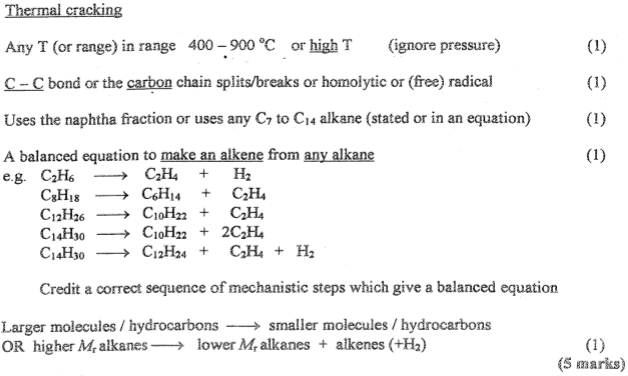
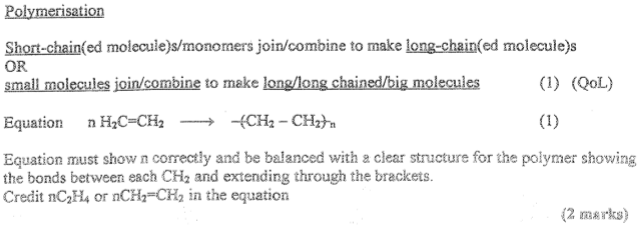
A-LEVEL PAPER 2 PP5 MS

