

English for Physics Solutions

Exercise 2-1

(1) 下

(2).

Figure 2. Energy dependence of the de Broglie wavelengths of photons, neutrons, and electrons. For the massless photons, the wavelength is inversely proportional to the energy, while for neutrons and electrons with nonzero masses, the wavelengths are inversely proportional to the square root of their energies.

Exercise 2-2

1. The Hamiltonian H sub zero is (equal to) p squared over two m plus one half m times omega squared times x squared.
2. The integral over x from minus infinity to infinity of the exponential of minus alpha times x squared is equal to the square root of π over alpha.
3. The partial derivative of rho with respect to t plus the divergence of open parentheses rho times the vector \mathbf{v} close parentheses is equal to zero.

Solutions to the Exercises 3

Exercise 3-1

1. spectra
2. analyses
3. quanta
4. parentheses
5. momenta
6. theses
7. media
8. axes
9. minima
10. criteria
11. radii
12. supernovae [soo-per-**noh**-vee]

Exercise 3-2

1. 常磁性体である銅が、磁場に対してどう反応するかの磁氣的性質
2. 鉄が磁性体(強磁性体)であるという性質
強磁性体(ferromagnet): 外部から磁場をかけなくても自発磁化が生じる物質

Exercise 3-3

1. The temperature was stabilized in this way.
2. The iron was oxidized.

3. Synchrotron radiation is used in this way.

Exercise 3-4

1. Many pieces of evidence for unusual nonlinear behavior have been found in a variety of physical properties.
“Evidence” and “behavior” are both uncountable nouns [U].
2. These phenomena (This phenomenon) can be experimentally studied using these two pieces (units) of equipment and theoretically analyzed in terms of a product of two matrices.

English for Physics

Solutions to Exercise 4

Exercise 4-1

1. is
2. (correct)
3. (correct)
4. was
5. (correct)

Exercise 4-2

1. ratio, is
2. dependence, is (correct)
3. considerations, lead; results, were
4. total, were (correct)

(“21 values”に焦点がある。“A total of” はそれを修飾している感じ。
これが was か were かの用法は微妙。)

5. series, was
(“Series”は単複同形、“Two series of lectures were given.”となる。)

Exercise 4-3

1. has recently been
2. was discovered
3. is schematically shown

Exercise 4-4 (略解)

1. oscillations result from
2. The apparatus consists of
3. violation occurs
4. discuss the nonlinear effects in detail.
5. The long life time of the muons is attributed to the relativistic effect.
6. The sample was irradiated with X-ray for two hours.
(“With” の代わりに”by”でもよいが、withの方がこなれた言い方。)
7. was raised to

Exercise 4-5

1. The atomic configuration can be resolved **with** an electron microscope.
(道具)
2. Iron has successfully been substituted for copper.
(has been successfully)
3. This phenomenon has been ascribed to adiabatic softening by most of the previous authors.
4. The magnetic flux density inside can be calculated **from** Eq. 1.
(文頭なら Equation 1, Figure 2; 文中なら Eq. 1, eq. 1, Fig. 2, fig. 2 などと書くのが国際的慣習。)

Exercise 4-6

1. The 2015 models feature laser processing.
2. We attribute the origin of attraction between electrons to the electron-phonon interaction.
3. We could not identify a number of diffraction peaks.

English for Physics

Solutions to Exercise 5

Exercise 5-1

1. The effects of (the) spin-orbit interaction are negligible.
(can be neglected.)
2. We will qualitatively discuss the behavior of electrons in a metal.
3. The number of photons in a given volume is proportional to the cube of (the) temperature.
4. The mass of a neutron is larger than that of an electron by three orders of magnitude.
5. It has long been considered that there is a profound relation between the weak interaction and the electromagnetic interaction.
6. Einstein described the universe as a four-dimensional space-time continuum.
Hyphens に注意。
A continuum (連続体) is a countable noun [C].
7. The signal-to-noise ratio has been improved by more than a factor of five with this new detection technique.
8. The neutrino and the antineutrino are electrically neutral, nearly massless particles, but with lepton numbers +1 and -1, respectively.

English for Physics

Solutions to the Exercises 6

Exercise 6-1

1. starting,
2. to account,
3. writing,
4. to repair,
5. to meeting,
6. to use—rather than to send,
or (alternatively,) using—to sending
7. increasing

Exercise 6-2

1. supplying
2. remaining (remain は自動詞 ; 過去分詞はとれない)
3. developed (スペルに注意)
4. Having emphasized
5. Shown

Exercise 6-3 (略解)

1. holding,
2. The mechanical parts requiring immediate repair are listed below.
3. Hadrons differing ... groups called multiplets.

Exercise 6-4

1. We are here interested in exploring its implications, assuming that the same reactions take place in other systems.
2. Looking farther back, we (one) can imagine an endless cycle of expansion and contraction of the universe stretching into the infinite past.

English for Physics

Solutions to the Exercises 7

Exercise 7-1

1. in, on,
2. for (of),
3. for, in,
4. for (of), by, with (to),
5. in,
6. to, in (of), across, with,
7. of, on, of,
8. to, over, of
9. between, of, than

Exercise 7-2

1. to (with),
2. with,
3. with,
4. at, with,
5. from,
6. against,
7. from,
8. of,
9. to,
10. to

Exercise 7-3

1. to, from, 2. of, 3. to, 4. to, 5. with, 6. of

Exercise 7-4

1. under (in),
2. in, in,
3. by, by
4. by, with
5. in, in
6. in, at,
7. by,
8. at,
9. with, for

Exercise 7-5

1. with respect to,
2. In terms of,
3. On the basis of,
4. on the order of,
5. by a factor of

English for Physics

Solutions to the Exercises 8

Exercise 8-1

1. a, 2. the, 3. The, 4. a, 5. a, 6. a (the), 7. the, 8. ϕ , 9. an,
10. ϕ (the), 11. ϕ (the), 12. The, 13. a, 14. A, 15. a, 16. the, 17.
 ϕ

Exercise 8-2

1. The, 2. an, 3. an, 4. the, 5. the, 6. a, 7. the,
8. an, 9. ϕ , 10. the, 11. the, 12. the, 13. the, 14. ϕ , **15. ~~an~~ ϕ** ,
16. an, 17. ϕ , 18. the, 19. the, 20. the, 21. the, 22. ϕ , 23. The

Exercise 8-3

1. a, 2. the, 3. ϕ , 4. the, 5. the, 6. a, 7. the, 8. the, 9. ϕ , 10.
 ϕ , 11. the, **12. ~~an~~ ϕ** , 13. ϕ , 14. the, 15. ϕ , 16. the, 17. ϕ , 18.
the, 19. ϕ , 20. the, 21. ϕ

Exercise 8-4

1. the, 2. the, 3. ϕ , 4. the, 5. ϕ , 6. the, 7. an, 8. the, **9. ϕ** ,
10. a, 11. the, 12. the, 13. a, 14. ϕ , **15. ~~an~~ ϕ**

Red marks are for special attention.

Exercise 8-5

1. The, 2. ϕ , 3. a, 4. ϕ , 5. a, 6. a, 7. a, 8. the, 9. a, 10. a,
11. the, 12. the, 13. ϕ , 14. a, 15. ϕ , 16. the, 17. the, 18. the,
19. the, 20. the, 21. a, 22. the, 23. the, 24. a, 25. ϕ , 26. the,
27. the, 28. the, 29. the, 30. the, 31. the, 32. ϕ , 33. the,
34. the, 35. a, 36. the

Exercise 8-6

From Glenn Paquette

1. an, 2. an, 3. a, the, 4. a, ϕ , 5. the, the,
6. the, a, 7. a, 8. the, 9. the, 10. the
11. the, 12. the, 13. ϕ , 14. ϕ , 15. the, ϕ

14. ϕ data: 一部のデータ

The data: その「すべてのデータ」という意味になってしまう。

15. The proton is mysterious. ~というものは

English for Physics

Solutions to Exercises 9

Exercise 9-1

1. on which,
2. in which (where), which, for which,
3. in which

Exercise 9-2

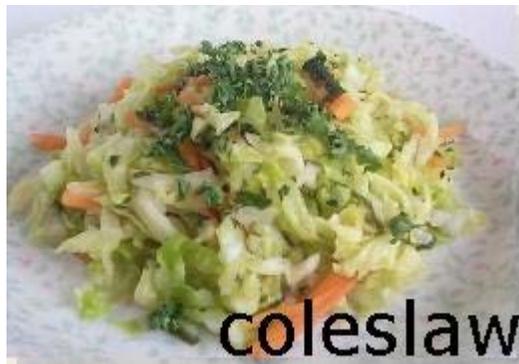
1. even,
2. However,
3. in which,
4. although

Exercise 9-3

1. :
2. ;
3. :
4. ;
5. :
6. :, ;

Cole's law:

Thinly sliced cabbage



English for Physics

Solutions to Exercises 10

Exercise 10-1

1. Use parallel construction not only **to be concise** but also **to be clear**.
2. This effect was found **by** Smith and Jones and **by** Suzuki.
3. **Both** quantum mechanics and relativity introduced ideas that seemed outlandish; yet **both** have made the universe more explicable and predictable.
4. While **we** did not observe the expected second transition, **we** found (observed) strong frequency dependence in the magnetic susceptibility.

Exercise 10-2

1. We found that this metal melts below 400°C . **Since the melting point of aluminum is 660°C** , this metal cannot be pure aluminum.
2. This voltmeter is designed for a power-line frequency of 50 Hz only. **Since the power-line frequency in Kyoto is 60 Hz**, you should not use it here.