

## Fluorinated and Hypervalent Compounds - Answer sheet

6% of total										
Question	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	Total
Points	4	4	4	2	6	4	1	4	5	34
Score										

**4.1** (4.0 pt)

**Identify** elements **E<sup>1</sup>**, **E<sup>2</sup>**, **E<sup>3</sup>**, and **E<sup>4</sup>** in the three species **1**, **[2]<sup>-</sup>**, and **[3]<sup>-</sup>**.

**4.2** (4.0 pt)

**Choose** which elements **E<sup>5</sup> / E<sup>6</sup>** and **E<sup>7</sup> / E<sup>8</sup>**, respectively, would display the given molecular geometry, including E-F bond distances close to those in **1**.

**4.3** (4.0 pt)

**Specify** the ideal geometry of compound **6** in terms of the arrangement of the valence-shell electron-pair domains around the Te atom. **Tick** one of the following boxes:

- square planar
- trigonal bipyramidal
- tetrahedral
- square pyramidal
- octahedral

**Provide** the expected ideal bond angles C<sup>1</sup>-Te-I, C<sup>2</sup>-Te-I, I-Te-O, and C<sup>1</sup>-Te-C<sup>2</sup>.

## Theory



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# A4-2

English (Official)

4.4 (2.0 pt)

**Write** the number of  $^1\text{H-NMR}$  signals you expect for the two methyl groups in compounds **4** and **6** respectively.

Compound **4**:

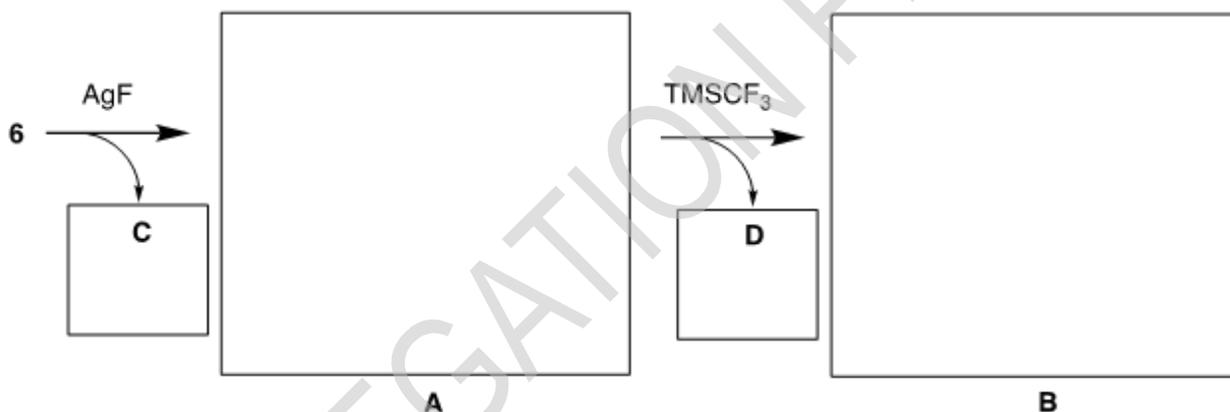
signal(s)

Compound **6**:

signal(s)

4.5 (6.0 pt)

**Formulate** the Te-containing intermediate **A** and final product **B**, including their correct geometry, as well as the byproducts **C** and **D**. **Draw** the intermediates and **write** the by-products. *Hint: MW of **D** is  $92.08 \text{ g mol}^{-1}$ .*



## Theory



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# A4-3

English (Official)

**4.6** (4.0 pt)

**Draw** the structure of both the Te-containing cation and the boron-containing anion and **tick** the box corresponding to the ideal geometry of the cation in terms of the arrangement of the valence-shell electron-pair domains around the Te atom. *Hint: Use for compound 8 (chiral, enantiomerically pure) the generic schematic representation given in the question sheet.*

cation	anion

**Tick** the box containing the ideal molecular structure

- square-planar
- trigonal-planar
- tetrahedral
- trigonal-pyramidal
- trigonal-bipyramidal

**4.7** (1.0 pt)

**Write** the number of possible stereochemically different salts **9**.

**4.8** (4.0 pt)

**Formulate** balanced half-cell reactions and a balanced overall reaction for this process. *Hint: Abbreviate **10** as R-I and **12** as R-IF<sub>2</sub> and TCICA as C<sub>3</sub>Cl<sub>3</sub>N<sub>3</sub>O<sub>3</sub>. The six-membered ring of TCICA stays intact upon reduction.*

**4.9** (5.0 pt)

**Determine** how fast the IF<sub>2</sub> group can in principle rotate at room temperature (298 K). Consider this process as if it were a chemical reaction for which you are determining the rate constant. The unit of the constant should be given in s<sup>-1</sup>.