

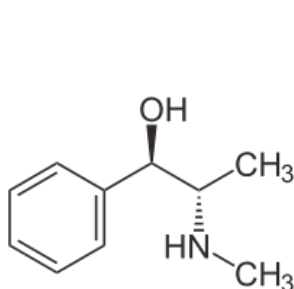
Written Exam
529-0043-00S - Analytical Strategy
Winter 2015

Vorname : _____ Name : _____

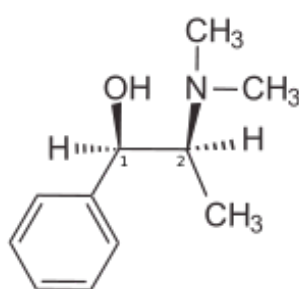
- Zeit: 60 Min. Teilen Sie sich Ihre Zeit gut ein.
Time: 60 min, organize your time carefully.
- Sie können auf Englisch oder Deutsch antworten
Answers are accepted in German or English.
- Es sind alle Hilfsmittel mit Ausnahme von Computern und Telekommunikation erlaubt.
It is allowed to use all resources 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
- Schreiben Sie jedes abzugebende Blatt einzeln mit Ihrem Namen und Vornamen an.
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!

Prüfung Winter 2015 / Analytical Strategy

You are responsible for the doping laboratory at the Olympic Winter games in Sochi 2014. The compounds that are regulated are clearly defined in “The 2014 Prohibited List” of the World Anti-Doping Agency (WADA), and include anabolic agents, hormones, growth factors and related substances, Beta-2 agonists, hormone and metabolic modulators, diuretics and other masking agents, stimulants, narcotics, cannabinoids, glucocorticosteroids, alcohol, and beta blockers. Some of the compounds are only prohibited in competition. There are rumors that ephedrine and N-methylephedrine are becoming very popular among athletes. Routinely, only spot checks are done, with urine as the sample material. After collection, the urine sample is immediately separated (into an A and a B sample), and only the A sample is analyzed. Ephedrine and N-methylephedrine are prohibited when each compound’s concentration in urine is greater than 10 $\mu\text{g/ml}$.



Ephedrine



N-methylephedrine

Answer the following questions:

1. Explain why the sample is split into an A- and a B-sample. Discuss problems that could arise if there was only one sample, and problems that could arise if the two samples (A and B) are analyzed at different times. How would you propose to store the B sample? Justify your answer.
2. Propose a routine method for detecting ephedrine and N-methylephedrine in urine, and explain how you would perform compound identification and quantitation. The stereochemistry can be neglected. What are the time requirements for your proposed method?
3. You find a N-methylephedrine concentration of 10.05 $\mu\text{g/ml}$ in an athlete’s urine. Would you indict this athlete for doping? Justify your answer. How would you proceed to have a legally robust basis for accusing an athlete of doping abuse?
4. Because ephedrine and N-methylephedrine are becoming very popular among athletes, your laboratory is commissioned with setting up a high-throughput screening method. Propose a high-throughput method, with which the two compounds could be detected very rapidly and in a fashion such that every athlete could be tested.
5. Speculate about the compound class listed above to which ephedrine and N-methylephedrine belong, and about the relatively high threshold of 10 $\mu\text{g/ml}$ for these compounds to count as dopants. Do you think these compounds are prohibited only in competition or also out-of competition? Justify your answer.