B Oxidation number of Mn in MnO_4^{2-} = +6 ☑C Oxidation number of Mn in MnO_4^{3-} = +5 ☒D Oxidation number of Mn in MnO_2 = +4
7	A		☑A increase in temperature decreases K and decreases concentration of SO_2 ☒B increase in temperature favours reverse endothermic reaction ∴ less products ☒C increase in temperature favours reverse endothermic reaction ∴ K decreases ☒D increase in temperature favours reverse endothermic reaction ∴ K decreases
8	D		H_2CO_3 + CN^- ⇌ HCN + HCO_3^- Acid (Donates H^+) — Base (Accepts H^+) — Conjugate Acid (Formed when Base accepts H^+) — Conjugate Base (Formed when Acid loses H^+)
9	B		pH = 8.5 ∴ $-\log_{10}[H^+] = 8.5$ ∴ $\log_{10}[H^+] = -8.5$ ∴ $[H^+] = 10^{-8.5} = 3.16\times10^{-9}$ mol l^{-1} $[H^+]\,[OH^-] = 10^{-14}$ ∴ $[OH^-] = \frac{10^{-14}}{[H^+]} = \frac{1\times10^{-14}}{3.16\times10^{-9}} = 3.16\times10^{-6}$ mol l^{-1}
10	C		☒A Catalysts do not change the position of equilibrium ☒B H_3O^+ ions are a product so adding sulphuric acid will shift equilibrium to left ☑C NaOH neutralises H_3O^+ ions so removing a product and shifts equilibrium to right ☒D $C_3H_7COO^-$ ions are a product so adding sulphuric acid will shift equilibrium to left
11	D		☒A sodium sulphate solution is neutral pH=7 (strong acid v strong alkali) ☒B lithium chloride solution is neutral pH=7 (strong acid v strong alkali) ☒C ammonium nitrate solution is acidic pH<7 (strong acid v weak alkali) ☑D potassium propanoate solution is alkaline pH>7 (weak acid v strong alkali) H^+ ions join up with propanoate ions to form molecules of propanoic acid. Water molecules then split into ions to replace H^+ ions but concentration of OH^- builds up as H^+ is removed.

12 B

☒A sodium chloride is made from a strong alkali so no buffer forms
☑B buffers form when salt of a weak alkali (ammonium chloride) dissolves in a weak acid (ammonia)
☒C sodium hydroxide is a strong acid and no buffer forms
☒D sodium hydroxide is a strong acid and no buffer forms

13 D

$\Delta G = \Delta H - T\Delta S$ ∴ $\Delta G - \Delta H = -T\Delta S$

If $\Delta G - \Delta H$ is approximately zero then $-T\Delta S$ must also be approximately xero. This means ΔS must be approximately zero then there must be little change to disorder during the reaction.

☒A CO_2 gas released which increases disorder and increases ΔS
☒B Two gases formed from a solid which increases disorder and increases ΔS
☒C H_2 gas released which increases disorder and increases ΔS
☑D Solid and an ion turning into a solid and an ion keeps disorder level (ΔS) similar

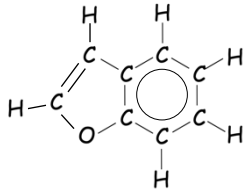
14 B

☒A The overall order is the sum of the individual orders ∴ overall order = 1+2 =3
☑B This reaction must have second step as equal no. of moles of P + Q are used up in the equation but the rate determining step has two particles of Q reacting with one particle of P. A second particle of P must react in the other step.
☒C Rates of reaction always decrease as concentration of reactants decreases
☒D As P is first order then doubling [P] will double the rate of reaction

15 B

Bond	C–H	C–C	C≡C
Type of hybridisation	sp^3 hybridisation	sp^3 hybridisation	sp hybridisation

16 C



formula C_8H_6O

gfm = (8x12) + (6x1) + (1x16) = 96+6+16 = 118g

17 A

☑A W and X in same position in both diagrams but Z and Y in opposite positions
☒B XYZ on bottom are in in same anti-clockwise as comparison diagram.
☒C XYZ on bottom are in in same anti-clockwise as comparison diagram.
☒D XYZ on bottom are in in same anti-clockwise as comparison diagram.

