

國立中央大學 108 學年度碩士班考試入學試題

所別：大氣科學學系大氣物理 碩士班 不分組(一般生)  
大氣科學學系大氣物理 碩士班 不分組(在職生)

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科目：普通化學

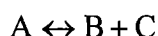
本科考試禁用計算器

1. Multiple choice. Please complete this problem by matching the following chemical species to each of questions. The proper answer to each of questions may be more than one choice.

- |                                    |                                   |
|------------------------------------|-----------------------------------|
| (A) NO                             | (J) CO <sub>2</sub>               |
| (B) NO <sub>2</sub>                | (K) CH <sub>4</sub>               |
| (C) N <sub>2</sub> O               | (L) O                             |
| (D) HNO <sub>3</sub>               | (M) O <sub>2</sub>                |
| (E) COS                            | (N) O <sub>3</sub>                |
| (F) H <sub>2</sub> S               | (O) CFCs                          |
| (G) SO <sub>2</sub>                | (P) F                             |
| (H) H <sub>2</sub> SO <sub>4</sub> | (Q) Cl                            |
| (I) CO                             | (R) Non-methane organic compounds |

- (a) Which four species are the primary greenhouse gases? (6 points)
- (b) Which species can be regarded as an indicator of urban air pollution? (6 points)
- (c) Which two gases are the major anthropogenic (human-made) sources of acid rain? (6 points)
- (d) In a rain-water sample collected from a highly polluted area, what acid or acids would you expect to detect generally? (6 points)
- (e) What industrial product (products) has been entirely banned since 1996 according to Montreal Protocol for saving the atmospheric ozone? (6 points)

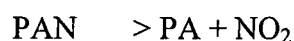
2. Given the following balanced equation



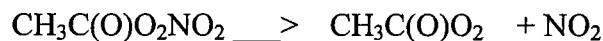
and equilibrium constant  $K = 5 \times 10^{-6} \text{ M}$  at 25 °C.

What is the concentration of C at equilibrium at 25 °C when  $[A] = 5 \text{ M}$  at the beginning of the reaction? Make any necessary assumption. (30 points)

3. The thermal decomposition of peroxy-acetyl nitrate (commonly called "PAN") is expressed in the following way,



or



and the reaction constant  $k = 1.95 \times 10^{16} \exp(-13543/T) \text{ sec}^{-1}$ .

- (a) Write a rate equation for the decomposition process. (20 points)
- (b) Integrate the rate equation to obtain an expression for  $[\text{PAN}]$  as a function of the initial concentration of PAN ( $[\text{PAN}]_0$ ), the reaction constant, and the reaction time  $t$ . (20 points)

