

- 說明: 1. 答案一律寫在試卷上, 否則不予計分。
2. 請依序作答, 須標明題號但不必抄題。
3. 計算題必須寫出計算過程, 否則不予計分。

1. Give the formula of each of the following compounds: (10%)
 - (a) Ferrous hydroxide
 - (b) Sodium carbonate
 - (c) Dichlorodifluoromethane
 - (d) Cyclohexanone
 - (e) Pentaamminechlorochromium(III) sulfate.
2. Select the better choice in each of the following, and explain your selection briefly. (16%)
 - (a) Higher ionization energy: Be or B
 - (b) Higher electron affinity: O or S
 - (c) Stronger reducing agent: Mg or Sr
 - (d) Stronger Lewis base: $(\text{CH}_3)_2\text{S}$ or $(\text{CH}_3)_2\text{O}$
3. According to the kinetic theory of gases,
 - (a) What postulates are not strictly true for real gas? (4%)
 - (b) At what temperature will the molar kinetic energy of 0.3 mole of He be the same as the molar kinetic energy of 0.6 mole of Ar at 500°K ? (4%)
4. Why don't we observe the wave properties of large objects such as baseballs? (6%)
5. Predict the hybridization of the central atom and draw the geometry for each of the following species. (8%)
 - (a) H_2S
 - (b) SO_3^{2-}
 - (c) CF_3
 - (d) ICl_4^-
6. Describe in detail the experiment you would use to measure the value of K_a for formic acid, HCOOH . (6%)

7. Calculate the $[Zn^{2+}]$ and $[C_2O_4^{2-}]$ remaining in solution after 15.00 ml of 0.120 M $Zn(NO_3)_2$ are mixed with 10.00 ml of 0.100 M $Na_2C_2O_4$. (K_{sp} of $ZnC_2O_4 = 2.5 \times 10^{-9}$) (8%)
8. An ideal gas undergoes a reversible isothermal expansion from an initial volume of V_1 to a final volume $10 V_1$ and thereby does 10.0 KJ of work. The initial pressure was 100 atm. Calculate the initial volume, V_1 . ($1 \text{ l-atm} = 101.3 \text{ J}$) (8%)
9. What effect does a catalyst have on
 (a) The heat of reaction
 (b) The potential energy of the reactants
 (c) The transition state (6%)
10. Which of the following cations is colorless? Why? (6%)
 (a) $Fe^{3+}(aq)$ (b) $Ni^{2+}(aq)$ (c) $Zn^{2+}(aq)$
11. Give brief explanations for the following: (18%)
 (a) CO has a large bond dissociation energy (1072 kJ/mole) than N_2 (945 kJ/mole).
 (b) For a given substance, $\Delta S_{vap} > \Delta S_{fus}$.
 (c) K_a for $Fe^{3+}(aq)$ is larger than K_a for $Fe^{2+}(aq)$.