Organic Chemistry 2 Lab Report

Chemical Identification

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Introduction

The purpose of this laboratory is to identify four chemical unknowns through determination of physical properties of the unknowns and their derivatives, chemical reactivity, and spectroscopic methods. The unknowns have a primary functional group of an Aldehyde, an Amine, a Ketone, an Alcohol, a Carboxylic Acid, an Ester, or a Phenol group. They may have also have an additional secondary or tertiary functional group of a halogen, a nitro, a cyano, an alkoxy, an alkene, an alkyne, or an aromatic group.

Chemical reactivity can be used to identify substituents on a carbon chain. The ability of a substance to dissolve can used to identify whether a molecule is polar or non-polar or if it is an acid or base. Numerous functional groups can be detected using with qualitative tests. Physical properties like melting points and boiling points can be used to look up chemicals in a reference book that may be potential matches. Finally NMR, IR, and mass spectrometry can be used to estimate the structure and mass of the molecule with a high degree of accuracy.

1 Data Tables

1.1 Unknown C1

Test	**Result**	**Conclusion**
H_2O Solubility	Not Soluble	C1 is a relatively non-polar molecule
$NaOH$ Solubility	Not Soluble	C1 is not an acid
HCl Solubility	Not Soluble	C1 is not a base
H_2SO_4 Solubility	Reactive	C1 is neutral
Beilstein Test	No green flame, Negative	C1 does not have a halide substituent
Soot Formation	No soot	C1 is unlikely to be aromatic or have an alkene group
H_2CrO_4	Positive Blue/Green Precipitate	C1 is likely an alcohol or aldehyde
Bromine	No reaction	C1 is unlikely to have an alkene group and is likely not an aldehyde
2,4-DNPH	No reaction	C1 is not an aldehyde or ketone
$KMnO_4$	No reaction	C1 is not an alkene
$AgNO_3$ Test	No reaction	C1 does not have a tertiary alkyl halide moiety
AgI Test	No reaction	C1 does not have a primary alkyl halide moiety
C1 Boiling Point	141 C	
3,5-Dinitrobenzoate Deriv. MP	92 C	
Phenylurethane Deriv. MP	127 C	

1.2 Unknown C2

Test	Result	Conclusion
H_2O Solubility	Not Soluble	C2 is a relatively non-polar molecule
$NaOH$ Solubility	Not Soluble	C2 is not an acid
HCl Solubility	Not Soluble	C2 is not a base
H_2SO_4 Solubility	Reactive	C2 is neutral
Beilstein Test	No green flame, Negative	C2 does not have a halide substituent
Soot Formation	No soot	C2 is unlikely to be aromatic or have an alkene group
H_2CrO_4	Produced orange liquid, Negative	C2 is not a primary or secondary alcohol nor is it an aldehyde
Bromine	No reaction	C2 is unlikely to have an alkene or aldehyde group
2,4-DNPH	Yellow/Orange Precipitate	C2 has a carbonyl group
$KMnO_4$	No reaction	C2 is not an alkene
$AgNO_3$ Test	No reaction	C2 does not have a tertiary alkyl halide moiety
AgI Test	No reaction	C2 does not have a primary alkyl halide moiety
C2 Boiling Point	105 C	
2,4-DNPH Deriv. MP	93 C	
Semicarbazone Deriv. MP	236 C	

1.3 Unknown C3

Test	Result	Conclusion
H_2O Solubility	Not Soluble	C3 is a relatively non-polar molecule
$NaOH$ Solubility	Soluble	C3 is at least slightly acidic
$NaHCO_3$ Solubility	Not Soluble	C3 is only slightly acidic i.e. not a carboxylic acid
Beilstein Test	No green flame, Negative	C3 does not have a halide substituent
Soot Formation	Produced soot	C3 is likely aromatic or contains an alkene group
H_2CrO_4	Produced dark purple fluid, Negative	C3 is not a primary or secondary alcohol nor is it an aldehyde
Bromine	No reaction	C3 is unlikely to have an alkene or aldehyde group
2,4-DNPH	No reaction	C3 does not have a carbonyl group
$KMnO_4$	Becomes clear with brown precipitate, Positive	C3 likely has double bonds or possibly an activated aromatic
$AgNO_3$ Test	No reaction	C3 does not have a tertiary alkyl halide moiety
AgI Test	No reaction	C3 does not have a primary alkyl halide moiety
C3 Melting Point	86 C	
Bromophenol Deriv. MP	105 C	
α-Naphthylurethane Deriv. MP	207 C	

1.4 Unknown C4

Test	Result	Conclusion
H_2O Solubility	Not Soluble	C4 is a relatively non-polar molecule
$NaOH$ Solubility	Not Soluble	C4 is not acidic
HCl Solubility	Soluble	C4 is slightly basic, almost certainly an amine
Beilstein Test	Green flame, Positive	C4 does has a halide substituent
Soot Formation	Produced soot	C4 is likely aromatic or contains an alkene group
H_2CrO_4	Produced dark purple fluid, Negative	C4 is not a primary or secondary alcohol nor is it an aldehyde
Bromine	Cleared, Positive	C4 is likely to have an alkene or aldehyde group, possibly an activated aromatic
2,4-DNPH	No reaction	C4 does not have a carbonyl group
$KMnO_4$	Becomes darker, Ambiguous	C4 is unlikely to have an alkene group
$AgNO_3$ Test	No reaction	C4 does not have a tertiary alkyl halide moiety
AgI Test	No reaction	C4 does not have a primary alkyl halide moiety
$Fe(OH)_2$ Test	No reaction	C4 does not have a primary alkyl halide moiety
C4 Melting Point	58 C	
Acetamide Deriv. MP	167 C	
Benzamide Deriv. MP	203 C	