Answer Sheet for Part A **APhO 2002**

Name	Student No.	Country	Page No	Total No of pages

(1) : Determine the plane of polarization of the incident laser light.

(a) Relative orientation of diode laser and polarizer (difference in degree between the angular settings of the diode laser rotary stage and the polarizer rotary stage)

The difference in the two angles (in degree) = _____ *(0.2 point)*

(b) Brewster angle of incidence _$_i$ for the glass plate = _____ *(0.2 point)*

Submit data on blank sheet

Graph of reflected laser power versus angular setting of the polarizer rotary stage

(0.4 point)

Angular setting of the polarizer rotary stage for axis of polarization parallel to the plane of incidence = _____

(0.2 point)

(2): Measure the reflectance R_p and R_s of the semiconductor wafer

(a) Reflectance R_p (plane of polarization parallel to the plane of incidence)

Parameters of your instrument:

(i) Angular setting of the polarizer rotary stage = _____

(ii) Angular setting of the diode laser rotary stage = _____

(iii) Measured incidence laser power I_i = _____*(mW)* *(no point)*

Measurement, calculation of R_p and graph of R_p versus incident angle *(3 points)*

(b) Reflectance R_s (plane of polarization perpendicular to the plane of incidence)

Parameters of your instrument:

(i) Angular setting of the polarizer rotary stage = _____

(ii) Angular setting of the diode laser rotary stage = _____

(iii) Measured incidence laser power I_i = _____*(mW)* *(no point)*

Measurement, calculation of R_s
and graph of R_s versu incident angle *(2 points)*

(3): Calculate the refractive index of the semiconductor sample

(a) Derivation of equation relating the refractive index n to $\pm\sqrt{R_p}$ and $\sqrt{R_s}$
(Submit derivation on blank sheet)

(0.5 point)

The sign (s) of $\pm\sqrt{R_p}$: _____

_____

(0.5 point)

(b) Six values of n

angle of incidence θ_i	R_p	R_s	*n*
20			
30			
40			
50			
60			
80			

(2 points)

Mean and standard deviation σ_n for n

n (mean) =
σ_n =

(0.4 point)

(c) Reflectance R_s and R_p of the semiconductor at normal incidence.

R_s =	%
R_p =	%

Refractive index n = _____ *(0.6 point)*