18 A

☑A sodium + butan-1-ol react to form sodium butoxide $CH_3CH_2CH_2CHO^-Na^+ + H_2$
☒B sodium + butanoic acid would form sodium butanoate + hydrogen
☒C sodium hydroxide does not react with alcohols
☒D sodium hydroxide + butanoic acid would form sodium butanoate + hydrogen

19 C

☒A Hydration: Adding water across a double or triple bond
☒B Oxidation: Increasing the oxygen : hydrogen ratio in a compound
☑C Hydrolysis: spitting into two molecules with water added at break
☒D Hydrogenation: Adding hydrogen across a double bond or triple bond

20 B

Element	Cu	O
Mass	16g	2g
No. of moles (divide % by gfm)	$\frac{16}{63.5}$ = 0.252	$\frac{2}{16}$ = 0.125
Mole ratio (divide through by smallest value)	$\frac{0.252}{0.125}$ = 2.02	$\frac{0.125}{0.125}$ 1.00
Round to Whole Number	2	1

21 C

☒A gfm CH_3OCOCH_3 = (3x12)+(6x1)+(2x16) = 36+6+32 = 74g
☒B gfm CH_3CH_2COOH = (3x12)+(6x1)+(2x16) = 36+6+32 = 74g
☑C gfm $CH_3CH_2CH_2CH_2NH_2$ = (4x12)+(11x1)+(1x14) = 48+11+34 = 73g
☒D gfm $CH_3CH(OH)CH_2CH_3$ = (4x12)+(10x1)+(1x16) = 48+10+16 = 74g

22 C

☒A Absorption peak at 3100 – 3000cm^{-1} due to C-H stretch in benzene ring
☒B Absorption peak at 2962 – 2853cm^{-1} due to C-H stretch in an alkane
☑C No absorption peak at 1730 – 1717cm^{-1} as there is no C=O aromatic ester in eugenol
☒D Absorption peak at 1150 – 1070cm^{-1} due to C-O stretch in alkyl ether

23	A		☑A Agonist: Binds to the receptor and causes an internal response in the cell ☒B Antagonist: Bind to the receptor but does not cause internal response in the cell ☒C Inhibitor: Block the substrate from entering the receptor ☒D Receptor: Protein in membrane of cells that allows molecules to bind with it.
24	B		**n**o. of mol = **v**olume x **c**oncentration = 0.05litres x 2 mol l^{-1} = 0.1mol **c**oncentration = $\frac{\textbf{n}\text{o. of mol}}{\textbf{v}\text{olume}} = \frac{0.1\text{ mol}}{0.25\text{litres}} = 0.4\text{ mol } l^{-1}$
25	B		☒A $CH_3CH_2CH_2CH_2CHO$ is an aldehyde and is miscible with water ☑B $CH_3CH_2OCH_2CH_2CH_3$ is an ether and is immiscible with water ☒C $CH_3CH_2CH_2CH_2COOH$ is an carboxylic acid and is miscible with water ☒D $CH_3CH(OH)CH_2CH_2CH_3$ is an alcohol and is miscible with water
26	D		☒A This is a step in a recrystallisation technique ☒B This is a step in a recrystallisation technique ☒C This is a step in a recrystallisation technique ☑D This is a step in gravimetric analysis to show all dissolved ion has precipitated.
27	B		☒A Purification should give a melting point over a narrower range ☑B Recrystallisation raises the melting point and narrows the temperature range ☒C Impurities lower the melting point so purification raises the melting point ☒D Impurities lower the melting point so purification raises the melting point
28	C		☒A Desiccators remove moisture from the atmosphere not oxygen ☒B Heating the sample removes water from the sample, not the desiccator. ☑C While sample is cooling in desiccator, moisture cannot be reabsorbed by the sample ☒D Desiccators do not prevent decomposition of sample, probably in the heating stage
29	D		☒A The distance moved by the solvent does not alter the value of the R_f value ☒B The sample will move the same distance regardless of concentration ☒C The length of TLC plate is not a factor in the R_f value ☑D The solvent used decides how far the sample moves and the R_f value.
30	C		☒A Distillation separates the chemicals while refluxing returns the chemical to flask ☒B Distillation separates the chemicals while refluxing returns the chemical to flask ☑C Coldest water (from tap) should be nearest hot vapours entering condenser ☒D If the water travels against the flow in condenser arm then the hottest water is nearest the flask and the vapour will travel further up the condenser

