APhO

15TH ASIAN PHYSICS OLYMPIAD
11 - 18 MAY 2014, SINGAPORE

Experimental Competition
May 15, 2014
0830 - 1330 hrs

Answer Sheets Cover Page

STUDENT CODE

Additional Number of writing sheets =

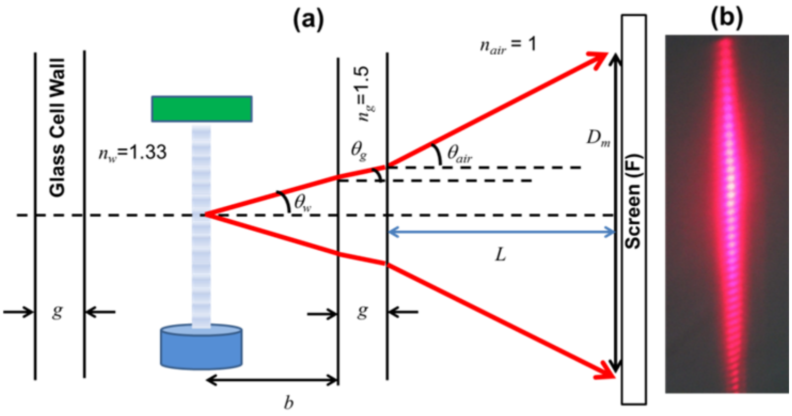
Do not write below this line.

	Part A	Part B	Part C	Part D	Total
Maximum allotted marks	6.5	6.0	5.0	2.5	20.0
Marks Scored					

Country:		Student Code:	

Experiment A:

A1.	An expression for λ_s is given by the equation: $$\lambda_s = A(m-1)\frac{n_{air}\lambda_{air}}{D_m}$$ In the space below, **determine A** in terms of (b, g, n_w, n_g, λ_{air}, and L,) under small angle approximation condition.	1.5



Country:		Student Code:	

A2.	Attach this Answer Sheet A2 to the Screen (F) and mark the fringes in the space below. **Do not forget to note down the relevant experimental parameters, in Answer Sheet A3 as well, needed for calculations.**	2.5

$m =$	
$D_m =$	
Temperature of the mineral water	

Country:		Student Code:	

A3.	Measure and record all relevant parameters in the space below and calculate the wavelength of sound, λ_s, in mineral water. $\lambda_s =$	1.0
A4.	Calculate and record the frequency of ultrasonic waves, f_s, in mineral water. $f_s =$	0.5

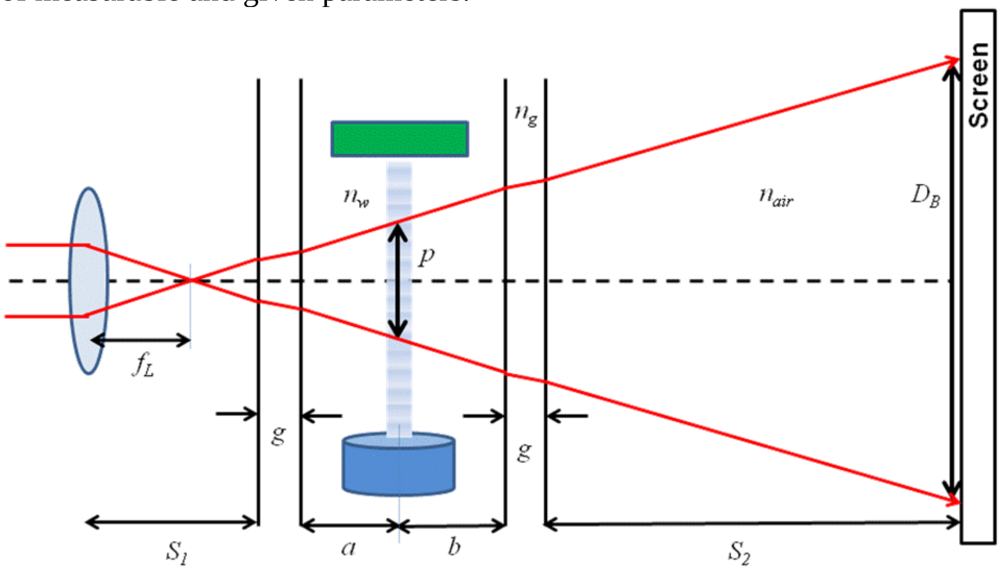
Country:		Student Code:	

