3220/202

SCOTTISH
CERTIFICATE OF
EDUCATION
1997

THURSDAY, 15 MAY
1.00 PM – 3.30 PM

PHYSICS
HIGHER GRADE
Paper II

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 Scottish Qualifications Authority.

SCOTTISH
QUALIFICATIONS
AUTHORITY

MCB 3220/202 6/3/21810

DATA SHEET

COMMON PHYSICAL QUANTITIES

Quantity	*Symbol*	*Value*	*Quantity*	*Symbol*	*Value*
Speed of light in vacuum	c	$3{\cdot}00 \times 10^{8}$ m s $^{-1}$	Mass of electron	m_e	$9{\cdot}11 \times 10^{-31}$ kg
Charge on electron	e	$-1{\cdot}60 \times 10^{-19}$ C	Mass of neutron	m_n	$1{\cdot}675 \times 10^{-27}$ kg
Gravitational acceleration	g	$9{\cdot}8$ m s $^{-2}$	Mass of proton	m_p	$1{\cdot}673 \times 10^{-27}$ kg
Planck's constant	h	$6{\cdot}63 \times 10^{-34}$ 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*
Hydrogen	656	Red
	486	Blue-green
	434	Blue-violet
	410	Violet
	397	Ultraviolet
	389	Ultraviolet
Sodium	589	Yellow

Element	*Wavelength*/nm	*Colour*
Cadmium	644	Red
	509	Green
	480	Blue

Lasers

Element	*Wavelength*/nm	*Colour*
Carbon dioxide	9550 } 10590 }	Infrared
Helium-neon	633	Red

PROPERTIES OF SELECTED MATERIALS

Substance	*Density*/ kg m $^{-3}$	*Melting Point*/ K	*Boiling Point*/ K	*Specific Heat Capacity*/ J kg $^{-1}$ K $^{-1}$	*Specific Latent Heat of Fusion*/ J kg $^{-1}$	*Specific Latent Heat of Vaporisation*/ J kg $^{-1}$
Aluminium	$2{\cdot}70 \times 10^3$	933	2623	$9{\cdot}02 \times 10^2$	$3{\cdot}95 \times 10^5$	....
Copper	$8{\cdot}96 \times 10^3$	1357	2853	$3{\cdot}86 \times 10^2$	$2{\cdot}05 \times 10^5$	....
Glass	$2{\cdot}60 \times 10^3$	1400	....	$6{\cdot}70 \times 10^2$	....	....
Ice	$9{\cdot}20 \times 10^2$	273	....	$2{\cdot}10 \times 10^3$	$3{\cdot}34 \times 10^5$	....
Glycerol	$1{\cdot}26 \times 10^3$	291	563	$2{\cdot}43 \times 10^3$	$1{\cdot}81 \times 10^5$	$8{\cdot}30 \times 10^5$
Methanol	$7{\cdot}91 \times 10^2$	175	338	$2{\cdot}52 \times 10^3$	$9{\cdot}9 \times 10^4$	$1{\cdot}12 \times 10^6$
Sea Water	$1{\cdot}02 \times 10^3$	264	377	$3{\cdot}93 \times 10^3$	....	....
Water	$1{\cdot}00 \times 10^3$	273	373	$4{\cdot}19 \times 10^3$	$3{\cdot}34 \times 10^5$	$2{\cdot}26 \times 10^6$
Air	1·29	....	....	....	....	....
Hydrogen	$9{\cdot}0 \times 10^{-2}$	14	20	$1{\cdot}43 \times 10^4$	....	$4{\cdot}50 \times 10^5$
Nitrogen	1·25	63	77	$1{\cdot}04 \times 10^3$	....	$2{\cdot}00 \times 10^5$
Oxygen	1·43	55	90	$9{\cdot}18 \times 10^2$	....	$2{\cdot}40 \times 10^5$

The gas densities refer to a temperature of 273 K and a pressure of $1{\cdot}01 \times 10^5$ Pa.