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1a(i)

Answer: sodium

Reasoning: From page15 of data booklet: FLAME COLOURS

Element	Barium	Calcium	Copper	Lithium	Potassium	Sodium	Strontium
Wavelength /nm	554	620	522	671	405	589	650
Colour	green	orange-red	blue-green	crimson	lilac	orange-yellow	red

1a(ii)

Answer: 425nm

Reasoning:

$$E = \frac{L \times h \times c}{\lambda} \quad \therefore \lambda = \frac{L \times h \times c}{E} = \frac{6.02\times10^{23}\,mol^{-1} \times 6.63\times10^{-34}\,J\,s \times 3\times10^{8}\,m\,s^{-1}}{282 \times 1000\,J\,mol^{-1}}$$

$$= 4.25 \times 10^{-7}\,m$$

$$= 425\,nm$$

1a(iii)

Answer: 87

Reasoning:

Relative Intensity 375 ⟷ 435mg kg^{-1}

Relative Intensity 75 ⟷ 435mg $kg^{-1} \times {}^{75}/_{375}$

= 87mg kg^{-1}

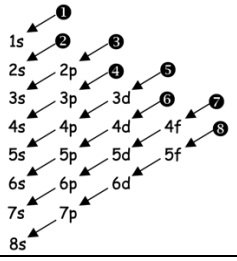
1b(i)

Answer: Orbitals fill up in order of increasing energy

Reasoning:

Aufbau Principle:
Electrons fill up in order of increasing energy:

1s 2s 2p 3s 3p 4s 3d 4p 5s 4d 5p 6s 4f 5d 6p 7s 5f 6d 7p 8s



1b(ii)

Answer:

n	l	m_l	m_s
3	1	-1 or 0 or +1	$+\frac{1}{2}$ or $-\frac{1}{2}$

Reasoning:

n	Principal Quantum Number	n = Electron Shell Number
l	Angular Momentum Quantum Number	l = Type/Shape of subshell where l goes from 0 up to n-1

l = 0	l = 1	l = 2	l = 3
s subshell	p subshell	d subshell	f subshell

m_l — Magnetic Quantum Number: m_l is the orientation of the subshell where m_l goes from -l to +l

Value of l	Subshell type	Value of m_l						
0	s				0			
1	p			-1	0	1		
2	d		-2	-1	0	1	2	
3	f	-3	-2	-1	0	1	2	3

m_s — Spin Quantum Number: m_s is the spin direction of an electron and has either value of $+\frac{1}{2}$ or $-\frac{1}{2}$

2a(i)

Answer: $K_a = \frac{[HOOCCH_2CH(OH)COO^-]\,[H_3O^+]}{[HOOCCH_2CH(OH)COOH]}$

Reasoning:

H_2O is both a reactant and the solvent $\therefore [H_2O] = 1$

$$K_a = \frac{[HOOCCH_2CH(OH)COO^-]^1 \times [H_3O^+]^1}{[HOOCCH_2CH(OH)COOH]^1 \times [H_2O]^1} = \frac{[HOOCCH_2CH(OH)COO^-]\,[H_3O^+]}{[HOOCCH_2CH(OH)COOH]}$$