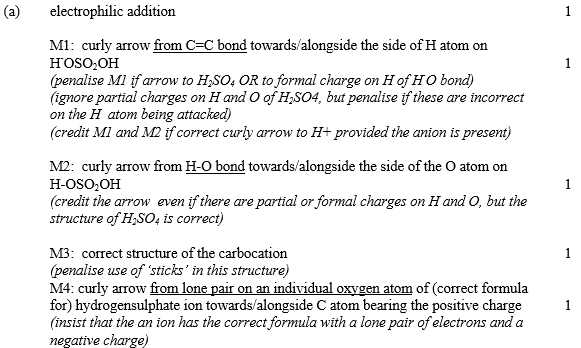
**1.**

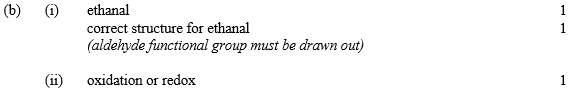
****

****

**[7]**

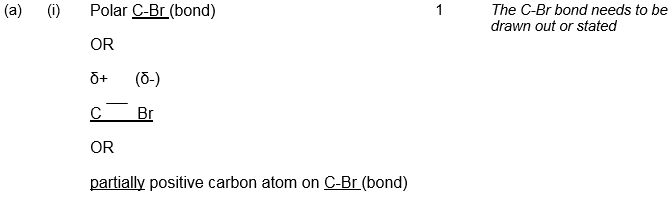
**2.**

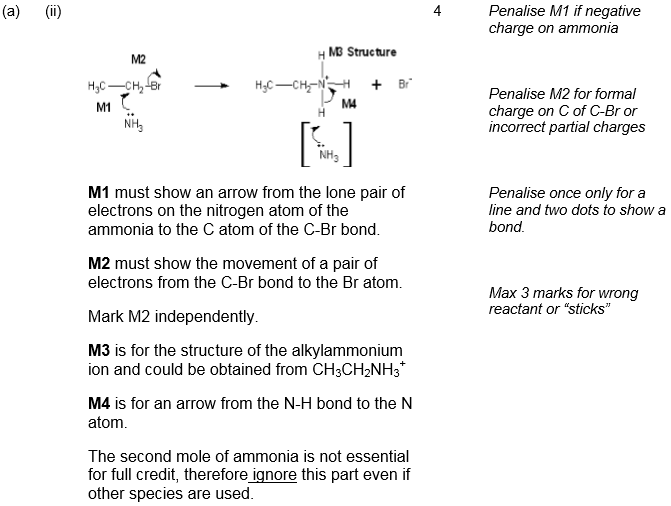
****

****

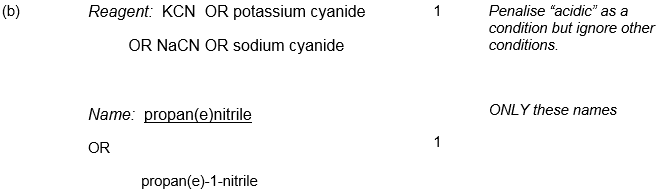
**[8]**

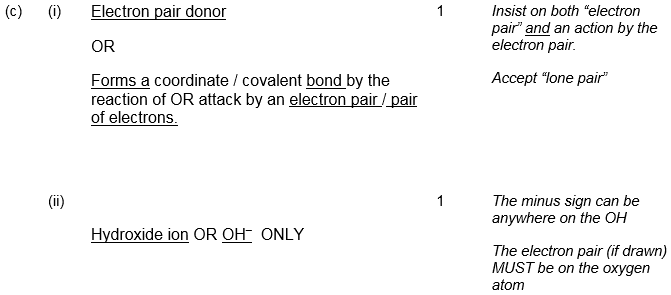
**3.**

****

****

****

****

****

**[9]**

**4.**      (a)     (i)      

*mark is for insertion of numbers into a correctly*

*rearranged rate equ, k = etc*

*AE (-1) for copying numbers wrongly or swapping two numbers*

**1**

= 0.32 (min 2sfs)

**1**

mol–2 dm6 s–1 Units must be conseq to their *k*

*Any order*

*If k calculation wrong, allow units conseq to their k*

**1**

(ii)     4.95 × 10–5 to 4.97 × 10–5 or 5.0 × 10–5 (min 2 sfs)

(ignore units)

*rate = their k × 1.547 × 10–4*

**1**

(b)     Step 2

*If wrong no further mark*

**1**

One H2 (and two NO) (appear in rate equation)  
or species (in step 2) in ratio/proportion as in the rate equation

**1**

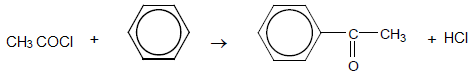
**[6]**

**5.** (a)     (i)      CH3COCl    +    C6H6    →    C6H5COCH3 + HCl

*Not molecular formulae     Not allow C6H5CH3CO*

**1**

***OR***

******

phenylethanone

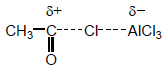
*Ignore number 1 in name but penalise other numbers*

**1**

AlCl3 can be scored in equation

**1**

****

*Allow RHS as *

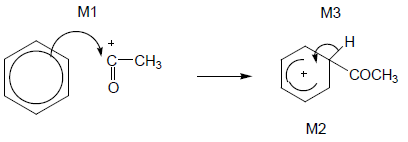
*Allow + on C or O in equation but + must be on C in mechanism below*

*Ignore curly arrows in balanced equation even if wrong*

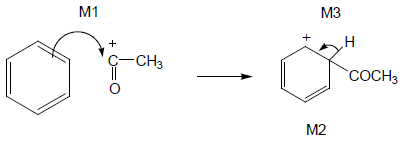
**1**

(ii)     Electrophilic substitution

**1**

****

***OR***

******

*•  M1 arrow from within hexagon*

*to C or to + on C*

*•  + must be on C of CH3CO in mechanism*

*•  + in intermediate not too close to C1*

*•  Gap in horseshoe must be centred approximately around C1*

*•  M3 arrow into hexagon unless Kekulé*

*•  Allow M3 arrow independent of M2 structure,*

*•  ie + on H in intermediate loses M2 not M3*

*•  Ignore base removing H for M3*

**3**

(b)     Electron pair donor or lone pair donor

*Allow donator*

*Allow lone pair used in description of (dative) bond formation*

**1**

****

*Allow (CH3CO)2O*

**1**

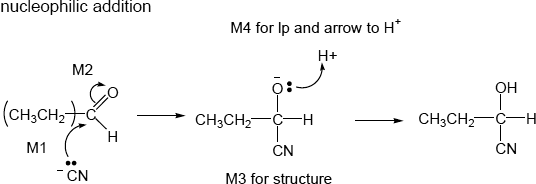
(acid) anhydride

*Allow ethanoic anhydride but not any other anhydride*

**1**

**[11]**

**6.** (a)



*•   allow :CN–*

*•   M2 not allowed independent of M1, but*

*•   allow M1 for correct attack on C+*

*•   + rather than δ+ on C=O loses M2*

*•   M3 is for correct structure including minus sign but lone pair is    part of M4*

