**ANSWERS: Acid Base reactions**

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| **2019** | **Evidence** | **Achieve** | **Merit** | **Excellence** |
| (i)  (ii) | Sodium carbonate, Na2CO3, solid or solution can be used as it will fizz  with **C**, which is a carboxylic acid in an **acid-base reaction** /neutralisation. The amine functional group of **B** would not react, as it is a  base like the sodium carbonate.  Any carbonate or hydrogen carbonate is acceptable.  OR add a strip of Mg metal to both **B** and **C**. **C** will fizz, producing gas  as it is an **acid-metal reaction** because **C** is a carboxylic acid.  The amine (**B**) functional group would not react with the Mg metal. | • Identifies TWO functional groups.  • Identifies TWO correct observations for two tests.  Chooses a valid reagent. | Links TWO functional groups  to correct reagent and  observations.  Links correct reagent to correct  observations. | Accurate table with  explanation of a reaction, and observations that  distinguish the functional groups. |

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| **2018** | **Evidence** | **Achieve** | **Merit** | **Excellence** |
| (i)  (ii) | Ethanoic acid is an acid so will react with the solid sodium  hydrogen carbonate to produce carbon dioxide gas as this is an  acid-base reaction. Therefore fizzing will be observed. The  propan-1-amine is a base and will not react with the NaHCO3.  Propyl ammonium ethanoate / propan-1-amine ethanoate | • Identifies that the acid will react  with the NaHCO3. | • Links the acid-base reaction  to **observations** to identify the liquids  • Names or draws the salt formed. |  |

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| **2017** | **Evidence** | **Achieve** | **Merit** | **Excellence** |
| (a)  (b) (i)  (ii) | Red litmus paper will turn blue in a solution of compound **E**, but will not change in **B**.  Blue litmus paper will turn red in a solution of compound **B**, but will not change in **E**.  CH3COOH(*aq)* + CH3CH2NH2(*aq)* → CH3COO–(*aq*) + CH3CH2NH3+(*aq*)  (or amide condensation reaction)  The reaction between **B** and **E** is an acid-base (neutralisation) reaction. Acid-base reactions involve a proton / H+ transfer.  Protons / H+, are released from the carboxylic acid functional group, –COOH, resulting in a salt forming containing the –COO– group.  The proton / H+ is accepted by the amine functional group, –NH2, this forms a salt containing the –NH3+ group. | • Identifies a distinguishing test for both compounds.  • Correctly identifies the products  AND  Correctly identifies the type of reaction. | • Writes correctly balanced equation. | • Justifies the type of  reaction by linking the  type of reaction to  proton / H+ transfer with  a correctly balanced  equation.  (*Proton / H+ transfer*  *only required at E*  *level.*) |

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| **2016** | **Evidence** | **Achieve** | **Merit** | **Excellence** |
| (i)  (ii) | CH3CH2NH2(*aq*) + HCl(*aq*) → CH3CH2NH3+(*aq*) + Cl–(*aq*) OR CH3CH2NH3Cl(*aq*)  Carboxylic acids have acidic properties because when they react, some of the acid molecules donate H+ to water molecules.  CH3COOH(*aq*) + H2O(*l*) → CH3COO–(*aq*) + H3O+(*aq*) | * Completes a balanced equation correctly. * Identifies H+ is transferred from ethanoic acid to water molecules.   OR  Identifies H+ / H3O+ as a product of the reaction.  OR  Identifies an acidic property, e.g. indicator, neutralisation reaction. | * Explains why carboxylic acids have acidic properties, e.g. donates a proton to water / produces hydronium ions.   AND  Writes a balanced equation for a reaction. |  |

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| **2014** | **Evidence** | **Achieve** | **Merit** | **Excellence** |
| (i)  (ii) | When propanoic acid reacts with sodium carbonate, an acid-base reaction occurs in which sodium propanoate, water and carbon dioxide are formed. It is acid-base because the propanoic acid donates a proton, forming the propanoate ion.  When propanamine reacts with HCl or H2SO4, acid-base reactions occur. Amines are bases and as a result, amines accept protons from acids. In these two reactions both sulfuric acid and hydrochloric acid donate protons to the amine to form organic salts.  When propan-1-ol reacts with HCl, a substitution reaction occurs; in this reaction the Cl from HCl replaces the –OH group from propan-1-ol, forming a haloalkane.  The reaction between conc. H2SO4 / heat, and propan-1-ol is an elimination reaction because an –OH group attached to C1, and a hydrogen atom from C2 are both removed from the organic molecule. A double bond forms between C1 & C2, with the elimination of water, forming propene. | * Has one product correct for either reaction (i) or (ii). * States THREE correct types of reaction.   **OR**  States a correct type of reaction with a supporting reason. | * Full explains one of the acid-base reactions.   **OR**  Identifies **AND** partially explains TWO different types of reactions.  © <https://www.chemical-minds.com>  NCEA questions and answers reproduced with permission from NZQA | Compares and contrasts the reactions by:   * Fully explaining one of the acid- base reactions.   **AND**  Fully explaining the substitution reaction.  **AND**  Fully explaining the elimination reaction. |