

総合研究大学院大学先端学術院
加速器科学コース・素粒子原子核コース
5年一貫制博士課程入学試験問題
英 語

令和6年8月21日（水） 11時20分～12時00分

注意

- ☆ 答案用紙の所定の欄に，受験番号，氏名を記入すること.
- ☆ 試験問題（2問）ごとに，異なった答案用紙を使用すること.
- ☆ 各問題に対して，答案用紙は複数使用してよいが，第〇〇問□□枚目というように，所定の欄に，選択した問題の番号及び答案用紙の順番を記入すること.
- 解答できない場合も，受験番号，氏名，問題番号を記入し，提出すること.
- ☆ 答案用紙がさらに必要な場合は，挙手をして監督者に知らせること.

第 1 問

次の文章は、C. D. Anderson の論文 "The Positive Electron" (Phys. Rev. 43 (1933), p.491) から一部を抜粋・改変したものである。文章を読み、下記の問いに答えよ。

On August 2, 1932, during the course of photographing cosmic-ray tracks produced in a vertical Wilson chamber (magnetic field of 15,000 gauss) designed in the summer of 1930 by Professor R. A. Millikan and the writer, the tracks shown in a) Fig. 1 were obtained, which seemed to be interpretable only on the basis of the existence in this case of a particle carrying a positive charge but having a mass of the same order of magnitude as that normally possessed by a free negative electron. Later study of the photograph by a whole group of people of the Norman Bridge Laboratory only tended to strengthen this view. The reason that this interpretation seemed so inevitable is that the track appearing on the upper half of the figure cannot possibly have a mass as large as that of a proton for as soon as the mass is fixed the energy is at once fixed by the curvature. b) The energy of a proton of that curvature comes out 300,000 volts, but a proton of that energy according to well established and universally accepted determinations has a total range of about 5 mm in air while the portion of the range actually visible in this case exceeds 5 cm without a noticeable change in curvature. The only escape from this conclusion would be to assume that at exactly the same instant (and the sharpness of the tracks determines that instant to within about a fiftieth of a second) two independent electrons happened to produce two tracks so placed as to give the impression of a single particle shooting through the lead plate. This assumption was [A] on a probability basis, since a sharp track of this order of curvature under the experimental conditions prevailing occurred in the chamber only once in some 500 exposures, and since there was practically no chance at all that two such tracks should line up in this way. We also [B] as completely untenable the assumption of an electron of 20 million volts entering the lead on one side and coming out with an energy of 60 million volts on the other side. A [C] possibility is that a photon, entering the lead from above, knocked out of the nucleus of a lead atom two particles, one of which shot upward and the other downward.

But in this case the upward moving one would be a positive of small mass so that either of the two possibilities leads to the existence of [D].

In the course of the next few weeks other photographs were obtained which could be interpreted logically only on the positive electron basis, and a brief report was then published with due reserve in interpretation in view of the importance and striking nature of announcement.

【問 1】空欄[A]と[B]には同じ言葉が入る。空欄に入る言葉を答えよ。

【問 2】次の選択肢のうち空欄[C]に当てはまるものを選べ。

- a) second
- b) third
- c) fourth
- d) fifth

【問 3】空欄[D]にはどのような言葉が入るか。本文から抜き出して答えよ。

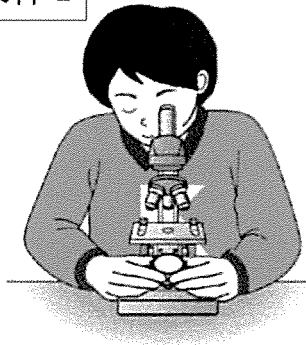
【問 4】下線部 b)を和訳せよ。

【問 5】下線部 a) Fig. 1 はどのような図であると考えられるか。図を描き、日本語で説明せよ。

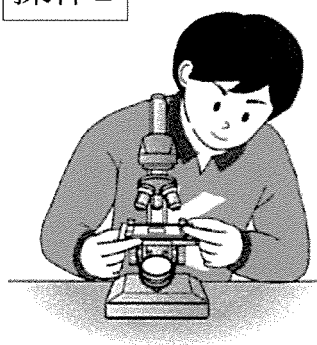
第2問

あなたは大学院生のティーチングアシスタントとして大学生向けに顕微鏡のマニュアルを作りたい。下の図に示した操作1~5は正しい手順を示している。各操作について英語で説明せよ。①~⑩の単語は自由に使用してよい。

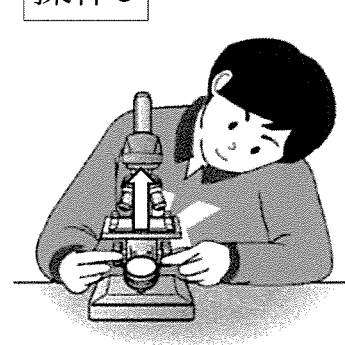
操作1



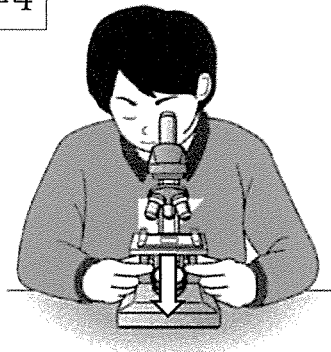
操作2



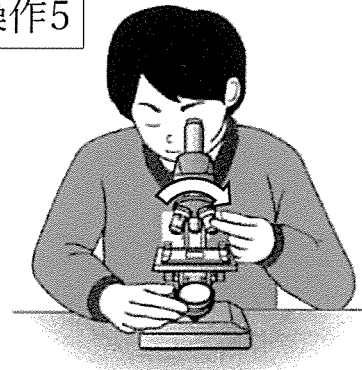
操作3



操作4



操作5



出典：日本理科教育振興協会

- ① Eyepiece
- ② Head
- ③ Arm
- ④ Nosepiece
- ⑤ Objective lens
- ⑥ Stage/Preparation
- ⑦ Diaphragm
- ⑧ Reflection mirror
- ⑨ Stage adjustment
- ⑩ Base

