



Reference: CC/331.1-OCInt  
Spiez, 05.08.2009

## Internship for organic chemistry skills development at SPIEZ LABORATORY

### Synthesis of compounds related to precursors, degradation products and by-products of CW-agents

#### Programme of the 2009 Three-months Internship

Main subjects	Days (approx.)
1. Accommodation (public transport and services, city and shopping) Introduction to SPIEZ LABORATORY, Chemistry Department, Organic Chemistry branch and staff Introduction to laboratory (safety and working rules) Internship organization	2
2. GC/MS, lectures, demonstration, hands-on training	4
3. Synthesis work, preparation of organophosphorus compounds (NMR and GC/MS identification): isopropylphosphonic dichloride, methylthiophosphonic dichloride, methylthiophosphonic difluoride, diisopropyl methylphosphonate, isopropyl methylphosphonochloridate, isopropyl methylphosphonic acid, O-isopropyl S-propyl methylthiophosphonate, N,N-diethylphosphoramidic dichloride, isopropyl isopropylphosphinate	20
4. NMR, lectures, demonstration, hands-on training	5
5. Visit to the Analytical Chemistry branch Demonstration: LC/MS, GC/AED, ...	2
6. Introduction to the Toxic Substances Building, synthesis of highly toxic substances (glove box, computer assisted technology)	1
7. Synthesis work, preparation of non-phosphorus compounds (NMR and GC/MS identification): N-isopropyl-propionamide, N-isopropyl-N-propylamine, N,N-diisopropylaminoethane-2-ol, N,N-diisopropylaminoethyl-2-chloride and the corresponding hydrochloride salt, N,N-diisopropylaminoethane-2-thiol and the corresponding hydrochloride salt	10
8. Sample preparation, lectures, extraction (soil, sand, water and organic solutions), derivatization (methylation and silylation), analysis, hands-on training	5
9. Synthesis work, microscale preparation of O-alkyl (C1 to C4, pinacolyl and cyclohexyl) alkyl(C1 to C3)phosphinates and their thiono derivatives	5
10. Stockpiled chemical databases and declarations of the Schedule 1 chemicals to the OPCW	1
11. Quality assurance	1
12. Visits to other departments of SPIEZ LABORATORY (Biology, Physics, NBC-Protection, Arms Control and Federal Commission for NBC-Protection)	2
13. Reports (technical and final OPCW)	5
14. Cleaning, packing, departure	2