

[3220/435]

1993

SCOTTISH CERTIFICATE OF EDUCATION

# PHYSICS (REVISED)

Higher Grade—PAPER II

Wednesday, 19th May—1.30 p.m. to 4.00 p.m.

## READ CAREFULLY

1. All questions should be attempted.
2. Enter the question number clearly in the margin beside each question.
3. Any necessary data will be found in the Data Sheet on page two.
4. Care should be taken not to give an unreasonable number of significant figures in the final answers to calculations.
5. Square-ruled paper (if used) should be placed inside the front cover of the answer book for return to the Examination Board.

**DATA SHEET**

**COMMON PHYSICAL QUANTITIES**

Quantity	Symbol	Value	Quantity	Symbol	Value
Speed of light in vacuum	$c$	$3.0 \times 10^8 \text{ m s}^{-1}$	Mass of electron	$m_e$	$9.11 \times 10^{-31} \text{ kg}$
Charge on electron	$e$	$-1.60 \times 10^{-19} \text{ C}$	Mass of neutron	$m_n$	$1.675 \times 10^{-27} \text{ kg}$
Gravitational acceleration	$g$	$9.8 \text{ m s}^{-2}$	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	Glycerol	1.47
Glass	1.51	Water	1.33
Ice	1.31	Air	1.00
Perspex	1.49		

**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 }	Infra-red
Sodium	589	Yellow	Helium-neon	633	Red

**PROPERTIES OF SELECTED MATERIALS**

Substance	Density/ $\text{kg m}^{-3}$	Melting Point/ K	Boiling Point/ K	Specific Heat Capacity/ $\text{J kg}^{-1} \text{ K}^{-1}$	Specific Latent Heat of Fusion/ $\text{J kg}^{-1}$	Specific Latent Heat of Vaporisation/ $\text{J kg}^{-1}$
Aluminium	$2.70 \times 10^3$	933	2623	$9.02 \times 10^2$	$3.95 \times 10^5$	....
Copper	$8.96 \times 10^3$	1357	2853	$3.86 \times 10^2$	$2.05 \times 10^5$	....
Glass	$2.60 \times 10^3$	1400	....	$6.70 \times 10^2$	....	....
Ice	$9.20 \times 10^2$	273	....	$2.10 \times 10^3$	$3.34 \times 10^5$	....
Glycerol	$1.26 \times 10^3$	291	563	$2.43 \times 10^3$	$1.81 \times 10^5$	$8.30 \times 10^5$
Methanol	$7.91 \times 10^2$	175	338	$2.52 \times 10^3$	$9.9 \times 10^4$	$1.12 \times 10^6$
Sea Water	$1.02 \times 10^3$	264	377	$3.93 \times 10^3$	....	....
Water	$1.00 \times 10^3$	273	373	$4.19 \times 10^3$	$3.34 \times 10^5$	$2.26 \times 10^6$
Air	1.29	....	....	....	....	....
Hydrogen	$9.0 \times 10^{-2}$	14	20	$1.43 \times 10^4$	....	$4.50 \times 10^5$
Nitrogen	1.25	63	77	$1.04 \times 10^3$	....	$2.00 \times 10^5$
Oxygen	1.43	55	90	$9.18 \times 10^2$	....	$2.40 \times 10^5$

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