2a(ii)

Answer: Equation showing:

Reasoning:

$$HOOCCH_2CH(OH)COO^- + H_2O \rightleftharpoons {}^-OOCCH_2CH(OH)COO^- + H_3O^+$$

2b(i)

Answer: 2.90

Reasoning:

$$pH = \tfrac{1}{2}pK_a - \tfrac{1}{2}\log_{10} c$$
$$= -\tfrac{1}{2}\log_{10}K_a - \tfrac{1}{2}\log_{10} c$$
$$= -\tfrac{1}{2}\log_{10}(3.2\times10^{-4}) - \tfrac{1}{2} \times \log_{10}(0.0051)$$
$$= (-\tfrac{1}{2} \times -3.49) - (\tfrac{1}{2} \times -2.29)$$
$$= 1.75 - (-1.15)$$
$$= 2.90$$

2b(ii)

Answer: Hydrogen bonding between chains

Reasoning: Each unit within a pectin chain has two hydroxyl -OH groups which would allow hydrogen bonding between the pectin chains and thicken the jam.

3a

Answer: All four of the following required:

Dissolve sodium carbonate in deionised water	Transfer the solution and the rinsings	Use of a 250cm^3 standard/volumetric flask	Make up to the line flask with deionised water

3b(i)

0.0348mol

Average titre = $\frac{19.5 + 19.4}{2}$ = 19.45 cm^3

no. of mol = **v**olume x **c**oncentration = 0.01945 litres x 0.358 mol l^{-1} = 6.97×10^{-3} mol

$$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + H_2O + CO_2$$

1mol : 2mol

3.48×10^{-3} mol : 6.97×10^{-3} mol

$25cm^3$ sodium carbonate solution ⟷ 3.48×10^{-3} mol

$250cm^3$ sodium carbonate solution ⟷ 3.48×10^{-2} mol

3b(ii)

7

gfm Na_2CO_3 = (2x23)+(1x12)+(3x16) = 46+12+48 = 106g

mass = **n**o. of mol x **gfm** = 0.0348 x 106 = 3.69g

mass of water = mass of hydrated sodium carbonate − mass of unhydrated sodium carbonate

mass of water = 8.10g − 3.69g

mass of water = 4.41g

Chemical	Na_2CO_3	H_2O
Mass	3.69g	4.41g
no. of mol (divide by gfm)	$\frac{3.69}{106}$ = 0.0348	$\frac{4.41}{18}$ = 0.245
Divide by smallest value	$\frac{0.0348}{0.0348}$ = 1	$\frac{0.235}{0.0348}$ = 7.04

Formula of hydrated sodium carbonate: $Na_2CO_3 \cdot 7H_2O$

3c

Open Question to include:

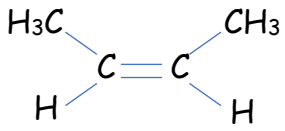
3 mark answer	2 mark answer	1 mark answer
Demonstrates a **good understanding** of the chemistry involved. A good comprehension of the chemistry has provided in a logically correct, including a statement of the principles involved and the application of these to respond to the problem.	Demonstrates a **reasonable understanding** of the chemistry involved, making some statement(s) which are relevant to the situation, showing that the problem is understood.	Demonstrates a **limited understanding** of the chemistry involved. The candidate has made some statement(s) which are relevant to the situation, showing that at least a little of the chemistry within the problem is understood.

