1. Compare fluorescence quantum yields, UV-visible absorption and emission maxima of BODIPY dyes 1 and 2, and explain what causes the differences. (5%)

![Diagram of BODIPY dyes 1 and 2]

2. Compare fluorescence quantum yields, UV-visible absorption and emission maxima of BODIPY dyes 3 and 4, and explain what causes the differences. (5%)

![Diagram of BODIPY dyes 3 and 4]

3. Please explain how BODIPY dye 5 responds to Zn\(^{2+}\) ions (5%).

![Diagram of BODIPY dye 5]

4. Please compare fluorescence quantum yields of BODIPY dyes 6 and 7, and explain why their fluorescence quantum yields are low. (5%)

![Diagram of BODIPY dyes 6 and 7]

5. Compare fluorescence quantum yields, UV-visible absorption and fluorescence maxima of BODIPY dyes 8 and 9, and explain what causes their differences. (5%)
6. Please compare fluorescence quantum yields of BODIPY dyes 10, 11, 12 and 13, discuss and explain pH effect on their fluorescent quantum yields. (5%)

7. Compare UV-visible absorption and fluorescence maxima of BODIPY dyes 14 and 15, and explain what causes their difference. (5%)

8. Predict and explain fluorescence quantum yields of BODIPY dyes 16 and 17, and pH effect of their fluorescence quantum yields. (5%)

9. Compare fluorescence quantum yields, UV-visible absorption and fluorescence maxima of BODIPY dyes 18 and 19, and explain what causes their differences. (5%)
10. Please explain difference between electron transfer and energy transfer, and predict what happens to fluorescence of compound 20 when we excite BODIPY core. (10%)

11. Please predict and explain what happens when we excite BODIPY core in compound 21. (5%)
12. Please predict and explain whether there are significant differences in UV-visible absorption and emission maxima between E-BODIPY dyes 22 and 23. (5%)

13. Please predict and explain whether there are significant differences in UV-visible absorption and emission maxima between E-BODIPY dyes 24 and 25. (5%)

14. Compare fluorescence quantum yields, UV-visible absorption and emission maxima of BODIPY dye 26 and 27, and explain what causes the differences. (5%)

15. Compare UV-visible absorption and emission maxima of BODIPY dye 28 and 29, and explain what causes the differences. (10%)
16. Predict and explain how BODIPY dyes 30-33 respond to Hg$^{2+}$ ions. (5%)

17. Compare fluorescence quantum yields, UV-visible absorption and emission maxima of BODIPY dye 34, 35 and 36, and explain what causes the differences. (10%)

18. Please explain how to increase fluorescence quantum yields of BODIPY dyes and how to tune their emission to near-infrared region. Please give a few examples (20%).