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(Supervisor's use only)

262/1



NEW ZEALAND QUALIFICATIONS AUTHORITY
MANA TOHU MĀTAURANGA O AOTEAROA

University Entrance, Bursaries and Scholarships Examination

PHYSICS: 2002

ANSWER BOOKLET

Check that the Candidate Code Number on your admission slip is the same as the number at the top of this page.

Answer **ALL** questions and write your answers in this Answer Booklet.

The spaces provided are a guide to the length of your answers, but it is **NOT** essential to use all the space available.

A list of formulae is given on page 17 of the Question Booklet 262 and may be detached along the perforation for use during the examination.

If you need more space for any answer, ask the Supervisor for extra paper. Answers on extra paper should be clearly numbered. Write your Candidate Code Number on all extra sheets used. Attach the extra sheets at the appropriate places in this booklet. Write the number of extra sheets used in the box at the top of the back flap of this booklet. Write NIL if you have not used any.

Answer spaces for each part begin on the following pages:

Waves	page 2
Mechanics	page 4
Electricity and Electromagnetism	page 9
Atomic and Nuclear Physics	page 13

To receive full marks for numerical questions:

- working should be clearly set out
- answers must be accompanied by the correct units
- answers must have an appropriate number of significant figures.

For 'describe' or 'explain' questions, answers must be written as complete sentences.

Check that this booklet has all of pages 2–14 in the correct order and that none of these pages is blank.

YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION



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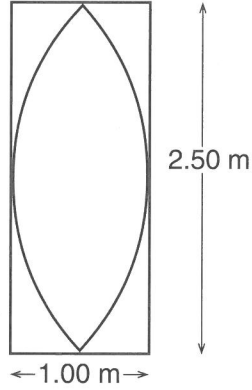
WAVES

(28 marks; 33 minutes)

QUESTION ONE: TOBIE AND THE SHOWER (14 marks)

Speed of sound in the shower = $3.35 \times 10^2 \text{ m s}^{-1}$

(a)



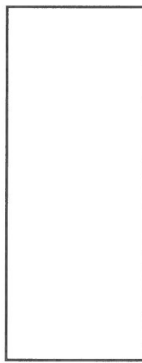
(2 marks)

(b) Show _____ (2 marks)

(c) _____

frequency = _____ (2 marks)

(d)



(2 marks)

(e) _____

frequency = _____ (2 marks)

(f) _____

(2 marks)

(g) _____

(2 marks)

Q1
14

QUESTION TWO: THE CONCERT HALL (14 marks)

Speed of sound in the concert hall = $3.35 \times 10^2 \text{ m s}^{-1}$

Acceleration due to gravity = 9.80 m s^{-2}

(a) Show _____

 _____ (2 marks)

(b) _____

 _____ (2 marks)

(c) _____

 _____ (3 marks)

(d) _____

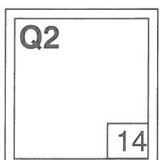
 _____ (2 marks)

(e) _____

 speed of cellphone = _____ (3 marks)

(f) _____

 distance travelled = _____ (2 marks)

**(Turn over**



MECHANICS

(57 marks; 68 minutes)

QUESTION THREE: GANYMEDE (11 marks)

Universal Gravitational Constant = $6.67 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$

(a) Show _____

 _____ (1 mark)

(b) _____

 linear speed = _____ (2 marks)

(c) _____

 _____ (1 mark)

(d) Show _____

 _____ (2 marks)

(e) Show _____

 _____ (3 marks)

(f) _____

 mass of Jupiter = _____ (2 marks)

QUESTION FOUR: THE INTERNAL COMBUSTION ENGINE (16 marks)

(a) Show _____
_____ (2 marks)

(b) _____
_____ frequency = _____ (2 marks)

(c) _____
_____ maximum velocity = _____ (2 marks)

(d)  _____ (4 marks)

(e) _____
_____ maximum force = _____ (2 marks)

(f) Show _____
_____ (2 marks)

(g) _____
_____ speed = _____ (2 marks)

Q4
16

(Turn over



QUESTION FIVE: THE SNOOKER GAME (21 marks)

