

科目	普通化學	適用 系列	二年級(四)組群	時間	80分鐘
----	------	----------	----------	----	------

※ 請務必在答案卷作答區內作答 ※

共2頁第1頁

1. Name the following compounds in English:

(a) S_2Cl_2 , (b) Na_3P , (c) CuO , (d) $MgSO_4 \cdot 7H_2O$, (e) $KMnO_4$ (10 points)

2. One of the compounds of iron and oxygen, "black iron oxide", occurs naturally in the mineral magnetite. When a 2.448g sample was analyzed it was found to have 1.771g of Fe. Calculate the empirical formula of this compound. Molar mass of Fe 55.845g ; O 16.00g

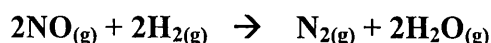
(10 points)

3. (a) On the Basis of MO theory, explain why Li_2 molecules can exist but Be_2 molecules cannot. Could the ion Be_2^+ exist? (9 points)

(b) Which of the following molecules is paramagnetic:

(1) O_2^+ , (2) O_2 , (3) O_2^- , (4) N_2 ? (6 points)

4. (a) The following data were measured for the reduction of nitric oxide with hydrogen.



Initial Concentrations (mol L ⁻¹)		Initial Rate of Formation of H ₂ O (mol L ⁻¹ s ⁻¹)
[NO]	[H ₂]	
0.10	0.10	1.23×10^{-3}
0.10	0.20	2.46×10^{-3}
0.20	0.10	4.92×10^{-3}

What is the rate law for the reaction?

(10 points)

(b) The decomposition of HI has rate constant $k = 0.079 \text{ L mol}^{-1} \text{ s}^{-1}$ at 508°C and $k = 0.24 \text{ L mol}^{-1} \text{ s}^{-1}$ at 540°C. What is the activation energy of this reaction in kJ mol^{-1} ?

(5 points)

5. Draw the molecular shape and predict the bond angles (relative to the ideal bond angles) of (a) CCl_4 (b) H_3O^+ (c) ICl_3 (12 points)

6. Which molecule in pair has the greater dipole moment?

Give the reason for your choice.

(a) SO_3 or SO_2 (b) ICl or IF (c) H_2O or H_2S (12 points)

7. Calculate the solubility of $\text{Ca}(\text{OH})_2$ in (a) water (b) 0.10M $\text{Ca}(\text{NO}_3)_2$.

(K_{sp} of $\text{Ca}(\text{OH})_2$ is 6.5×10^{-6}). (14 points)

8. Predict which solvent will dissolve more of the given solute: (6 points)

(a) KCl in methanol (CH_3OH) or in butanol ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$)

(b) Ethylene glycol ($\text{HOCH}_2\text{CH}_2\text{OH}$) in $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ or in water

Predict which solute is more soluble in the given solvent: (6 points)

(c) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ or $\text{HOCH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$ in water

(d) CH_3Cl or CCl_4 in water