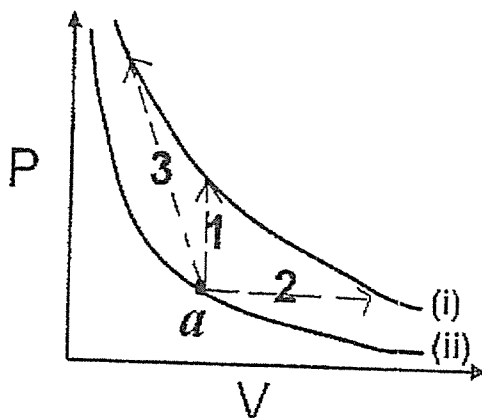


- Write
 - Hamiltonian operator for He atom.
 - Atomic term symbols for lithium and boron in their lowest states.
 - Lennard-Jones (6, 12) potential function.
 - Rotational partition function for a hetero-diatomic molecule. (12%)
- For the reaction of two different radicals at 298 K with a reduced mass of 4.98×10^{-26} kg and a collision diameter of 5 Å,
 - Evaluate the mean average velocity (cm s^{-1}).
 - Calculate the collision cross section (cm^2) based on hard-sphere collision model.
 - Calculate the bimolecular rate constant ($\text{cm}^3 \text{mol}^{-1} \text{s}^{-1}$). (12%)
Note: $k_B = 1.38 \times 10^{-23} \text{ J K}^{-1}$.
- A particle in a one-dimensional box limited in the region, $0 \leq x \leq a$, can be described by a wavefunction: $\Psi_n(x) = B \sin \frac{n\pi x}{a}$.
 - Find the B value for a normalized wavefunction of the particle. (4%)
 - Calculate the values of $\langle x \rangle$ and $\langle x^2 \rangle$ for the particle in any eigenstates of the one-dimensional box. (10%)
Note: $\int_0^a \sin^2 nx dx = \frac{\pi}{2}$
- Curves (i) and (ii) are two isothermal curves. Now, heat an ideal gas from state *a* through three different paths: *path 1* through constant volume, *path 2* through constant pressure, and *path 3* through an adiabatic process. Given the sign convention is that work done on the system is positive, and heat adding to the system is positive.



- Which process(es) returns with a positive q ?
- Which process(es) returns with a positive w ?
- Based on these processes, compare and explain the relative size of C_v and C_p . (12%)

見背面

Analytical Chemistry

5. Describe the condition of using a weighted calibration curve (weighted least square). (6%)
6. Explain that repetitive (重複) measurement of a sample often improve the accuracy of the result. (6%)
7. Describe the effect of analyte concentration to the titration curve of (a) strong acid titration (b) weak acid titration (c) oxidation titration. (12%)
8. List one type of high resolution mass spectrometer and describe the advantage of using a high resolution mass spectrometer. (6%)
9. Describe the instrument configuration of an energy dispersive X-ray fluorescence spectrometer. (8%)
10. What is the difference between fluorescence and chemiluminescence? (6%)
11. Describe the cause of junction potential. (6%)

試題隨卷繳回