

## **Biomedical Ultrasonics course project**

### *Research article (50p)*

You are writing a research article for a scientific journal with the title of your topic. Arrange the article with the following structure (maximum given points per subtitle in brackets):

- Title
- Name of the author
- Date
- Abstract
- Introduction (15p) + Aims (2p)
- Materials and methods (10p)
- Results (10p)
- Discussion (10p)
- Conclusions (3p)

### *Abstract*

The abstract should contain max 250 words and it should essentially summarize the contents of your review article. (Abstract 0p, abstract missing -5p)

### *Introduction*

There should be a description of the history of the ultrasound method of your topic (3p). Describe the central physical principles of the method with equations (3p), also those methods presented during the lectures. Present research and clinical applications in the field (4p). There should be at least 10 references of relevant full scientific papers (5p). Aims (of the experiment) should be the last paragraph of the Introduction. Describe in the aims paragraph what aspect of your topic you are going to investigate in the study (1p) and why is it relevant to the field (1p).

### *Materials and methods*

Describe the theory with help from equations (2p), experimental arrangement (with schematics) (2p), ultrasound/measurement protocols (2p), justification of ultrasound protocols (2p), data analysis methods (2p). Use titles for sub-sections if necessary.

### *Results*

Disclose the results in writing (2p) and quantitatively with figures (4p). Quantify the ultrasound field characteristics, i.e. some kind of a measure for the ultrasound pressure/intensity (4p).

### *Discussion*

Discuss your results in order of importance and in respect to the aims of the study (2p). Choose at least 5 ultrasound phenomena studied during the course (e.g. acoustic radiation force, secondary radiation force, acoustic streaming, cavitation, shock waves etc.) and justify why these are or are not likely to be present in your experiment (2.5p). Relate the phenomenon to the context of your biomedical application (2p). Justify based on physics and properties of biological matter (e.g. cell, tissue types) how biomedically relevant the observations are for the biomedical purpose (2p). Describe at least 3 limitations (1.5p).

### *Conclusions*

What conclusions can you draw based on the results and the discussion? List 3 most important conclusions (3p).

### *Figures*

There should be 5 meaningful figures related to the topic drawn by the student.

### *Equations*

There should be 3-5 meaningful equations related to the topic.

The length of your review article should be 3-7 pages with single-line using Times New Roman font and 12pt font size.

### *Presentation (60p)*

You are giving a scientific oral presentation on your topic in a scientific conference. The presentation contains a power point presentation with following structure (maximum given points per subtitle in brackets):

- Title
- Name of the author
- Date
- Definitions (5p)
- Introduction (15p)
- Aims (2p)
- Materials and methods (10p)
- Results (10p)
- Discussion (10p)
- Conclusions (3p)

Your presentation should last no longer than 7 minutes. You will get 5p if your presentation is 7:00 minutes or shorter. There will be 3 minutes time for questions.