國立彰化師範大學九十六學年度碩士班招生考試試題

系所：科學教育研究所　　組別：丙組　　科目：普通化學

★★請在答案紙上作答★★

1. (40 %) Explain the following terms as much as you can, give an example when possible.
   (a) molecular orbital, (b) atomic mass unit (amu), (c) Avogadro's principle, (d) Law of multiple proportions, (e) Law of definite proportions, (f) van der Waals equation, (g) buffer solution, (h) Dalton's law of partial pressures, (i) catalyst, (j) tetrahedral geometry.

2. (10 %) The standard enthalpies of combustion of C(s), H_2(g), and CH_4(g) are -393.5, -285.8, and -890.4 kJ/mol, respectively at 298 K. Calculate the standard enthalpy of formation of CH_4(g).

3. (10%) For a reaction 2A(g) + B(g) = A_2B(g), it is first order with respect to [B] and second order with respect to [A]. When [A] = [B] = 1.0M, the reaction rate is 0.2 M/sec.
   What is the initial rate when [A] = 5.0M and [B] = 2.0M ?

4. (20%) Please balance the following organic chemical reactions. You should rewrite the entire chemical reaction with proper chemical formula for reactants and products.
   (a) 2-pentanol + Bronsted acid catalyst $\rightarrow$
   (b) 2-bromopentane + potassium ethoxide $\rightarrow$

5. (20%) The mass of the earth atmosphere is estimated to be 5.20×10^{21} g, while the average molecular weight of the atmospheric gases is 28.9 g/mol. If the concentration of CO_2 in the atmosphere is 360 ppm by volume, calculate the mass of this gas in the atmosphere in bmt (billions of metric tons = 10^{12} kg).