*•   Allow C2H5*

*•   M1 and M4 for lp and curly arrow*

***1***

***4***

*(b)     2-bromobutanenitrile*

*Allow 2-bromobutane-1-nitrile*

***1***

*(c)****M1****ammonia or NH3*

*Ignore temp or pressure*

***1***

***M2****excess (ammonia)               excess tied to NH3 and may score in M1 unless   
contradicted*

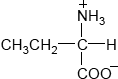
*Ignore concentrated or sealed container, Acid loses conditions mark*

***1***

***M3****nucleophilic substitution*

*Allow close spelling*

***1***

*(d)     (i)*

*Allow C2H5*

*Allow –CO2–*

*Allow +NH3–*

*Don’t penalize position of + on NH3*

***1***

*(ii)****M1****electrostatic forces between ions in* ***X******QOL***

*Allow ionic bonding.*

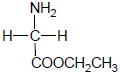
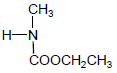
***1***

*Marks independent*

***M2****(stronger than) hydrogen bonding between CH3CH2CH(OH)COOH*

***CE*** *mention of molecules of* ***X*** *or inter molecular forces between* ***X*** *loses both marks*

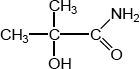
***1***

*(e)     (i)OR*

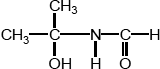
*Isomer of C4H9NO2*

*Allow NH2–*

***1***

*(ii)*

*Isomer of C4H9NO2   allow NH2–*

*Allow *

***1***

*(iii)     H2N–CH2CH2CH2–COOH   or   H2N–(CH2)3–COOH*

*Isomer of C4H9NO2   allow NH2–*

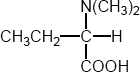
*OR*

**

*Do* ***not*** *allow –C3H6-*

*Beware – do not credit* ***X*** *itself*

***1***

*(f)*

*Answer has 6 carbons so* ***NOT*** *isomer of* ***X***

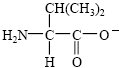
*Allow C2H5*

*Must have bond from C to N not to methyl group*

***1***

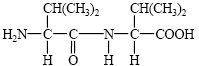
***[16]***

***7.****(a)     (i)*

**

***1***

*(ii)*

**

***1***

*(iii)     hydrogen bonding (do not allow H-bonding) QWC*

*do not penalise any error twice.*

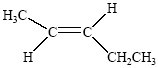
***1***

*(b)     (i)*

**

***1***

*(ii)*

**

***1***

*(iii)     Isomer must be saturated or must not contain a double bond*

***1***

*(c)*

**

***2***

*(d)     (i)      heat/reflux with aqu NaOH*

***1***

*poly(alkene) is inert/ no reaction*

***1***

*polyamide is hydrolysed (or undergoes hydrolysis)  
to form acid salt and alcohol QWC*

