Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

Schriftliche Prüfungen
Semesterkurs Analytik V
Analytical Strategy
Sommer 2012
MSc CHAB

Vorname:_____ Name: _____

- *Es sind alle Aufgaben zu lösen. Jede Aufgabe wird separat benotet.*
  Every question needs to be answered, each one will be graded separately

- *Zeit: 60 Min. Teilen Sie sich Ihre Zeit gut ein.*
  Time: 60 min, organize your time carefully.

- *Sie können auf Englisch oder Deutsch antworten*
  Answers are accepted in German or English.

- *Es sind alle Hilfsmittel mit Ausnahme von Computern und Telekommunikation erlaubt.*
  It is allowed to use all resources except for computers and communication devices.

- *Unleserliche Texte, unklare Formulierungen oder unsaubere Skizzen können nicht bewertet werden. Bitte bemühen Sie sich um eine saubere Darstellung.*
  Unreadable text, unclear formulations or graphs are not graded. Please try to use clear illustrations and descriptions

- *Beginnen Sie jede Aufgabe auf einem neuen Blatt und schreiben Sie jedes abzugebende Blatt einzeln mit Ihrem Namen und Vornamen an.*
  Start every question on a new page. Label every page with name and surname.

- *Dieses Deckblatt ist ausgefüllt abzugeben. Die Aufgabenstellung ist ebenfalls einzureichen.*

  Please fill in the first page. Hand in all pages including cover page and questions.

- *Wir bitten Sie um Fairness und wünschen Ihnen viel Erfolg!*
  We ask you for fairness and wish you good luck!

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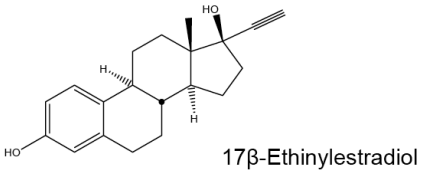
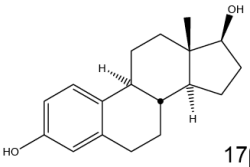
Endocrine Disruptors

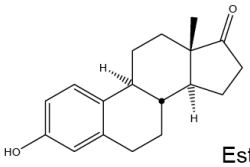
In surface water around the world, there is an increasing number of cases where fish and amphibians show disturbed endocrine (hormone) systems, giving rise to effects such as birth defects, developmental disorders, and sometimes seriously compromised fertility. It is suspected that these animals are exposed to environmental chemicals that have hormonal activity, which get into surface waters from industrial and human waste, because water treatment plants are not designed to retain these compounds. Steroid hormones can already lead to measurable effects in fish at very low concentrations (e.g. 0.1 ng/L for 17-β-ethinylestradiol, the active compound in birth control pills).



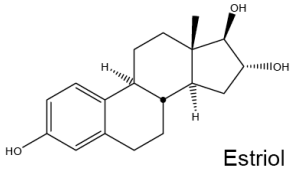
17β-Ethinylestradiol



17β-Estradiol



Estrone



Estriol

Answer the following questions:

1. ***Suggest an analytical method and workflow for quantitative analysis of the 4 compounds pictured above in aqueous environmental samples. Address in particular the figures of merit needed to be able to meet the analytical challenges (very low concentrations, quantitation required, many other compounds that are potentially present and may interfere with the measurement, ...).***

2. ***How would you modify the analytical method to determine these compounds in fish bile (German: Galle, the juice secreted by the gall bladder), which is known to accumulate such compounds by a factor 1000 ... 10'000. What has to be considered when taking samples and for transport and storage of samples?***

3. ***If an environmental water sample shows endocrine activity (from exposure of fish or a molecular-biological test screen), how would you proceed to identify the compound responsible for the endocrine activity?***

4. ***Make a suggestion for a design of a rapid, cheap, and highly selective test for determining one of the above compounds in an aqueous environmental sample.***

Answers can be given in English or German