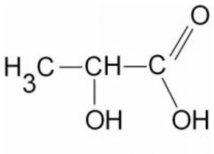
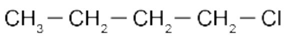
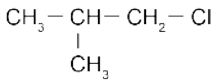
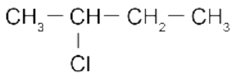
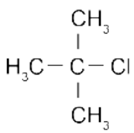
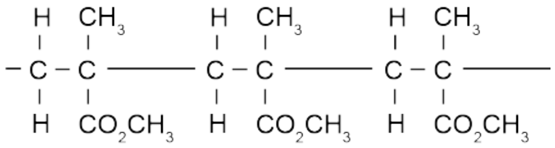
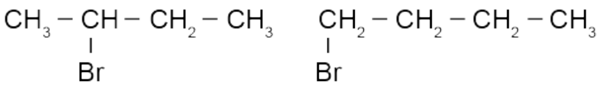
Assessment Schedule – 2018

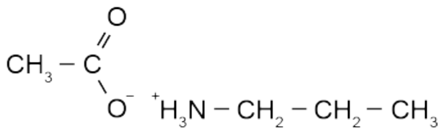
Chemistry: Demonstrate understanding of the properties of selected organic compounds (91165)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	Pent-1-ene 3-methylbutan-2-ol 	• TWO of three structures / names correct	• All SIX structures / names correct \	
(b)	1°  OR  2°  3° 	• TWO correct isomers drawn in correct place.		

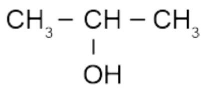
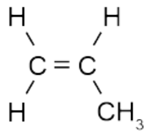
(c)(i)		• Correct structure.		
(ii)	The monomer forming perspex is not a geometric isomer. A geometric isomer must have a double bond between two carbon atoms which prevents rotation. This monomer does have this, but the other feature of a geometric isomer is that the carbon atoms of the double bond must have two different atoms or groups of atoms attached to them. One of the carbons on the monomer has a methyl group and a different group of atoms, but the other carbon has two hydrogen atoms. Therefore, it can't have a cis and trans form.	• Identifies that the monomer isn't a geometric isomer. OR States a feature required for geometric isomer.	• Explains why the double bond causes this isomeris*m* OR Explains why each C atom on the double bond must have two different atoms or groups of atoms attached.	• Explains both features AND relates their answer specifically to the monomer
(d)	HBr is the reagent. It is an addition reaction because the double bond is broken to form a single C–C bond allowing the H and Br to bond to the carbon atoms forming the haloalkane. There are two products because the reagent, HBr is asymmetric, and the alkene is asymmetric due to the position of the double bond. There are two carbons forming a double bond that the H and Br can bond to so there are two possible combinations. The carbon with the most hydrogens will gain more hydrogens. This means that 2-bromobutane will be the major product since the carbon at the end has two hydrogens and the middle carbon has only one hydrogen; therefore the H atom will preferentially bond to the end carbon. 1-bromobutane will be the minor product. *(The term "Markovnikov's rule" is not required.)* $CH_2=CH-CH_2-CH_3$ but-1-ene  2-bromobutane 1-bromobutane	• Identifies the reagent. • Identifies the type of reaction.	• Explains why it is an addition reaction. • Explains with limited detail why there are two products **OR** states the 2 products arise from an asymmetric alkene	Uses drawings of the organic substances to elaborate on both the addition reaction and the possible organic products. Structures MUST be correct

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

Q	Evidence	Achievement	Merit	Excellence
TWO (a)(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 $NaHCO_3$. Propyl ammonium ethanoate / propan-1-amine ethanoate $CH_3CH_2CH_2NH_3^+ + CH_3COO^-$ 	• Identifies that the acid will react with the $NaHCO_3$.	• Links the acid-base reaction to **observations** to identify the liquids • Names or draws the salt formed.	
(b)	When bromine water is added to hex-1-ene, it will quickly decolourise from a red-brown colour. This is an addition reaction forming dibromohexane. There will be no colour change with hexane or ethanol. When water is added to hexane and ethanol, two layers will form with hexane. Hexane is a non polar molecule so there will not be any attraction to the water. Ethanol is a polar molecule so it will be miscible with water. *There is no penalty for using only bromine water to distinguish all three liquids.*	• States that bromine water will react with hex-1-ene. • Recognises that alcohol is water soluble	• Links an identification method to an explanation to distinguish two of the molecules with observations	• Identifies **all three** molecules linking to properties of the molecules with observations.

