

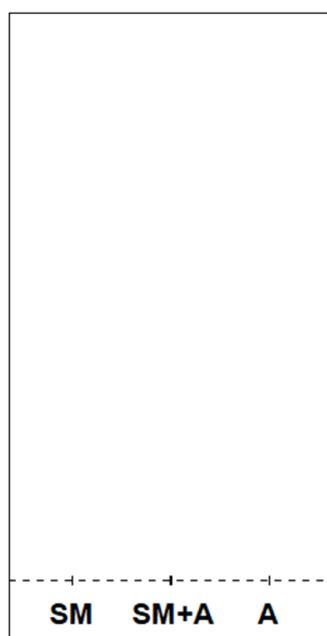
Bleach, a Chameleonic Reagent - Answer Sheet

16% of total													
Question	Yield A	TLC A	Deductions A	Yield B	TLC B	Deductions B	1.1	1.2	1.3	1.4	1.5	1.6	Total
Points	25	3	-6	25	3	-25	4	2	2	2	2	2	70
Score													

Thin Layer Chromatography (TLC) Analysis

Templates for **step 8** of the TLC analysis:

TLC A



TLC B



Submitted Items

Practical



55TH INTERNATIONAL
CHEMISTRY OLYMPIAD
SWITZERLAND 2023

A1-2

English (Official)

Product A	<input type="checkbox"/>		
Product B	<input type="checkbox"/>		
TLC A	<input type="checkbox"/>		
TLC B	<input type="checkbox"/>		
Signatures			
		Student	Lab Assistant

Analytics - Reserved for administration (not to be filled by the participant)

Yield.A (25 pt)

TLC.A (3 pt)

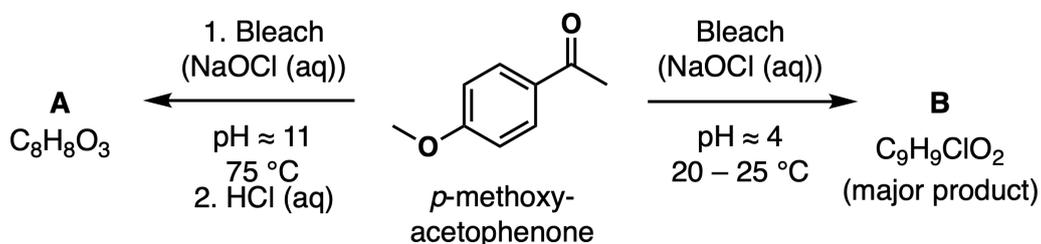
Ded.A (-6 pt)

Yield.B (25 pt)

TLC.B (3 pt)

Ded.B (-25 pt)

Questions



Legend for translation: Bleach, p-methoxyacetophenone, major product

Answer each of the following questions by ticking the appropriate checkbox (1 correct answer per question; ambiguous answers will be marked as incorrect).

1.1 (4 pt)

Answer questions a-d based on the above sketch of your TLC plates (stationary phase: SiO₂ on aluminium; eluent: hexane/EtOAc in a 80:20 ratio). No points will be attributed if the sketch is not done.

a. Which of the two products is more polar, **A** or **B**? **Choose** the correct answer.

- Product **A**
 Product **B**

b. Which of the following two compounds is more polar, product **A** or the starting material (**SM**)? **Choose** the correct answer.

- Product **A**
 Starting Material

c. Does your product **A** contain some remaining starting material? **Choose** the correct answer.

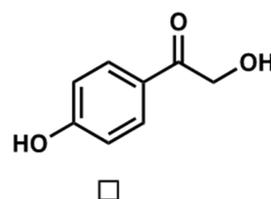
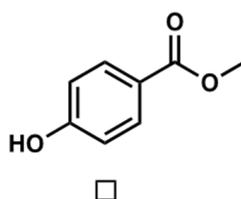
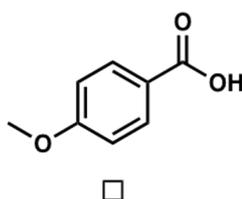
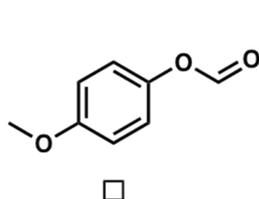
- Yes
 No

d. Does your product **B** contain some remaining starting material? **Choose** the correct answer.

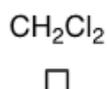
- Yes
 No

1.2 (2 pt)

Identify the structure of product **A** (empirical formula C₈H₈O₃):

**1.3** (2 pt)

As apparent from the empirical formula of product **A** (C₈H₈O₃), a C₁ fragment is cleaved off the starting molecule (C₉H₁₀O₂) in the course of the formation of **A**. After the reaction, the C₁ (= one carbon atom containing) fragment ends up containing chlorine. **Identify** its structure:



1.4 (2 pt)

The formation of product **A** is a redox reaction.

a. In this reaction, which atom type (element) is affected by an increase in oxidation number? **Choose** the correct answer:

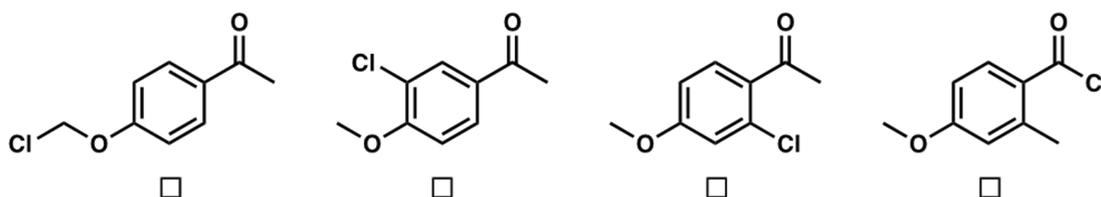
- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| C | H | O | Cl |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

b. In this reaction, which atom type (element) is affected by a decrease in oxidation number? **Choose** the correct answer.

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| C | H | O | Cl |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

1.5 (2 pt)

Identify the structure of product **B** (empirical formula $C_9H_9ClO_2$):

**1.6** (2 pt)

At some point in the synthesis of product **B**, $NaHSO_3$ (aq) is added to the reaction mixture. While serving its purpose, hydrogensulfite (HSO_3^-) undergoes a chemical reaction. **Identify** the resulting sulfur-containing species. **Note** that this question is **not** aimed at the protonation state of the resulting S-containing species (acid-base equilibria are ignored here).

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| HS^- | S_8 | $HS_2O_3^-$ | HSO_4^- |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |