

Name: \_\_\_\_\_

Assignment due:

# St Patrick's College, Silverstream

# PHYSICS



## Optics Homework Assignment 1

Level 2

AS 90254

2.3 Demonstrate understanding of wave phenomena

Credits: Four

Answer **ALL** the questions in the spaces provided.

If you need more space for any answer, use the pages provided at the back of this booklet and clearly number the question.

For all numerical answers, full working should be shown and the answer should be rounded to the correct number of significant figures and given with an SI unit.

For all 'describe' or 'explain' questions, the answer should be in complete sentences with all logic fully explained.

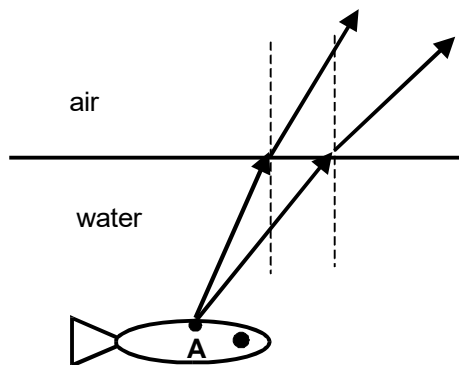
Achievement Criteria			<i>For Assessor's use only</i>
Achievement	Achievement with Merit	Achievement With Excellence	
Identify or describe aspects of phenomena, concepts or principles. <input type="checkbox"/>	Give descriptions or explanations in terms of phenomena, concepts, principles and/or relationships. <input type="checkbox"/>	Give concise explanations that show clear understanding, in terms of phenomena, concepts, principles and/or relationships. <input type="checkbox"/>	
Solve straightforward problems. <input type="checkbox"/>	Solve problems. <input type="checkbox"/>	Solve complex problems. <input type="checkbox"/>	
<b>Overall Level of Performance (all criteria within a column are met)</b>			<input type="checkbox"/>

Formulae that you may find useful are given below

$\frac{1}{f} = \frac{1}{d_o} + \frac{1}{d_i}$	or	$S_i S_o = f^2$
$m = \frac{d_i}{d_o} = \frac{h_i}{h_o}$	or	$m = \frac{f}{S_o} = \frac{S_i}{f}$
$n_1 \sin \theta_1 = n_2 \sin \theta_2$		$\frac{n_1}{n_2} = \frac{v_2}{v_1} = \frac{\lambda_2}{\lambda_1}$
$v = f\lambda$	$T = \frac{1}{f}$	$v = \frac{d}{t}$

### QUESTION ONE: SPEAR FISHING

Jack attempts to catch a fish by throwing a spear at where the fish appears to be in the water. The following diagram shows two light rays travelling from the fish to the air above the water.



- (a) Complete the above ray diagram to show the position of the image of the fish as seen by Jack.
- (b) Explain why Jack will see the point A on the fish at a different place to where it actually is in the water.

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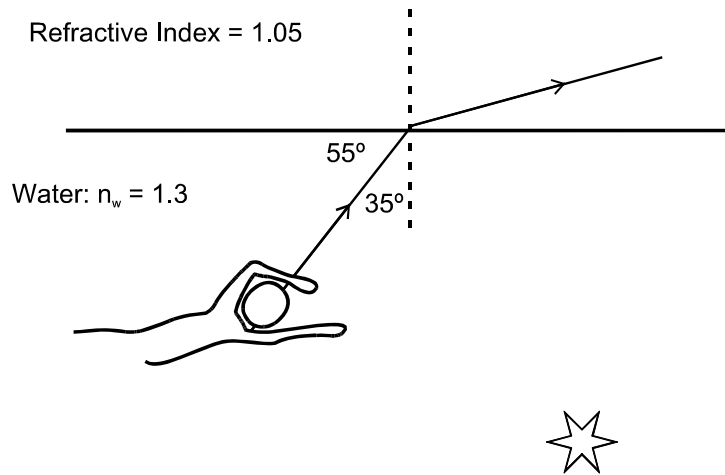
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## QUESTION TWO: THE SWIMMING HOLE

Janet is diving in a deep swimming hole in order to retrieve a hidden treasure as shown below.



When Janet looks up at the water surface, she notices that from some angles the water surface looks like a mirror.

(a) What is this phenomenon called?

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(b) Explain in detail how this phenomenon occurs.

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(c) Calculate the critical angle of the water.

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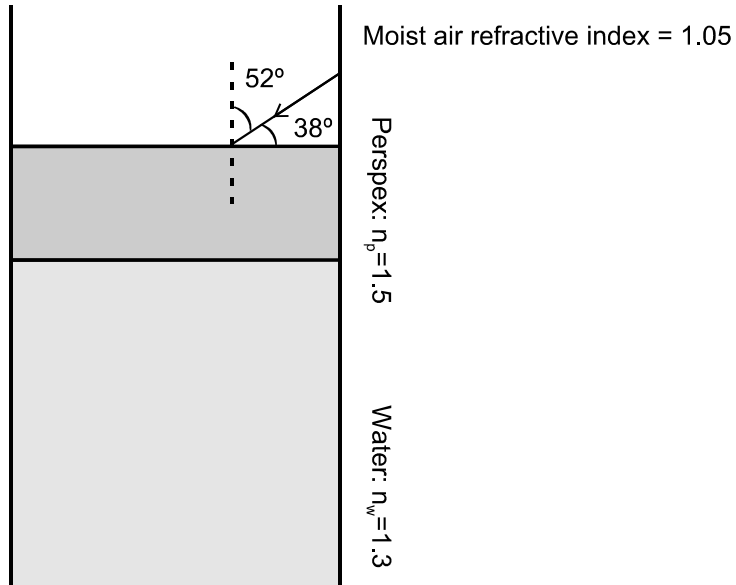


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critical angle = \_\_\_\_\_

### QUESTION THREE: THE TRIP HOME

On their way home Janet and Brad take a cruise on board a boat. The boat has a large, thick perspex bottom used to view marine life.



- (a) What is the angle of incidence at the moist air / perspex boundary?
- \_\_\_\_\_
- (b) A ray of light is shown entering the tank through the perspex window. Complete the ray diagram to clearly show what happens to the ray of light as it passes through the moist air into the perspex and from the perspex into the water.
- (c) Calculate the angle of refraction of the ray of light as it enters the perspex. Give your answer to the correct number of significant figures.

\_\_\_\_\_

\_\_\_\_\_

angle of refraction = \_\_\_\_\_

- (d) If the speed of light in moist air is  $2.86 \times 10^8 \text{ ms}^{-1}$ , calculate the speed of light in water. Give your answer to the correct number of significant figures.

\_\_\_\_\_

\_\_\_\_\_

speed of light in water = \_\_\_\_\_