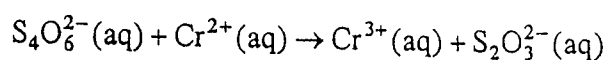
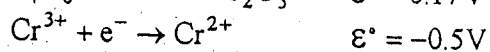
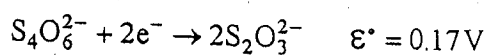


- 注意事項：1. 答案一律寫在試卷上，否則不予計分。
2. 請標明題號依序作答，不必抄題。
3. 試題應隨同試卷繳回，不得攜出試場。

1. For the oxidation-reduction reaction

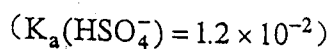


the appropriate half-reactions are



Balance the redox reaction and calculate ε° and K (at 25°C).
(6%)

2. Calculate the pH of a 1.0 M H_2SO_4 solution. (4%)



3. The expression for the energy levels available to the electron in the hydrogen atom is

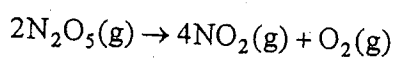
$$E = -2.178 \times 10^{-18} \text{J} \left(\frac{Z^2}{n^2} \right)$$

where n is an integer.

- a. Calculate the ionization energy of hydrogen atom.
b. Calculate the wavelength of light that must be absorbed by a hydrogen atom in its ground state to reach $n=3$ excited state.
(6%)
4. Predict the molecular structure of the sulfur dioxide molecule. Is this molecule expected to have dipole moment?
(4%)

(背面仍有題目,請繼續作答)

5. The decomposition of N_2O_5 in the gas phase was studied at constant temperature :



The following results were collected :

Time(sec)	0	50	100	200	300	400
N_2O_5 (mol/L)	0.1000	0.0707	0.0500	0.0250	0.0125	0.00625

- What is the order of rate law in N_2O_5 ?
 - Calculate the rate constant.
 - Calculate $[N_2O_5]$ 150.0 sec after the start of the reaction. (6%)
6. Silver crystallizes in a cubic closest packed structure. The radius of a silver atom is 1.44 Å. Calculate the density of solid silver ($Ag=108$ g/mol). (4%)
7. Give the structure for each of the following compounds.
- 2-methylpentane
 - p*-di-*tert*-butylbenzene
 - cis*-2-hexene (6%)
8. Use the kinetic molecular theory to explain why a liquid in an insulated vessel gets colder as it evaporated. (4%)
9. Identify the most important types of interparticle forces present in the solids of each of the following substances.
- $BaSO_4$
 - H_2O
 - NH_3
 - BF_3
 - Teflon (10%)

(背面仍有題目,請繼續作答)