

平成29年度第2次募集
新潟大学大学院自然科学研究科博士前期課程入学者選抜試験問題
外国人留学生特別入試
Entrance Examination for International Master Students

環境科学専攻
Environmental Science and Technology
流域環境学コース
Environmental Science for Agriculture and Forestry
E2

専門科目

Written examination (Specialized subject)

注意事項

General instructions

1 この問題冊子は、試験開始の合図があるまで開いてはならない。

You must not open this examination sheet before the examination starts.

2 問題冊子は、この表紙を含めて全部で3ページある。

There are 3 pages including this cover page.

3 解答は、すべて解答用紙の指定された箇所に記入すること。

Write your answer in the appropriate place on the answer sheets.

4 受験番号は、各解答用紙の指定された箇所に必ず記入すること。

Write your examinee's number in the appropriate place on all the answer sheets.

5 解答時間は、120分である。

Answer time is 120 minutes.

6 下書きは、問題冊子の余白を使用すること。

Use the space within the question sheets for draft writing.

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Consider the steady state percolation shown in Figure 1. Darcy's law is defined as follows:

$$q = -k \cdot J \quad \text{①}$$

where q is flux (amount of water passing through per unit area and unit time), k is hydraulic conductivity, and J is hydraulic gradient ($=\Delta H/\Delta x$, where H is potential and x is distance).

Answer the questions on the next page.

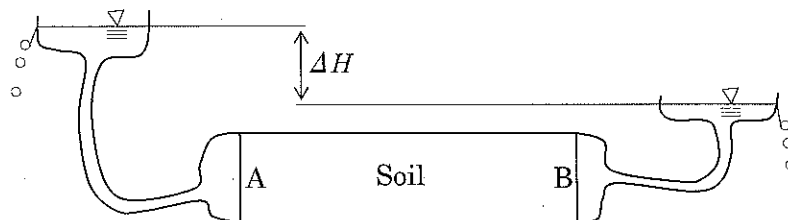


Figure 1. Experiment of steady state percolation in soil

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- (1) The potential was measured at two points A and B in Figure 1. The result is shown in Table 1. Calculate the hydraulic gradient J , and state the direction of soil water movement by considering the minus sign in the right-hand side of Equation ①.

Table 1. Potential measured at two points A and B

Points*	A	B
Potential (cm)	65	20
*The distance from A to B is 15 cm.		

- (2) Assuming that the hydraulic conductivity between the points A and B is 5×10^{-4} (cm/s), calculate flux q through the soil in Figure 1.
- (3) Under saturated conditions, the hydraulic conductivity, k , depends on soil particle size. Explain the nature of the relationship between soil particle size and hydraulic conductivity, and compare k for sandy soil and clay soil.
- (4) Under unsaturated conditions, k depends on soil water content. Explain the nature of the relationship between soil water content and hydraulic conductivity under unsaturated conditions.