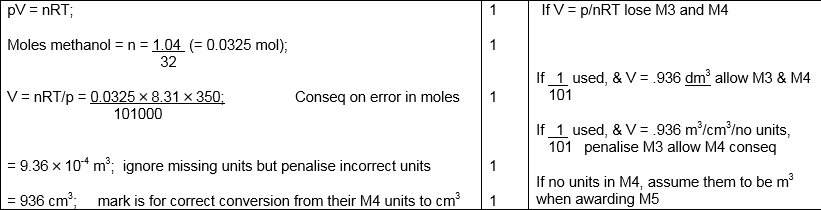
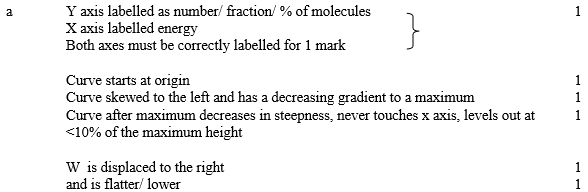
A-LEVEL PAPER 2 PP19 MS

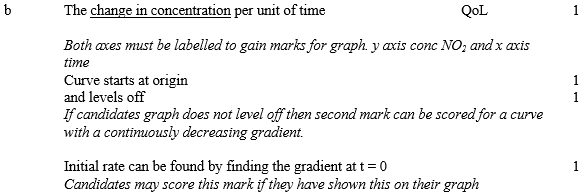
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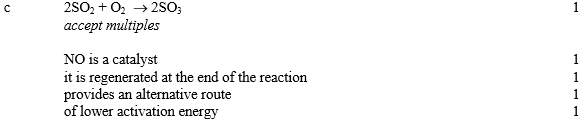


**[5]**

**2.**





**[15]**

**3.**     (a)      (i)     CnH2n / CxH2x

**1**

(ii)     Fractional distillation / GLC / gas liquid chromatography / fractionation

*Do* ***not*** *allow cracking / distillation*

**1**

(b)     (i)     But-1-ene / but1ene

*Ignore hyphens and commas*

*Do* ***not*** *allow butene-1 / but-2-ene / butane / butane /alkene / C4H8 / propene / straight-chain alkene*

**1**

(ii)     A structure of cyclobutane or  
methyl-cyclopropane

*Allow skeletal formula.*

**1**

(c)     (i)     C15H32 → 2C4H8 + C7H16

*Do not accept multiples.*

**1**

(ii)     Thermal cracking

*Not catalytic cracking or cracking.*

**1**

To produce products that are in greater demand / more valuable / more  
expensive / more profitable

*The (unsaturated) alkene or the (unsaturated) molecule or X produced can be polymerised or can be made into plastics.*

*Ignore more useful products.*

**1**

(iii)     Break (C–C or C–H) bonds

*Allow to overcome the activation energy.*

*Allow to break the carbon chain.*

*Penalise breaking wrong bonds.*

**1**

(d)     (i)     C4H10 + 2.5O2 → 4C + 5H2O

*Accept multiples.*

**1**

(ii)     SO2 / sulfur dioxide

*If other sulfur oxides, mark on.*

**1**

Calcium oxide / CaO / lime / quicklime

*Allow CaCO3 / allow Ca(OH)2 or names.*

*Allow any solid base.*

*M2 dependent on M1.*

*Do not allow limewater.*

**1**

(iii)     Neutralisation

*Allow acid-base reaction.*

*Allow flue gas desulfurisation / FGD*

**1**

(e)    (Molecules) are similar sizes / have similar *M*r / have similar number of electrons

*Chemical error CE = 0/2 if breaking bonds.*

*Allow similar number of carbon and hydrogen atoms / similar surface area / similar chain length.*

*Can accept same number of carbon atoms.*

*Do not accept same number of H atoms / same number of bonds.*

*Ignore similar amount of bonds.*

**1**

Similar van der Waals forces between molecules / similar intermolecular forces  
(IMF)

*Not similar incorrect IMF eg dipole-dipole*

**1**

**[14]**

**4.**      (a)     (i)      Prevents release of toxic CO  
More energy efficient (releases more energy on combustion)

**1**

(ii)     C6H14 + 6.5O2 → 6CO + 7H2O

**1**

         Suitable product eg CO or C

**1**

         Balanced equation

**1**

(iii)     Detect CO gas or C (soot or particles) in exhaust gases

**1**

(b)     CH3CH2CH2CH(CH3)2

**1**

          2-methylpentane

**1**

          CH3CH2CH(CH3)CH2CH3 etc

**1**

(c)     (i)      CH3CH2CH2CH=CH2

**1**

(ii)     Alumino silicate etc

**1**

(iii)     Can be made into polymers (or alcohols etc)

**1**

(d)     (i)      % atom economy = mass CH2Cl2/total mass  
reactants = 85 × 100/158

