

- 說明： ^{答案} 1. 答案一律寫在 卷上，計算題必須寫出計算過程，否則不予計分。
 2. 請依序作答，並標明題號。
 3. $R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1} = 8.206 \times 10^{-2} \text{ atm L K}^{-1} \text{ mol}^{-1}$, $h = 6.626 \times 10^{-34} \text{ J s}$
 $e = 1.602 \times 10^{-19} \text{ C}$, $m_e = 9.11 \times 10^{-31} \text{ kg}$, $N_A = 6.022 \times 10^{23} \text{ mol}^{-1}$

- Please describe or give a definition for the following terms. (30%)
 - Boyle's law
 - Dalton's law
 - Bohr radius
 - nodal plane
 - Carnot cycle
 - phase diagram and triple point
 - Schrödinger equation
 - work function
 - zero-point energy
 - standard enthalpy of formation
- The mass percentage composition of dry air at sea level is approximately N_2 : 75.5; O_2 : 23.2; Ar: 1.3. What is the partial pressure of each component when the total pressure is 1.00 atm? (atomic weight: N=14.01, O=16.00, Ar=39.95) (10%)
- A certain first-order reaction has a half-life of 1.00 hours. (10%)
 - Calculate the rate constant for this reaction.
 - How much time is required for this reaction to be 75% complete?
- Use molecular orbital theory to describe the bonding (electron configuration), magnetism, and relative bond energies of the (1) O_2 , (2) O_2^- , and (3) O_2^{2-} species. (10%)
- (1) Calculate the de Broglie wavelength of an electron that has been accelerated by a potential of 1 MV. (5%)
 (2) The speed of a projectile of mass 1.0 kg is known to within $1 \times 10^{-6} \text{ m s}^{-1}$. Calculate the minimum uncertainty in its position. (5%)
- At 298K, the equilibrium constant, K_p , for the reaction $\text{N}_2\text{O}_4(g) \rightleftharpoons 2\text{NO}_2(g)$ is 0.142. What is ΔG° for the reaction? (10%)
- Calculate the equilibrium constant at 25°C for the reaction
 $\text{AgCl}(s) \rightleftharpoons \text{Ag}^+(aq) + \text{Cl}^-(aq)$ $K = [\text{Ag}^+][\text{Cl}^-]$. (10%)
 $[\text{AgCl}(s) + e^- \rightarrow \text{Ag}(s) + \text{Cl}^-(aq) \quad E^\circ = +0.22 \text{ V}; \quad \text{Ag}^+(aq) + e^- \rightarrow \text{Ag}(s) \quad E^\circ = +0.80 \text{ V}]$
- Name the point groups of the following molecules to which they belong:
 (1) NO_2 (2) N_2O (c) CHCl_3 (4) $\text{CH}_2=\text{CH}_2$, and (5) trans-CHBr=CHBr . (10%)