4a

One answer from:

Unpaired d electrons	Empty/half-filled/incomplete d orbitals	Variable oxidation states	Donating and accepting electrons

4b



structural formula

Skeletal formula

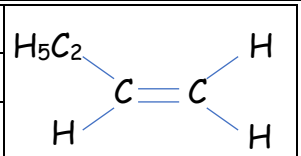
4c

One answer from:

But-1-ene has two hydrogens on one end of C=C

But-1-ene has three hydrogens attached to C=C

Swapping any of the groups on the C=C always results in the same structure



4d(i) PART A

-126 kJ mol^{-1}

ΔH^o = $\Sigma \Delta H_f^o$(products) − $\Sigma \Delta H_f^o$(reactants)

= (1x-6.99) − ((1x119)+(1x0))

= -6.99 − (119 + 0)

= -6.99 − 119

= -125.99 kJ mol^{-1}

4d(i) PART B

-23.2 J K^{-1} mol^{-1}

ΔG^o = $\Sigma \Delta G^o$(products) − $\Sigma \Delta G^o$(reactants)

= (1x-65.9) − ((1x185)+(1x0))

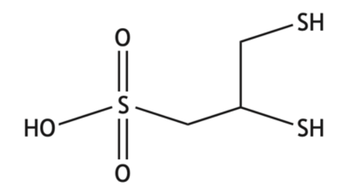
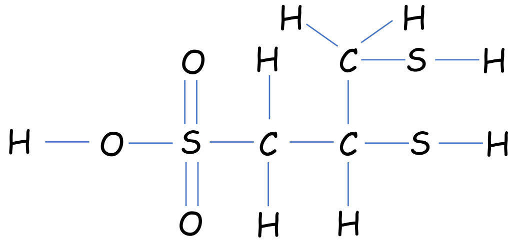
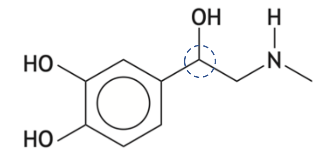
= -65.9 − (185 + 0)

= -65.9 − 185

= -119.1 kJ mol^{-1}

$\Delta G^o = \Delta H^o - T\Delta S^o$ $\therefore \Delta S^o = \frac{\Delta G^o - \Delta H^o}{-T} = \frac{-119.1 - 126}{-298}$ = -0.0232 kJ K^{-1} mol^{-1}