(c)(i)	Alcohol **X** $CH_3 - CH - CH_2 - CH_2 - CH_3$ $\quad\quad\quad\;|$ $\quad\quad\quad OH$ Organic molecule **Y** $CH_3 - CH - CH_2 - CH_2 - CH_3$ $\quad\quad\quad\;|$ $\quad\quad\quad Cl$ Pentan-2-amine $CH_3 - CH - CH_2 - CH_2 - CH_3$ $\quad\quad\quad\;|$ $\quad\quad\quad NH_2$	• Draws pentan-2-amine.		
(ii)	Reagent 1: $SOCl_2$ / PCl_3 / PCl_5 Reagent 2: NH_3(*alc*) or conc or Lucas Reagent Both reactions are substitution reactions because one atom or group of atoms is substituted by another. In the first step, the OH group on the alcohol, pentan-2-ol is substituted by a Cl atom to make a chloroalkane, 2-chloropentane. The reagent used is $SOCl_2$. To convert the chloroalkane to an amine requires conc NH_3 (alc). This causes the Cl to be substituted by an NH_2 to form the amine. (This is so that the OH group in aqueous ammonia does not get substituted onto the chloroalkane.)	• Identifies the substitution reaction for both steps.	• Both reaction types. **AND** • Both reagents **OR** • Both structures.	• **Names** and **draws** all molecules linking to the reaction type and reagents with condition(s).

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

Q	Evidence	Achievement	Merit	Excellence
THREE (a)	As the number of carbons increases, the boiling points for alcohols increase, but the solubilities of the alcohols in water decreases.	• Identifies the trends in the graph.		
(b)(i)	A reaction with dilute aqueous KOH will produce an alcohol, propan-2-ol.  This is a substitution reaction. The Cl atom is substituted by an OH group. If concentrated KOH(*alc*) is used, an elimination reaction occurs, and the 2-chloropropane forms propene because a H and a Cl atom will be removed, whilst a double bond is formed. 	• Identifies one product (name or structure) • Identifies one type of reaction with correct reagent and product (can be in a structural formula).	• Explains ONE type of reaction linked to correct reagent condition and organic product.	• Elaborates on both reactions of 2-chloropropane, referring to reaction type, conditions, and products.
(ii)	The OH group on the alcohol can be identified by a reaction with warm, acidified potassium dichromate, $H^+ / Cr_2O_7^{2-}$. The colour change observed will be orange to green as the alcohol oxidises to a ketone in a redox / oxidation reaction. The double bond of propene can be identified using bromine water, which turns colourless from orange-brown rapidly as a dibromoalkane is formed in an addition reaction. $KMnO_4$(*aq*) cannot be used because both an alcohol and an alkene will react with it. The alcohol would be oxidised to a ketone and the alkene would form a diol. Colour change purple to colourless/brown or pale pink. *(No products from identification reactions needed)*	• States a reagent that can be used to identify ONE product. • Matches ONE correct reagent with the correct reaction type OR observation	• Links appropriate chemical test and the reaction type to ONE functional group, with observations. e.g Bromine, addition, alkene, orange to colourless • dichromate , oxidation, alcohol, orange to green • Links $KMnO_4$(*aq*) to reacting with both organic products, both oxidation, and either oxidation products(diol, ketone c acid) OR colour change	• Links correct chemical tests and reactions to both organic products AND explains why $KMnO_4$(*aq*) can't be used.

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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