***1***

*(ii)     e.g combustion*

***1***

*heat energy produced*

***1***

*toxic gases produced*

***1***

***[14]***

***8.****(a)* ***J*** *(acid) amide*

*not peptide, not N-substituted amide*

***1***

***K*** *(secondary) amine or amino*

*penalise primary or tertiary  
allow N-substituted amine*

***1***

*(b)     (δ =) 3.1-3.9*

***1***

*doublet* ***OR*** *duplet*

*Not 3.7 – 4.1*

*Not secondary  
name required not the number 2*

***1***

*(c)     (i)      Solvent must be proton-free*

***OR*** *CHCl3 has protons or has H or gives a peak*

***1***

*(ii)     CDCl3 is polar* ***OR*** *CCl4 is non-polar*

***1***

*(d)     11* ***OR*** *eleven*

***1***

*(e)     (i)      Si(CH3)4* ***OR*** *SiC4H12*

*ignore TMS*

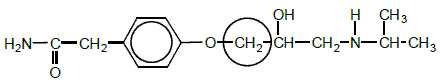
***1***

*(ii)     a single number or a range within 21-25*

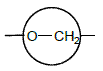
*penalise anything outside this range*

***1***

*(iii)*

**

*allow ring around the C only and also allow*

**

***1***

*(f)      (i)      NaBH4*

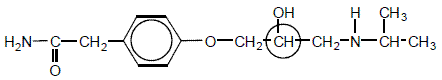
*ignore name if formula correct*

*ignore solvent*

*allow LiAlH4   Zn/HCl   Sn/HCl   H2/Ni   H2/Pt*

***1***

*(ii)*

**

*allow ring around the C only*

***1***

*(iii)     (plane) polarised light* ***OR*** *light in a polarimeter*

***1***

*polarised light is not rotated or is unaffected*

*penalise bent/diffracted/deflected/reflected*

*Not just solution is optically inactive*

***1***

*(iv)* ***adv*** *cheaper medicine due to cost or difficulty of separation or  
both can lower blood pressure*

***OR*** *more effective/beneficial with a reason*

*or no need to separate*

***1***

***disadv*** *may be side effects from one enantiomer in the mixture or  
only half the product works or one enantiomer may be  
ineffective or double dose required*

***1***

***[16]***

***9.****A gives three peaks* ***(1)****B gives one peak* ***(1)***

*Allow one for “A has more peaks than B” when no number of peaks is given*

***2***

***[2]***

***10.***

|  |  |
| --- | --- |
| *(a)* ***F*** | ***G*** |
|  |  |

*Penalize –O2N once*

*Penalise missing circle once*

*Don’t penalise attempt at bonding in NO2*

***1***

***1***

|  |  |
| --- | --- |
| *(b)****H*** | ***J*** |
|  |  |

*If* ***both H*** *and* ***J*** *correct but reversed, award one mark*

***1***

***1***

*A carbon in saturated ring structures should be shown as*

**

|  |  |
| --- | --- |
| *(c)****K*** | ***L*** |
|  |  |

***1***

***1***

|  |  |
| --- | --- |
| *(d)****M*** | ***N*** |
|  |  |

*Allow C2H5 but*

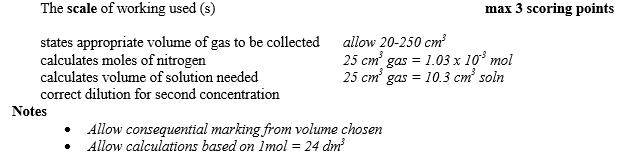
*NOT allow C4H9 or C3H7*

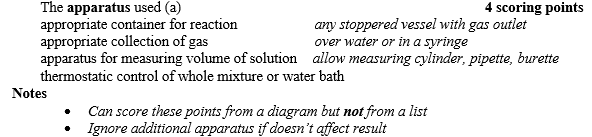
***1***

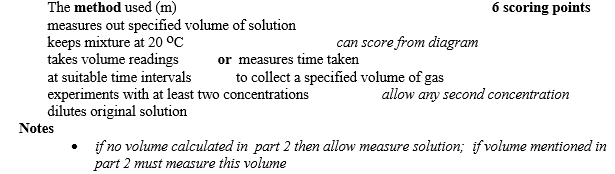
***1***

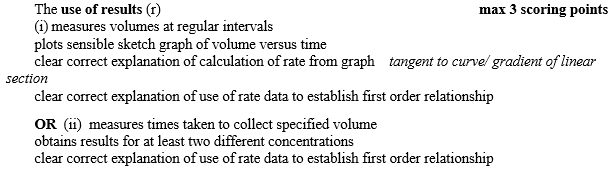
***[8]***

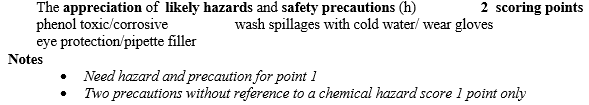
**11.**

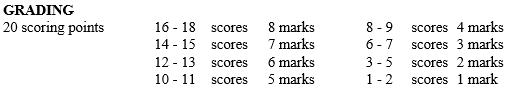
****

****

****

****

****

****

**[8]**