

國立臺北教育大學 97 學年度碩士班招生入學考試
自然科學教育學系碩士班 化學 科試題

1. At a given temperature, an equilibrium mixture of the reaction $2\text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2\text{NO}_2(\text{g})$ contains 0.090 mol NO, 0.120 mol O_2 , and 0.060 mol NO_2 in a 5.00 L container. Calculate the value of K_c for this reaction. (10 分)
2. Draw the electron-dot structure for the BrO_3^- ion. (10 分)
3. Assign a point group to each member in the series (a) CCl_4 (b) CCl_3F (c) CCl_2F_2 (d) CClF_3 (e) CF_4 . (15 分，每題 3 分)
4. Write down the Schrödinger equation. (10 分)
5. Give an example of the Diels-Alder reaction. (10 分)
6. One Saturday night, you were watching a TV show, in which a magician was performing a magic show to the audience. She poured a glass of brown solution, in which she said that it was a traditional "Taiwanese brown wine", into another transparent glass with some "water" in it. The time the "brown wine" touched the "water", the color changed instantly from brown to colorless, or transparent, and she called that solution a "white wine". The audience gave her great response. However, she then poured another glass of colorless solution into the colorless white wine, the "white wine" gradually changed from colorless to the original color: the brown color in a few minutes. As a science teacher, you understand that the brown solution (or "the traditional Taiwanese wine") was an iodine solution, people can just visit a local drug store to purchase a bottle of the iodine for about 50 NT dollars. Your students asked you the way to perform the magic show, and you are ready to tell them the procedure along with the chemical reaction. Please highlight the procedure and the related chemical reaction the magician performed on the TV show. Reminder: the trick uses the concept of the redox reaction between iodine and some redox chemicals. (25 分)
7. There are many science activities in the elementary science education. Please describe one unit that uses concepts from any chemical understanding. (20 分)