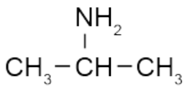
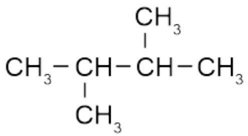
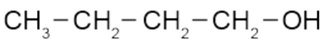
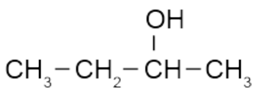
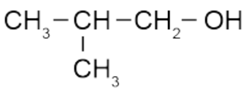
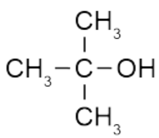
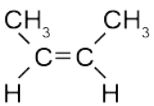
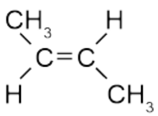
Assessment Schedule – 2019

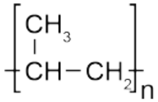
Chemistry: Demonstrate understanding of the properties of selected organic compounds (91165)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	propanoic acid  5-chloropent-1-ene 	• TWO structures correct.	• SEVEN of eight sorrect.	
(b)	 primary  secondary  primary  tertiary	• TWO isomers drawn and classified.		
(c)(i)	 *cis*-but-2-ene  *trans*-but-2-ene	• Draws and names the two isomers.		

(ii)	Compound **A** is a geometric isomer because it has the two required features. It has a double bond which prevents rotation. Compound **B** doesn't have this. Compound **A** also has different atoms / groups of atoms on each carbon on the double bond. Both carbons have a methyl group and a hydrogen atom that can be arranged differently in space.	Describes the features required for geometric isomers. OR • Has double bond which restricts rotation.	• Explains the features required for geometric isomers.	• Relates the requirements of cis-trans isomers relevant to the named and drawn examples of but-2-ene.
(iii)	Potassium permanganate will turn from purple to colourless / pale pink / brown when mixed with compound **A**, whereas there would be no observable change with compound **B**. This is an oxidation reaction.	• Identifies the type of reaction. OR States the colour change.	• Links the observation to the reaction type.	
(iv)	Compound **B** reacting with bromine water will be a slow reaction requiring UV light as a catalyst. It will form 1-bromobutane / 2-bromobutane and HBr. The bromine water will decolourise from a red-brown / orange / brown / yellow colour. This is a substitution reaction where the H on one carbon is substituted by a Br atom. The H atom that is removed bonds with the remaining Br atom to form hydrogen bromide. Compound **A** reacting with bromine water is a fast reaction, forming 2,3-dibromobutane. The bromine water decolourises from a red-brown colour. This is an addition reaction, where the double bond is broken and two Br atoms are added.	• Identifies the two types of reaction occurring. OR States the colour change.	• Explains the type of reaction linked to observations for **A** or **B**.	• Compares and contrasts all aspects of the reactions for **A** and **B**.

NØ	**N1**	**N2**	**A3**	**A4**	**M5**	**M6**	**E7**	**E8**
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	2e minor error / omission	2e

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	 **A**: Polypropene **R1**: conc sulfuric acid **R2**: conc NH_3 (alc) **B**: propan-2-ol OR propan-1-ol **C**: 2-bromopropane **D**: 1-bromopropane	• THREE correct in the reaction scheme.	• FIVE correct in the reaction scheme.	• SIX of seven correct in the reaction scheme.
(b)	This is an addition reaction to an asymmetric alkene. When the HBr is added to propene when the double bond breaks, there are two possible products. The H atom is more likely to bond to the carbon with more hydrogens. In propene, the second carbon has one hydrogen and the first carbon has two hydrogens therefore the H from HBr bonds to the first carbon and the Br bonds to the second carbon making 2-bromopropane the major product. 1-bromopropane is the minor product where Br bonds to the first carbon.	• Recognises addition reaction. • Describes rule regarding addition to asymmetric alkene OR identifies propene as an asymmetric alkene. OR Describes the placement of H or Br using Markovnikov to propene or to the C atoms in the double bond.	• Explains why 1-bromopropane is the minor product. OR Explains why 2-bromopropane is the major product. OR Missing asymmetry. OR Only discusses fully one group for both products.	• Explains the formation of BOTH products and groups in this addition reaction.
(c)	The reaction that forms compound **B** is an addition reaction where the double bond is broken to add OH and H to saturate the molecule and form an alcohol. The reverse reaction is the removal of the H and OH to form a double bond in an elimination reaction, forming an unsaturated molecule with a double bond. The elimination reaction uses concentrated sulfuric acid to remove the water whereas the addition reaction uses dilute sulfuric acid to add the water. The reactions are opposite in that one breaks the double bond to increase saturation and one forms a double bond to decrease saturation.	• States reaction to form **B** is addition. • Reverse reaction is elimination.	• Explains the addition reaction. • Explains the elimination reaction.	• Contrasts the two reactions related to propene and propanol.

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	2e	3e

Q	Evidence	Achievement	Merit	Excellence
THREE (a)(i)	**A** alcohol — acidified dichromate solution — orange to green **B** amine — red litmus paper — turns blue **C** carboxylic acid — blue litmus paper — turns red	• Identifies TWO functional groups. • Identifies TWO correct observations for two tests.	• Links TWO functional groups to correct reagent and observations.	
(ii)	Sodium carbonate, Na_2CO_3, 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.	• Chooses a valid reagent.	• Links correct reagent to correct observations.	• Accurate table with explanation of a reaction, and observations that distinguish the functional groups.
(b)(i)	The three structural formulae of bromoethane, ethanol, choloroethane; the name ethanol beside its structural formula; and the two reagents – KOH(*aq*) and $SOCl_2$ / PCl_3 / PCl_5. CH_3-CH_2-Br 1. KOH(*aq*) Ethanol: CH_3-CH_2-OH 2. $SOCl_2$ / PCl_3 / PCl_5 / conc HCl	• TWO correct structural formulae.	• THREE structural formulae with one correct reagent.	• Correct scheme with explanation of conditions and type of reaction.
(ii)	Both reactions are a substitution. In the first step, KOH is in aqueous solution to enable the OH to be substituted for the bromine atom to form ethanol. In the second step, $SOCl_2$ / PCl_3 / PCl_5 can be used to substitute the OH for a chlorine atom.	• Identifies ONE of the substitution reactions.	• Explains a substitution reaction.	

NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	1a	2a	3a	4a	2m	3m	2e with minor error or omission	2e

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 7	8 – 14	15 – 18	19 – 24