**1**

= 53.8%

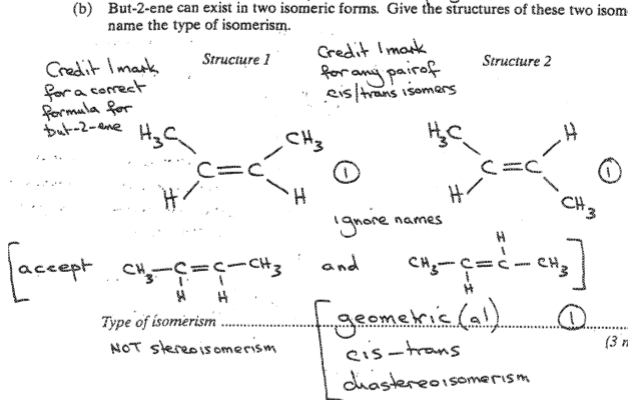
**1**

(ii)     Because expensive chlorine is not incorperated into  
desired product Raise money by selling HCl

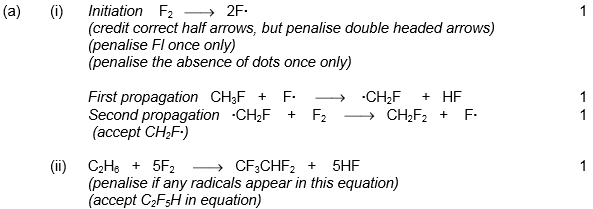
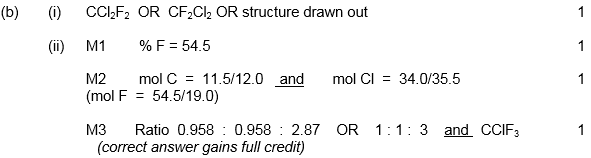
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**[14]**

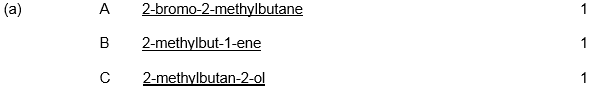
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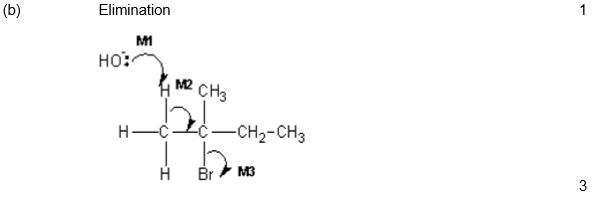
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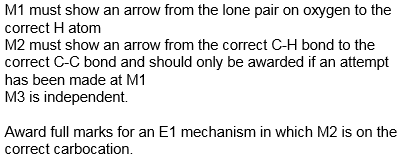
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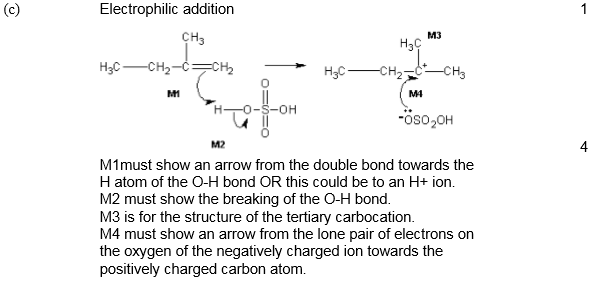
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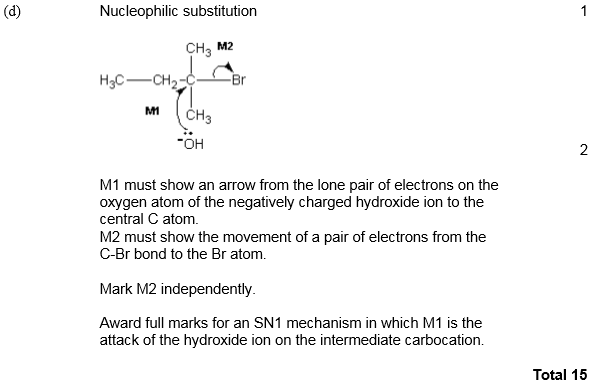
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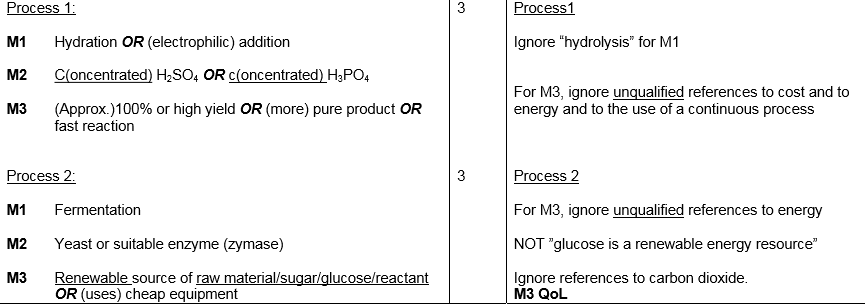
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**8.**

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**[6]**