= -23.2 J K^{-1} mol^{-1}

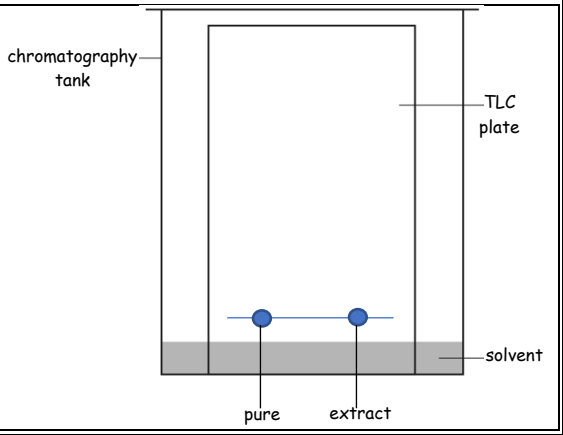
4d(ii)	5431	The reaction becomes thermodynamically feasible when $\Delta G° = 0$ $\Delta G° = \Delta H° - T\Delta S° = 0 \quad \therefore T\Delta S° = \Delta H° \quad \therefore T = \frac{\Delta H°}{\Delta S°} = \frac{-126 \times 1000 \text{ J mol}^{-1}}{-23.2 \text{ J K}^{-1} \text{ mol}^{-1}} = 5431\text{K}$
5a	Conjugated system	A conjugated system is a section of a compound with alternating C=C double bonds and C-C single bonds.
5b	Answer to include:	1st Mark: Electrons move from HOMO (Highest Occupied Molecular Orbital) to LUMO (Lowest Unoccupied Molecular Orbital) 2nd Mark: Absorption of light (from the visible part of the spectrum) means that light of the complementary colour is seen
5c	Answer to include:	1st Mark: One from: less conjugation / a shorter sequence of alternating double and single bonds / a smaller chromophore 2nd Mark: Larger gap between HOMO and LUMO and greater energy (absorbed) as shorter wavelength has greater energy
6a	One answer from:	Ligands donate pairs of electrons to metal atom (lone pairs or non-bonding pair) / Ligands form dative covalent bonds with metal ion
6b(i)	$C_3H_8O_3S_3$	 Skeletal Formula  Full Structural Formula
6b(ii) PART A	Bidentate	An electron pair on each Sulphur in the thiol -SH groups donate one of their lone pairs to the Mercury ion and forms a dative covalent bond.
6b(ii) PART B	4	Each DMPS ligand molecule donates lone pairs of from two of its sulphur atoms to give four dative covalent bonds on the Mercury ion in the centre.
6c(i)	Gravimetric	Gravimetric analysis involves measuring the mass accurately to calculate the number of moles of substances.
6c(ii)	96.1%	$\text{no. of mol} = \frac{\textbf{mass}}{\textbf{gfm}} = \frac{4.82\text{g}}{388.7 \text{ g mol}^{-1}} = 0.0167\text{mol}$ 0.0167mol complex contains 0.0167mol Ni ions **mass** of Ni = **no.** of mol x **gfm** = 0.167mol x 58.7g mol^{-1} = 0.98g $\% \text{ mass} = \frac{\textbf{mass of Ni}}{\textbf{mass of Alloy}} \times 100 = \frac{0.98}{1.02} \times 100 = 96.1\%$
7a(i)	Electrophilic Substitution	Adding onto a benzene ring is electrophilic substitution. The H on the benzene ring is joins to the Cl and the remainder of that molecule joins onto the benzene ring.
7a(ii)	Secondary	Primary Amine: $H-N(H)-C_3H_7$ (1 Carbon attached to the Nitrogen) Secondary Amine: $H_3C-N(H)-C_2H_5$ (2 Carbons attached to the Nitrogen) Tertiary Amine: $H_3C-N(CH_3)-CH_3$ (3 Carbons attached to the Nitrogen)
7a(iii)	lithium aluminium hydride	Step 3 converts a ketone into a secondary alcohol. This reaction is reduction and a reducing agent like lithium aluminium hydride $LiAlH_4$ will carry out this reaction.
7a(iv)	Step 3	A chiral centre is when the carbon has four different groups attached.  Groups attached to chiral carbon (circled) • -OH group • -H group • $-CH_2NHCH_3$ group • $-C_6H_3(OH)_2$ group

7b — 0.15mg

500ppm = 500mg per litre
$\therefore$ 1 litre of adrenaline solution contains 500mg adrenaline
1000cm^3 of adrenaline solution contains 500mg adrenaline
0.3cm^3 of adrenaline solution contains 500mg adrenaline x $^{0.3}/_{1000}$ = 0.15mg

7c — Diagram showing:

Labelled start positions of the extract and pure samples on a horizontal line. This line must be above the level of the solvent.



8a — 0.97

In Step 1, 13% ethanol is produced 13cm^3 ethanol and 87cm^3 water
1cm^3 ethanol = 0.79g $\therefore$ 13cm^3 ethanol = 10.27g
1cm^3 water = 1.00g $\therefore$ 87cm^3 ethanol =87.00g

$$d = \frac{m_1 + m_2}{100} = \frac{10.27+87.00}{100} = 0.9727 \text{ g cm}^3$$

8b — One answer from:

Boiling points are similar	(some) water evaporates at ethanol's boiling point	Any mention of attraction or forces between water and ethanol

8c — One answer from:

Water molecules are smaller than ethanol molecules	ethanol molecules are too large to pass through	ethanol molecules are larger than water molecules	water molecules pass through but ethanol molecules cannot	water molecules are trapped in the sieve

8d — Open Question to include:

