

1. Please describe "the etiology of orthodontic problems" and whether these factors should be considered during orthodontic treatment.

40%

2. Please describe the biological basis of orthodontic tooth movement (how mechanical forces can be translated into bone remodeling)? How could you study the factors determining the rate of tooth movement? Please propose experiments to test the possible candidates. 30%

3. Is friction an important factor during orthodontic treatment? What can influence the amount of friction based on some "law of Physics"? Please design a model to test the amount of friction to compare the traditional brackets (metal, and ceramic) and self-ligating brackets during leveling stage. Describe all the operational conditions as in detail as possible. 15 %

4. In clear aligner treatment,

- 1) please describe and draw the forces map of how to generate a couple for palatal crown torque on incisors
- 2) what is the anchorage source to intrude the incisors for leveling the curve of Spee
- 3) please describe how to de-rotate a premolar

15 %