平成１１年度東京大学大学院理学系研究科
物理学専攻修士課程入学試験問題（外国語）

英　　語

平成１０年８月２５日（火）　１３時３０分～１４時３０分

【注意事項】

1．試験開始の合図があるまで、この問題冊子を開いてはならない。
2．解答には、必ず黒色鉛筆（または黒色シャープペンシル）を使用すること。
3．問題は全部で２問ある。２問のすべてに解答せよ。
4．答案用紙は各問につき１枚、合計２枚配布してあるから、確実に配布されていることを確かめること。
5．各答案用紙の所定欄に**科目名**（英語）、**受験番号、氏名、問題番号**を記入すること。
6．解答は、各問ごとに所定の答案用紙を使用すること。
7．答案用紙は点線より切り取られるから、裏面も使用する場合には、点線の上部を使用しないこと。
8．答案用紙には解答に関係ない文字、記号、符号などを記入してはならない。
9．解答できない場合でも、答案用紙に科目名・問題番号・受験番号および氏名を記入して提出すること。
10. 答案用紙を草稿用紙に絶対使用しないこと。

次の２問について、別々の解答用紙に解答しなさい。

第１問

次の英文を読み、以下の設問に答えなさい。

In 1961, during the very month that President John F. Kennedy launched the race to the moon, K. Watson, B. C. Murray and H. Brown of the California Institute of Technology noted the importance of the fact that some craters in the moon's polar regions are permanently in shadow. Rather than being subjected to two weeks of blistering rays from the sun each lunar month, these sites remain eternally dark and frigid. Such "cold traps", they argued, might snare water dumped on the lunar surface by crashing comets or spewed forth by lunar volcanoes. And over the aeons, inky crater floors near the poles might accumulate substantial amounts of ice. Those deposits would be immensely valuable to people on future lunar bases, who could distill water from them or separate out the oxygen and hydrogen to use as rocket propellant. It took nearly three decades, but the latest robot probe, Lunar Prospector, has seemingly confirmed that frozen caches of water can indeed be found on the moon.

Because none of the Apollo missions visited the moon's poles, the (ア) proposal of Watson, Murray and Brown had remained untested for 30 years. The first experimental indication came when the Department of Defense and National Aeronautics and Space Administration sent a probe called (a) Clementine into a polar orbit around the moon in 1994.

Clementine found evidence for ice by bouncing radar signals off the lunar surface and back to antennas on the earth. Some of the signals that were returned suggested that ice might be present near the moon's south pole. Yet Clementine uncovered no indications of ice at the north pole, even though the probe flew much lower there, and the radar experiment should have been more sensitive to ice on the surface.

A 1994 report by the late (b) E. M. Shoemaker and two colleagues at the U.S. Geological Survey noted that the south pole of the moon contains "much larger" areas of permanent shadow than the north does, although just how much was hard to say. So Clementine's finding evidence for ice only in the south seemed to make some sense. But in 1997 (c) three radio astronomers reported that radar reflections of the type seen by Clementine could also be found for sunlit parts of the moon, casting doubt on this earlier indication of an icy southern pole. (イ) And the latest results from Lunar Prospector have completely reversed the bias that had, up to this point, placed the moon's south pole in the spotlight.

According to (d) A. B. Binder of the Lunar Research Institute, the leader of the Lunar Prospector science team, measurements from the spacecraft show "about twice as much water ice in the north polar regions as in the south polar regions." Actually, the relevant instrument on Lunar Prospector can only sense the presence of hydrogen. The conclusion that the hydrogen detected is from water, Binder admits, is (ウ) "a leap of faith" but a logical one. The ice is apparently mixed with a great deal of rock, so that it makes a tiny fraction of the lunar soil. However, the ice-tinged soil may extend a couple of meters deep.

Binder does not yet know why the new results from Lunar Prospector show more ice in the north than in the south. He suggests that the shadow maps previously obtained from Clementine may have been misleading. Unfortunately the mystery remains unsolved for the moment: Lunar Prospector carries no camera, so the scientists cannot just take a quick look.

snare: 捕らえる
spewed: はき出される
aeons: 永遠
propellant: （ロケット等の）推進剤
caches: 隠し場
leap: 跳躍

(1) 下線部（ア）の proposal とは何か説明せよ。

(2) 下線部（イ）を和訳せよ。
(3) 下線部（ウ）にはどういう意味が込められているか。
(4) 下線部 (a), (b), (c), (d) による主張点ないし観測結果を、その相互関係がわかるように要約せよ。

第２問

つるまきバネ(coil spring)に重りをぶら下げると、その自然長から$x(m)$だけ伸びる。重りがバネに及ぼす力$F(N)$は、フックの法則(Hooke's law)より、$F = kx$と書ける。この時の比例定数$k(N/m)$をそのバネのバネ定数(spring constant)という。このフックの法則を確かめ、バネ定数 k を測定する実験を行った。その測定結果は下図のグラフにxとFの関係として与えられている。

この実験を報告するレポートを英文で書け。ただし、 １．実験の目的 、２．実験方法、３．結果、４．考察、５．結論 のセクションに分けて書け。それぞれのセクションは、数行程度の記述で良い。必要ならば、解答用紙に適当な図を書き、それを参照しながら説明してもよい。