UNIVERSITY OF TORONTO
Faculty of Arts and Science

APRIL/MAY 2004 EXAMINATIONS

PHY252H1S (Thermal Physics)
Examiner: Prof. A. Peet

Duration - 3 hours.

Aids permitted -
(1) non-programmable non-graphing calculator,
(2) double-sided letter-sized handwritten aid sheet.

Part I has qualitative and multi-choice questions.
Part II has quantitative long-answer questions.
Do *both* questions in Part I and *three of four* questions in Part II.
(If more than three questions in Part II are attempted, only the first three will be marked; clearly cross out any question you do not want marked.)

Each question is worth 20 marks.
Total = 100 marks.

You have three hours and five questions to answer.
Apportion your time sensibly: spend about half an hour per question.
Allow time to read the questions carefully.

Write all answers inside your exam book(s).
Write clearly, using either black or blue pen or 2B-or-darker pencil.
Clearly indicated crossouts are OK.
Unclear answers will *not* be marked.

Show your working to enable partial credit.
(e.g. catch a math mistake by using physical reasoning.)

N.B.: Formulæ, integrals, and physical constants can be found on page 8.

PART I: Do *both* questions.

Q1: Qualitative

Explain the following four terms or phrases briefly, illustrating your understanding of thermal physics. Write *no more than 3 sentences* for each:–

[2.5] (1A)

[2.5] (1B)

[2.5] (1C)

[2.5] (1D)

Explain the following two phenomena, with an example if appropriate, showing that you understand the connection between microscopic statistical physics and macroscopic thermodynamics. Write *no more than 2 paragraphs* for each:–

[5] (1E)

[5] (1F)

Q2: Multiple choice

Instructions:–

- Choose the option(s) that *best* answer(s) the question.
- Questions requesting *only one* answer are worth 3 marks;
  questions requesting *more than one* answer are worth 4 marks.
- *No* penalty will be assessed for wrong answers.
- Partial credit will be awarded for partially correct answers, where possible.
- Write your answer(s) inside your exam book.

(SEE OVER...⟶)

[3] (2A)
(i)
(ii)
(iii)
(iv)
(v)

[4] (2B)
(i)
(ii)
(iii)
(iv)
(v)

[3] (2C)
(i)
(ii)
(iii)
(iv)
(v)

[3] (2D)
(i)
(ii)
(iii)
(iv)
(v)

[3] (2E)
(i)
(ii)
(iii)
(iv)
(v)

[4] (2F)
(i)
(ii)
(iii)
(iv)
(v)

PART II: Do *three out of four* questions.

Q3:

Q4:

Q5:

Q6:

FORMULÆ

Physics

Integrals and Mathematical approximations

Physical Constants

$k_B = 1.38 \times 10^{-23} JK^{-1}$	$\sigma_B = 5.67 \times 10^{-8} Wm^{-2}K^{-4}$	$c = 3.00 \times 10^{8} ms^{-1}$
$e = 1.60 \times 10^{-19} C$	$1eV = 1.60 \times 10^{-19} J$	$m_p = 1.67 \times 10^{-27} kg$
$h = 6.63 \times 10^{-34} Js^{-1}$	$\hbar \equiv h/(2\pi)$	

TOTAL PAGES = 8