

X069/301

NATIONAL
QUALIFICATIONS
2005

TUESDAY, 24 MAY
1.00 PM – 3.30 PM

PHYSICS
HIGHER

Read Carefully

- 1 All questions should be attempted.

Section A (questions 1 to 20)

- 2 Check that the answer sheet is for Physics Higher (Section A).
- 3 Check that the answer sheet you have been given has **your name, date of birth, SCN** (Scottish Candidate Number) and **Centre Name** printed on it.
Do not change any of these details.
- 4 If any of this information is wrong, tell the Invigilator immediately.
- 5 If this information is correct, **print** your name and seat number in the boxes provided.
- 6 Use **black** or **blue ink** for your answers. **Do not use red ink.**
- 7 There is **only one correct** answer to each question.
- 8 Any rough working should be done on the question paper or the rough working sheet, **not** on your answer sheet.
- 9 At the end of the exam, put the **answer sheet for Section A inside the front cover of your answer book.**
- 10 Instructions as to how to record your answers to questions 1–20 are given on page three.

Section B (questions 21 to 30)

- 11 Answer questions numbered 21 to 30 in the answer book provided.
- 12 Fill in the details on the front of the answer book.
- 13 Enter the question number clearly in the margin of the answer book beside each of your answers to questions 21 to 30.
- 14 Care should be taken to give an appropriate number of significant figures in the final answers to calculations.



DATA SHEET
COMMON PHYSICAL QUANTITIES

Quantity	Symbol	Value	Quantity	Symbol	Value
Speed of light in vacuum	c	$3.00 \times 10^8 \text{ m s}^{-1}$	Mass of electron	m_e	$9.11 \times 10^{-31} \text{ kg}$
Magnitude of the charge on an electron	e	$1.60 \times 10^{-19} \text{ C}$	Mass of neutron	m_n	$1.675 \times 10^{-27} \text{ kg}$
Gravitational acceleration on Earth	g	9.8 m s^{-2}	Mass of proton	m_p	$1.673 \times 10^{-27} \text{ kg}$
Planck's constant	h	$6.63 \times 10^{-34} \text{ J s}$			

REFRACTIVE INDICES

The refractive indices refer to sodium light of wavelength 589 nm and to substances at a temperature of 273 K.

Substance	Refractive index	Substance	Refractive index
Diamond	2.42	Water	1.33
Crown glass	1.50	Air	1.00

SPECTRAL LINES

Element	Wavelength/nm	Colour	Element	Wavelength/nm	Colour
Hydrogen	656	Red	Cadmium	644	Red
	486	Blue-green		509	Green
	434	Blue-violet		480	Blue
	410	Violet	<i>Lasers</i>		
	397	Ultraviolet	<i>Element</i>	<i>Wavelength/nm</i>	<i>Colour</i>
	389	Ultraviolet	Carbon dioxide	9550 } 10590 }	Infrared
Sodium	589	Yellow	Helium-neon	633	Red

PROPERTIES OF SELECTED MATERIALS

Substance	Density/ kg m^{-3}	Melting Point/ K	Boiling Point/ K
Aluminium	2.70×10^3	933	2623
Copper	8.96×10^3	1357	2853
Ice	9.20×10^2	273
Sea Water	1.02×10^3	264	377
Water	1.00×10^3	273	373
Air	1.29
Hydrogen	9.0×10^{-2}	14	20

The gas densities refer to a temperature of 273 K and a pressure of $1.01 \times 10^5 \text{ Pa}$.

