

1. The prevalence of dental caries remains high in Taiwan. Caries prevention is an urgent responsibility of pediatric dentists. Several agents have been proved effective in caries prevention. Please describe the mechanisms of action for following caries-protective agents: (20%)
  - (a) Sodium fluoride (Please specify the mechanisms at low and high concentrations.)
  - (b) Silver diamine fluoride
  - (c) Xylitol (Please also specify the regimen of application or usage.)
  - (d) Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP)
  
2. A 4-year-old boy is referred to you from a pediatrician for treatment of severe early childhood caries. He is a case of progressive familial intrahepatic cholestasis (PFIC) with chronic liver failure, waiting for liver transplantation. Clinically, all his primary teeth exhibit green discoloration and multiple decays. He also has mild intellectual disability.
  - (a) Please provide plausible explanations for green discoloration of his teeth and the intellectual disability. (5%)
  - (b) Please describe in detail all essential considerations, precautions, and managements of dental treatments and oral hygiene maintenance for this boy before and after liver transplantation. (15%)
  
3. Adequate space maintenance is important for children with early loss of primary teeth. Please specify the necessity, considerations, and treatment modalities for space maintenance in following cases: (20%)
  - (a) A 4-year-old boy with loss of all upper incisors
  - (b) An 8-year-old girl with loss of Tooth 54 and Tooth 65
  - (c) A 5-year-old boy with loss of Tooth 74 and Tooth 84
  - (d) A 9-year-old girl with loss of Tooth 73, Tooth 75, Tooth 83, and Tooth 85
  
4. Recently, there has been great advance in robotics. Child-robot interaction has been applied in medical practice, such as autism therapy. Our department is considering whether a robot can improve children's behavior during dental appointments. We plan to use a mini-robot that can introduce our environment, dental facilities, and basic dental procedures to the children right before the first tell-show-do appointment. With this approach, we expect that the kids will be more eased and cooperative at the actual appointment. Please design a research project to investigate this potential application of a mini-robot to facilitate our tell-show-do practice. Please specify the followings: (40%)
  - (a) the hypothesis of the research
  - (b) specific aims of the research
  - (c) the approaches of the research (Please describe in detail the experimental design, subjects, processes, evaluation methods of children's behavior, and statistics.)
  - (d) the expected results and potential pitfalls of the research