A5.	Carry out an error analysis to estimate the uncertainty, Δf_s, in the frequency of ultrasonic wave.	1.0

$\Delta f_s =$	

Country:		Student Code:	

Experiment B

B1.	Assume that the number of bright regions counted within the length D_B on screen is m_B. Use equation (3) from the question paper, to write the expression for λ_s in terms of measurable and given parameters.  	1.0

Country:		Student Code:	

B2.	Attach this Answer Sheet B2 to the Screen (F) and mark the projected standing wave pattern in the space below. **Do not forget to note down the relevant experimental parameters, in Answer Sheet B3 as well, needed for calculations.**	2.0

$m_B =$	
$D_B =$	
Temperature of the mineral water	

Country:		Student Code:	

B3.	Measure and record all relevant parameters in the space below and calculate the wavelength of sound, λ_s, in mineral water. $\lambda_s =$	1.5
B4.	Calculate and record the frequency of ultrasonic waves, f_s, in mineral water. $f_s =$	0.5

Country:		Student Code:	

B5.	Carry out an error analysis to estimate the uncertainty, Δf_s, in frequency of ultrasonic wave.	1.0
	$\Delta f_s =$	

Country:		Student Code:	

Experiment C

C1.	Attach this Answer Sheet to the Screen (F) and mark the observed patterns in the space below. Tick in the box below for the experimental method that you have adopted for this question: Experiment A (Diffraction Method) | | Experiment B (Projection Method) | Label each recorded pattern with the corresponding salt concentration. ***Do not forget to note down the relevant experimental parameters, in Answer Sheet C2 on page 10, needed for calculations.*** If additional sheets are needed for marking please use the Writing Sheets	1.0

Experiment A (Diffraction Method)		Experiment B (Projection Method)	

Country:		Student Code:	

C2.	Measure and record all relevant parameters in the table below and calculate the speed of sound, v_s, in each of the known salt concentration. C_s – Salt Concentration T – Temperature of Salt Solution $\boldsymbol{v_s}$ – Speed of sound in salt solution The third column can be divided into suitable numbers of column to record other relevant parameters.	2.0

$\mathbf{C_s}$	**T**		$\boldsymbol{v_s}$

Country:		Student Code:	

C3.	Plot the speed of sound in solution against the salt concentration of the solution. Include error bars, assuming that the percentage error is the same as that obtained in Experiment A or Experiment B, for each data point	1.0

Country:		Student Code:	

C4.	Attach this Answer Sheet to the Screen (F) and mark the observed patterns in the space below for unknown salt concentration solution. Note down the temperature of the solution and all other relevant experimental parameters needed for calculation of the speed of sound in this solution. v_s in unknown solution =	0.8

C5.	Determine the salt concentration in the unknown solution. Write down your answer along with the uncertainty. Concentration of Salt in Unknown Solution =	0.2

Country:		Student Code:	

Experiment D:

D1.	Draw a labeled sketch of the experiment you have designed for calculation of the refractive index of the corn-syrup. Use the space below to record relevant parameters and their values and calculate the refractive index of the corn-syrup. $n_{corn\text{-}syrup} =$	1.5

Country:		Student Code:	

D2.	Attach this Answer Sheet to the Screen (F) and mark diffraction patterns in the space below for corn-syrup. Note down the temperature of the corn-syrup and all other relevant experimental parameters needed to calculate the speed of sound in this solution. v_s in corn-syrup =	1.0

Writing Sheet

Country:		Student Code:	
Question No:		Page Number	

Writing Sheet

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