

2009年8月27日実施

2010年度立命館大学大学院理工学研究科
博士課程前期課程
入学試験問題（外国語科目）

応用化学型

【注意事項】

1. 解答は問題番号1、2、・・・ごとに解答用紙1枚を使用すること。
2. 解答用紙には専攻名、課程、受験番号、氏名、問題番号を解答用紙すべてに記入すること。
3. 無記名答案は無効、問題用紙および解答用紙は持ち帰らないこと。
4. 解答用紙はホッチキス止めしてあるので、はずさないこと。
5. 問題用紙が事前に届けでている型の問題であるか確認し、解答すること。
6. 外国語科目試験時間
10:00～11:30（90分）
試験時間中の途中退室は認めない。

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1. 以下の文章を全文和訳せよ。

The ionic bond is most easily understood with reference to a gas-phase molecule, such as NaCl. At internuclear distance not far from the equilibrium distance it appears to be satisfactory to treat the molecule as an Na^+ ion bound to a Cl^- ion by the coulombic attraction of the opposite charges.

If the charges on the ions are q_1 and q_2 (for NaCl the value of q_1 is $+e$ and that of q_2 is $-e$), the electrostatic attraction leads to the attractive-energy term, $q_1q_2/4\pi\epsilon_0r$, where r is the internuclear separation. The effect of this energy term is to draw the ions together.

An opposing effect exists in the form of a repulsion between the nuclei and their closed shells of electrons.

This repulsion term cannot easily be deduced, and it is satisfactory here to use an empirical expression to represent the repulsion that sets in at small internuclear distances. The form of the variation of this repulsive-energy contribution with internuclear distance has been shown by Born and Mayer to be satisfactorily represented by an empirical equation of the form

$$U_{\text{rep}} = b \exp(-r/p) \quad (1)$$

where p and b are empirical constants. Furthermore, to a quite good approximation, the constant p can be taken to be the same for all ionic molecules and is equal to 0.30×10^{-10} m. The total energy function for an ionic bond can then be written

$$U = \frac{q_1q_2}{4\pi\epsilon_0r} + b \exp\{-(3.3 \times 10^{10})r\} \quad (2)$$

The value of the remaining empirical constant b can be assigned, for a given molecule, so that the total potential-energy curve constructed from equation (2) will have a minimum of an internuclear separation equal to the experimentally determined equilibrium internuclear distance.

(G. M. Barrow 著、"Physical Chemistry" より抜粋し、一部修正)

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2. 次の英文を読んで、下記の設問に答えよ。