考生可使用計算機，常用的元素原子量如下
C: 12.01,     H:1.008,     N:14.01,     O:16.00,    S:32.07

一、解釋名詞(25%)
1. Electronegativity
2. Resonance
3. Stoichiometry
4. Electrolyte
5. Solubility
6. molarity
7. Free energy
8. Chirality
9. Colligative properties
10. Reversible reaction

二、配合題(請從表格中找出正確答案)(25%)
1. hydrogen chloride
2. carbon dioxide.
3. chloric acid
4. methane
5. sodium hydroxide
6. zinc iodide
7. hydrocyanic acid
8. carbonic acid
9. potassium dichromate
10. ammonium sulfate
| a | CO₂          | j | NH₄SO₄ | s | C₂H₆          |
| b | HClO₄        | k | H₂SO₄  | t | KOH           |
| c | ZnCl₂        | l | NaOH   | u | K₂CrO₄        |
| d | H₂CN         | m | HClO₃  | v | (NH₄)₂S       |
| e | CO           | n | K₂Cr₂O₇| w | HCN           |
| f | HCl          | o | HCO₃   | x | ZnI           |
| g | (NH₄)₂SO₄    | p | HClO₂  | y | ZnI₂          |
| h | H₂CO₃        | q | SO₂    | z | HBr           |
| i | CH₄          | r | C₂H₄   |   |               |

三、非選擇題 (50%)

1. Which of these symbols provides more information about the atom:²³Na or ¹¹Na? Explain. (6%)

2. Nitrous oxide (N₂O) is also called “laughing gas.” It can be prepared by the thermal decomposition of ammonium nitrate (NH₄NO₃). The other product is H₂O.
   (a) Write a balanced equation for the reaction.
   (b) How many grams of N₂O are formed if 0.46 mole of NH₄NO₃ is used in the reaction? (8%)

3. Dry ice is solid carbon dioxide. A 0.050-g sample of dry ice is placed in an evacuated 4.6-L vessel at 30°C. Calculate the pressure inside the vessel after all the dry ice has been converted to CO₂ gas.
   (Gas constant R=0.082057 L · atm/K · mol) (5%)

4. A metal ion with a net +3 charge has five electrons in the 3d subshell. Identify the metal. (5%)

5. Classify these bonds as ionic, polar covalent, or covalent, and give your reasons:
   (a) the SiSi bond in Cl₂SiSiCl₃,
   (b) the SiCl bond in Cl₃SiSiCl₃,
   (c) the CaF bond in CaF₂,
   (d) the NH bond in NH₃. (12%)

6. Draw all the possible structural isomers for the molecule having the formula C₃H₇Cl. The molecule contains one benzene ring. (6%)
7. The concentrated sulfuric acid we use in the laboratory is 98.0 percent H$_2$SO$_4$ by mass. Calculate the molality and molarity of the acid solution. The density of the solution is 4.83 g/ml. (8%)