(a) Show _____

(2 marks)

(b) _____

change in momentum = _____ (2 marks)

(c) _____

average force = _____ (2 marks)

(d) Show _____

(2 marks)

(e) _____

component of momentum = _____ (2 marks)

(f) _____

speed = _____ (3 marks)

(g) _____

(2 marks)

(h) time = _____ (1 mark)

(i) _____
gradient = _____ (1 mark)

(j) _____

_____ (2 marks)

(k) _____

_____ height = _____ (2 marks)

P6
15

P7
6

Q5
21

(Turn over

**QUESTION SIX: THE ZOO TRIP** (9 marks)Acceleration due to gravity = 9.80 m s^{-2}

(a) Show _____

(2 marks)

(b) _____
(1 mark)

(c) Show _____

(3 marks)

(d) _____

tension $T_2 =$ _____ (3 marks)

ELECTRICITY AND ELECTROMAGNETISM

(44 marks; 52 minutes)

QUESTION SEVEN: THE ELECTRON MICROSCOPE (7 marks)

Mass of electron = 9.11×10^{-31} kg

Charge on electron = 1.60×10^{-19} C

(a) _____

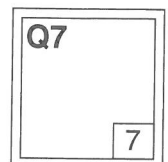
_____ (2 marks)

(b) Show _____

_____ (2 marks)

(c) _____

_____ speed = _____ (3 marks)



(Turn over

**QUESTION EIGHT: THE CONTACT TIMER** (16 marks)

(a) _____
total resistance = _____ (1 mark)

(b) Show _____

(2 marks)

(c) _____

resistance = _____ (2 marks)

(d) Show _____

(2 marks)

(e) _____

time constant = _____ (2 marks)

(f) _____

(2 marks)

(g) _____

voltage = _____ (2 marks)

(h) _____

contact time = _____ (3 marks)

QUESTION NINE: THE TRANSFORMER (9 marks)

(a) _____ (1 mark)

(b) _____

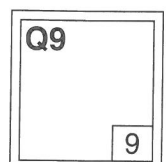
_____ number of turns = _____ (2 marks)

(c) _____
_____ rms current = _____ (2 marks)

(d) _____
_____ induced emf = _____ (2 marks)

(e) _____

_____ (2 marks)



(Turn over



QUESTION TEN: INDUCTORS (12 marks)

(a) Show _____ (1 mark)

(b) _____

reactance = _____ (2 marks)

(c) _____

rms current = _____ (3 marks)

(d) resistance = _____ (1 mark)

(e) _____

_____ (2 marks)

(f) (i) _____ (1 mark)

(ii) _____

_____ (2 marks)

ATOMIC AND NUCLEAR PHYSICS

(23 marks; 27 minutes)

QUESTION ELEVEN: NUCLEAR PHYSICS (10 marks)

Speed of light = $3.00 \times 10^8 \text{ m s}^{-1}$

(a) $a =$ _____
 $b =$ _____ (2 marks)

(b) particle $X =$ _____ (1 mark)

(c) _____

energy = _____ (3 marks)

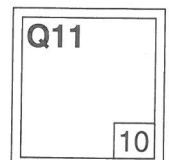
(d) $k =$ _____ (1 mark)

(e) _____

 _____ (1 mark)

(f) _____

 _____ (2 marks)



(Turn over)

QUESTION TWELVE: THE BOHR ATOM (13 marks)Charge on electron = $1.60 \times 10^{-19} \text{ C}$ Planck's Constant = $6.63 \times 10^{-34} \text{ J s}$ Rydberg's Constant = $1.097 \times 10^7 \text{ m}^{-1}$ Speed of light = $3.00 \times 10^8 \text{ m s}^{-1}$

(a) _____ (1 mark)

(b) _____
_____ (1 mark)

(c) _____
_____ angular momentum = _____ (2 marks)

(d) _____
_____ (2 marks)

(e) Show _____

_____ (2 marks)

(f) _____

_____ wavelength = _____ (3 marks)

(g) _____

_____ (2 marks)

Q12

13

