

University of Canterbury

End-of-year Examinations 2009

Prescription Number(s): CHEM 224

Paper Title: Analytical & Environmental Chemistry

Time Allowed: Two hours

Number of pages: Four

Answer **ALL** questions.

Total marks: 120

TURN OVER

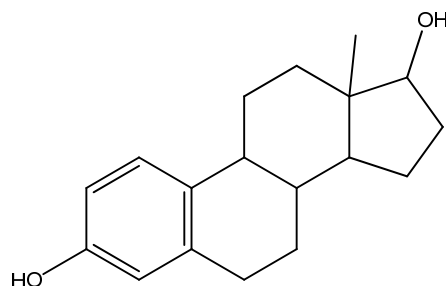
1. (40 marks)

EITHER

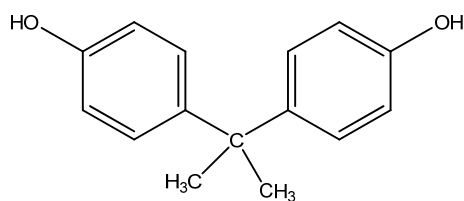
Explain the concepts of hazard, risk and benefit and outline how risk is assessed for a chemical that is expected to enter the environment (e.g. a pesticide).

OR

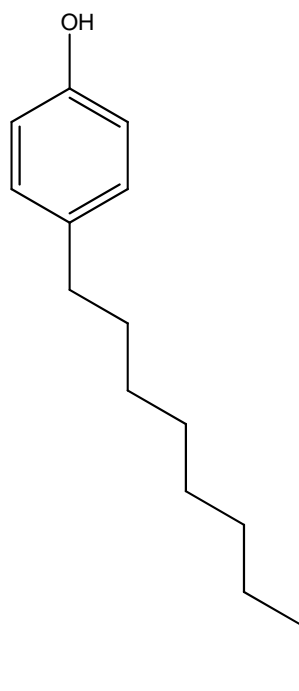
The female hormone, 17 β -estradiol has the following molecular structure:



Discuss the proposed environmental impacts of the following two compounds AND explain the molecular mechanisms of these impacts:



Bisphenol-A



4-Nonylphenol

TURN OVER

2. (20 marks)

EITHER

Write descriptive notes on the environmental chemistry of mercury. Your answer should include the significant anthropogenic and natural sources of mercury, the types of chemical species of mercury found in the environment, and the uptake of each type of mercury species by the body and their associated health effects.

OR

Outline the important reservoirs, reactions and fluxes for sulfur's geochemical cycle. As part of your answer define the term geochemical cycle and outline how humans have altered the sulfur cycle.

3. (15 marks)

- (a) Explain the essential features of weathering processes for primary minerals including the important weathering agents and the formation of different types of products.
- (b) Using diagrams explain the difference between a 1:1 and a 2:1 layer aluminosilicate clay mineral. As part of your answer explain how the sheets are held together.

4. (15 marks)

- (a) Describe the important properties of humic substances. Your answer should refer to both fulvic and humic acids, their origin and their important properties in soils.
- (b) Define the term **cation exchange capacity**. List three soil components that contribute to the cation exchange capacity of a soil.

5. (30 marks)

Give an account, with examples, of the applications of Beer's Law of light absorption in analytical chemistry.

END OF PAPER