Assessment of your knowledge

(a) Answer the following questions to assess your command on terminology, facts, concepts, and theories learned in this chapter:

1. What compounds are necessary to set up a bioreactor system?
2. What do you need to consider when choosing the material for the tubing?
3. What are crucial properties of a sensor?
4. What are the two main classes of bioreactors for expansion of cells?
5. Why are scale-out strategies more relevant for tissue engineering applications rather than scale-up of a bioreactor?
6. How can you improve the cell distribution at the start of a tissue engineering process?
7. Which are the basic mechanical forces applied in tissue engineering?
8. Which forces are applied for the maturation of which kind of target tissue?
9. Is copper a suitable material for bioreactors?
10. How does perfusion increase the nutrient concentration within the tissue?
11. Which stimuli can be applied via the medium?
12. How is media perfusion applied in perfusion bioreactor systems and what other bioreactor systems are there establishing motion?
13. Is there a limit for tissue size and if so, what are the limiting factors and how could they be overcome?
14. Strain, weight bearing, and air-liquid boundary are the most critical stimuli for bone tissue engineering?
15. Argue whether commercially available bioreactor system are always superior to custom-made systems.

(b) Answer the following questions to assess your ability to apply the concepts and theories learned in this chapter in real life, clinical, and scientific situations:

1. Describe a general tissue engineering process for the production of a bone substitute.
2. Why is it challenging to increase the size of a cell-scaffold construct?
3. Which stimuli could be important for generation of cornea tissue and how would a bioreactor look like?
4. How would you realize a microscopic real time observation of the tissue inside a bioreactor?
5. What are the main differences between bioreactors for bioprocess engineering and tissue engineering?
6. Describe physiological cell culture conditions.
7. Design a bioreactor system for a tissue engineered bladder and describe the requirements.
8. Explain Flick's laws and their application in tissue engineering.