

中原大學 96 學年度博士班入學考試

96/06/06 10:30~12:00 化學系化學組、材料化學組 誠實是我們珍視的美德，
我們喜愛「拒絕作弊，堅守正直」的你！

科目：物理化學和分析化學 (共 1 頁第 1 頁)

可使用計算機，惟僅限不具可程式及多重記憶者 不可使用計算機

Part I 物理化學 (50%)

1. Explain why the mean radius of a hydrogenic atomic orbitals with the same principal quantum number lies in the order of $d < p < s$ while the energies of these subshells in a many-electron atom lie in the order of $s < p < d$. (5%)
2. Draw the molecular orbital diagrams of HF and CO molecules and based on these results to explain their dipole moments. (5%)
3. Write down the term symbols arising from the configurations (a) $2s^1 2p^1$, (b) $2p^1 3d^1$. (5%)
4. Explain how the perfect gas equation of state arises by combination of Boyle's law, Charles's law, and Avogadro's principle. (10%)
5. Suggest a physical interpretation of the dependence of the Gibbs energy on the temperature. (10%)
6. Provide a molecular interpretation for each of the following processes : diffusion, thermal conduction, electric conduction, and viscosity. (15%)

Part II 分析化學 (50%)

1. (28%) Explain or define the following terms:
 - (a) method of least squares
 - (b) t -test
 - (c) spiked sample
 - (d) limit of detection
 - (e) sampling
 - (f) aliquot
 - (g) matrix effect
2. (12%) What does "on-line analysis" mean? List the advantages of on-line analysis in contrast to that of the off-line analysis.
3. (10%) What is the four-step mechanism of ionization for the electrospray ionization (ESI) interface used in liquid chromatography-mass spectrometry (LC-MS)?