ANSWERS: **Reaction schemes**

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| **2017** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a) |  | • ONE correct reagent and one reaction type.• TWO correct structures. | • SEVEN correct.ORAll correct showing understanding of the chemistry but with repeated error. | • ALL NINE correct, includingidentification of both minor and major products. |

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| **2016** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a) | Structures:**S1:** CH3COOCH2CH2CH3**S2:** CH3CH2CH2OH**S3:** CH3CH=CH2**S4:** CH3CH2CH2Cl**S5:** CH3CH(Cl)CH3**S6:** CH3COCl**S7:** CH3CONHCH2CH2CH3Reagent **1** = H2O / H+ (dilute acid)Reagent **2** = conc. H+ (H­2SO4 or H3PO4)Reagent **3** = NH3 (*alc*) or conc. | * Any THREE correct structures.
* Any ONE fully correct reagent.
 | * At least SEVEN correct including ONE fully correct reagent.
 | * All structures and reagents correct.
 |
| (b) | Step 1: **Butan-1-ol to but-1-ene.**Dehydration reaction (elimination reaction) using conc H2SO4.Step 2: **But-1-ene to butan-2-ol.**Hydration reaction (addition reaction) using dil. H2SO4 (H+/H2O)Step 3: **Butan-2-ol (Major product) to butan-2-one**.Oxidation reaction of secondary alcohol to from a ketone using Cr2O72– / H+ under reflux.Other workable scheme are possible. | * ONE correct reagent.
* ONE correct conversion step.
 | * Workable scheme, with at least one fully correct reagent.
 | * All correct with full understanding.
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| **2015** | **Structures**A = CH3CH2CH2NH2B = CH3CH2CH2OHC = CH3CH2CHO OR CH3CH2COOHD = CH3CH2COOCH2CH3E = CH3CH2COCl**Reagents**1 = NaOH(*aq*) OR KOH(*aq*)2 = Cr2O72– / H+ or MnO4– / H+ 3 = NaBH4 OR LiAlH44 (i) = CH3CH2OH or ethanol4 (ii) = concentrated H2SO45 = NH3 (alcoholic / gas / conc). | * Any THREE correct structures.
* Any THREE correct reagents.
 | * Any EIGHT correct structures / reagents.
 | * ALL structures and reagents correct.

(Note: One error or omission – E7). |

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| **2014** | **Evidence** | **Achievement** | **Achievement with Merit** | **Achievement with Excellence** |
| (a) | **A** = Propan-2-ol91391assq3a1b**B** = Propan-1-ol**91391assq3a2b****C** = Propanone91391assq3a3b**D** = Propanoic acid91391assq3a4b**E** = Propanoyl chloride91391assq3a5b**F** = Propanamide91391assq3a8 **G** = Propyl propanoate91391assq3a6b**H** = Methyl ethyl propanoate (not required)91391assq3a7 | * FIVE correct structures.
* FIVE correct names.
 | * ELEVEN structures or names correct.
 | * FOURTEEN structures or names correct.

(*Penalise once for –HO / –H2N.*) |

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| **2013** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
|  | **1** SOCl2 (Accept PCl3, PCl5 or conc HCl / ZnCl2) | * ONE correct
 | * ALL correct
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| **2012** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| 1. |  | Two correct structuralformula WITH names. | THREE correct structural formula with names. | ALL formulae and names correct. |

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| 2.  |  | Any TWO reactionscorrect includingreagents.(States and / orconditions notrequired.) | Any THREE reactionscorrect includingreagents.(States and / orconditions ARErequired.) | ALL reactions correct .*(Allow one reaction**error.)*(States and / orconditions ARErequired.) |

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|  **2011** | A90698assq4a1propyl propanoateB sodium propanoateC 90698assq4a2 propan-1ol (1-propanol)D 90698assq4a3 propanoic acid propanoyl chloride OR methylpropanoateE 90698assq4a4propanal propanoic acidF 90698assq4a5 | Reagent 1 = NaOH(*aq*) Reagent 2 = NaOH(*aq*), accept NaOH(*alc*) if D = acid chloride, Na2CO3 (*aq*).Reagent 3 = PCl5 / SOCl2 / PCl3. Reagent 4 = Cr2O72– / H+ or MnO4– / (H+) / Fehling / Benedicts/ Tollens or if D is given as acid chloride, accept PCl5 / SOCl2 / PCl3./ methanol or other alcohol + acid to give ester in D. | THREE correct consecutive structures. ORnames PLUS one linking condition.  | No more than two errors.(Allow incorrect structure with its correct name as one error.) | Correct.One minor error.Eg reagent 2 NaOH without (aq).Eg propanol without 1. |

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| **2010** | **Evidence** | **Achievement** | **Merit** | **Excellence** |
| **1**. | 90698q4aass Substitution.The alcohol group is removed and substituted with the chlorine side chain. | * Correct equation.

ANDReaction type with reason | * Correct equation.

ANDReaction type with reason. | • Correct equation.ANDReaction type with reason. |

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| **2.** | PRODUCTS (letters) REAGENTS (numbers)**1** Cr2O72– / H+ (or MnO4– / H+)**A**  90698q2aass**B** 90698q2bass**2**  90698q2fass1. conc. H2SO4

**C** 90698q2cass**D** 90698q2dass1. KOH / NaOH

**E** 90698q2eass**5** Cr2O72– / H+ (or MnO4– / H+) | Any FOUR answers correct. | SIX answers correct including at least TWO reagents. | Correct pathways (only ONE error allowed). |

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| **2009** | Reagent 1 H+ / Cr2O72– OR MnO4– / H+ OR MnO4–Reagent 2 PCl3 / PCl5 / SOCl2 OR HBr OR SOBr2Reagent 3 PCl3 / PCl5 / SOCl2 / conc HCl with ZnCl2 (not just conc HCl)Reagent 4 NH3 (alcohol not required)90698q4aassAlternative answer:Reagent 1 (as above) and Reagent 2 = Reagent 1 OR Tollens / Benedicts / Fehlings90698q4bass | * TWO reagents and TWO structures correct.
 | * Scheme has no more than TWO errors.
 | * Scheme correct.
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| **2008** |

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| **Reagent** | **Formula** |
| 1 | PCl3, or PCl5, or SOCl2, or HCl |
| 2 | NH3 |
| 3 | Cr2O72– / H+ or MnO4-/H+ |
| 4 | PCl3, or PCl5, or SOCl2  |
| 5 | CH3NH2 |

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| **Product** | **Name or formula** |
| 1 |  |
| 2 |  |
| 3 |  |
|  |  |

OR

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| **Reagent** | **Formula** |
| 1 | PCl3, or PCl5, or SOCl2, or conc HCl |
| 2 | NH3 |
| 3 | Cr2O72–/H+ or MnO4-/H+ |
| 4 | Cr2O72– / H+ or MnO4-/H+ |
| 5 | CH3NH2 |

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| **Product** | **Name or formula** |
| 1 |  |
| 2 |  |
| 3 | 90698assq5 |
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| **Reagent** | **Formula** |
| 1 | PCl3, or PCl5, or SOCl2, or conc HCl |
| 2 | NH3 |
| 3 | Cr2O72– / H+ or MnO4-/H+ |
| 4 | PCl3, or PCl5, or SOCl2 NOT conc HCl |
| 5 | CH3NH2 |

 | In the blank boxes provided:EitherTwo correct products and the reagents that form them (may omit H+)ORthree consecutive boxes correct. | In the blank boxes provided:EITHERTwo series of 3 consecutive boxes correct ORall correct except for one of the reagents. | Scheme correct.  |

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