3 mark answer	2 mark answer	1 mark answer
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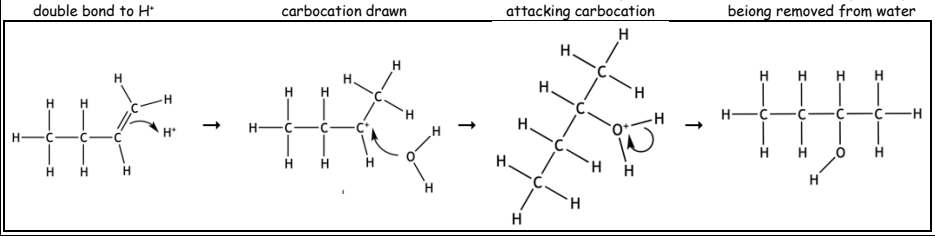
9a — (Base-induced) Elimination

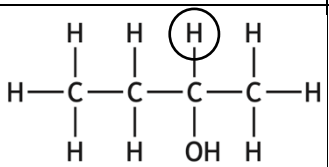
Elimination reactions involve the removal of a small water leaving behind a C=C double bond. Elimination reactions are the opposite reactions to addition reaction.

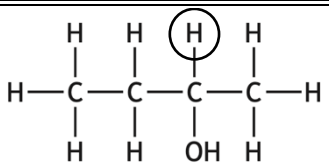
9b — Mechanism showing:

1st Mark: Curly arrow from double bond to H$^+$
2nd Mark: Correct carbocation drawn
3rd Mark: Curly arrow showing water attacking carbocation
Curly arrow showing hydrogen beiong removed from water



9c





Multiplet has 6 peaks
Conclusion: 5 Hydrogen atoms on adjacent carbons
Chemical Shift at 3.7ppm
Conclusion: Group has oxygen in Alcohol/ether

9d(i) — Rate = k [C_4H_9Br] [OH^-]

Order of 1-bromobutane is [C_4H_9Br]^1	Rate = k [C_4H_9Br]^1 [OH^-]^1
Order of hydroxide ion is [OH^-]^1	$\therefore$ Rate = k [C_4H_9Br] [OH^-]

<table>
<tr><td>9d(ii)</td><td>1.32×10^{-4} l mol^{-1} s^{-1}</td><td>$\text{rate} = k[C_4H_9Br][OH^-]$
$k = \dfrac{\text{rate}}{[C_4H_9Br] \times [OH^-]}$
$= \dfrac{3.3 \times 10^{-6} \text{ mol l}^{-1} \text{ s}^{-1}}{0.25 \text{ mol l}^{-1} \times 0.10 \text{ mol l}^{-1}}$
$= 1.32 \times 10^{-4}$ l mol^{-1} s^{-1}</td></tr>
<tr><td>10a</td><td>Delocalised electrons</td><td>Benzene rings have six delocalised electrons which provide the stability in a benzene molecule.</td></tr>
<tr><td>10b</td><td>$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7$</td><td>Co atom: $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7\ 4s^2$ $\therefore$ Co^{2+} ion : $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^7$</td></tr>
<tr><td>10c(i)
PART A</td><td>All fours sections required:</td><td><table><tr><td>solutions of known concentration are prepared</td><td>suitable filter/wavelength/colour used</td><td>Mention of a blank or solvent only measurement</td><td>Absorbance/transmittance of each solution is measured/plotted</td></tr></table></td></tr>
<tr><td>10c(i)
PART B</td><td>Both sections required:</td><td><table><tr><td>The absorbance/transmittance of the unknown is measured</td><td>mention of using the graph to turn unknown's absorbance/transmittance back into concentration</td></tr></table></td></tr>
<tr><td>10c(ii)</td><td>Propan-1-ol</td><td>Propanal is an aldehyde and will reduce to for the primary alcohol propan-1-ol.
Other reduction reactions:
carboxylic acid → aldehyde → primary alcohol
ketone → secondary alcohol</td></tr>
<tr><td>10d</td><td>1</td><td>Every bond in the decamethylcobaltocene is identical
i.e. aromatic carbon with a methyl -CH_3 group attached</td></tr>
</table>