Name:_____

Assignment due:

Waimea College

PHYSICS

Optics Homework Assignment 2

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.

For Assessor's use only

Achievement Criteria

Achievement	Achievement with Merit	Achievement With Excellence
Identify or describe aspects of phenomena, concepts or principles. ☐	Give descriptions or explanations in terms of phenomena, concepts, principles and/or relationships. ☐	Give concise explanations that show clear understanding, in terms of phenomena, concepts, principles and/or relationships. ☐
Solve straightforward problems. ☐	Solve problems. ☐	Solve complex problems. ☐
Overall Level of Performance (all criteria within a column are met) ☐		

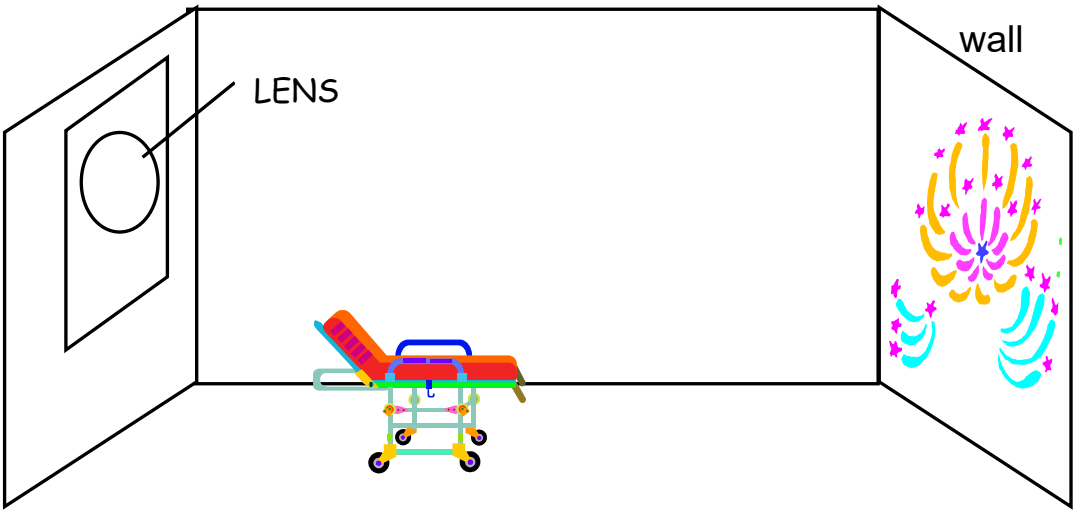
Assessor's use only

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: VIRTUAL FIREWORKS

Lois is in hospital while the fireworks show is on. She cannot see out of the window but Malcolm has installed a lens in the window of the room that projects an image of the fireworks onto the wall.



(a) What type of lens can be used to produce a real image?

_____

The window is 500m from the fireworks and 5.00m from the wall.

(b) Calculate the focal length of the lens.

_____

_____

_____

_____

_____ Focal length = _____

(c) If each exploding rocket produces an image 30cm wide on the wall, how wide is the original explosion?

_____

_____

_____

_____ Width = _____

(d) Explain why the fireworks show appears upside down on the wall. You may use a diagram if you wish.

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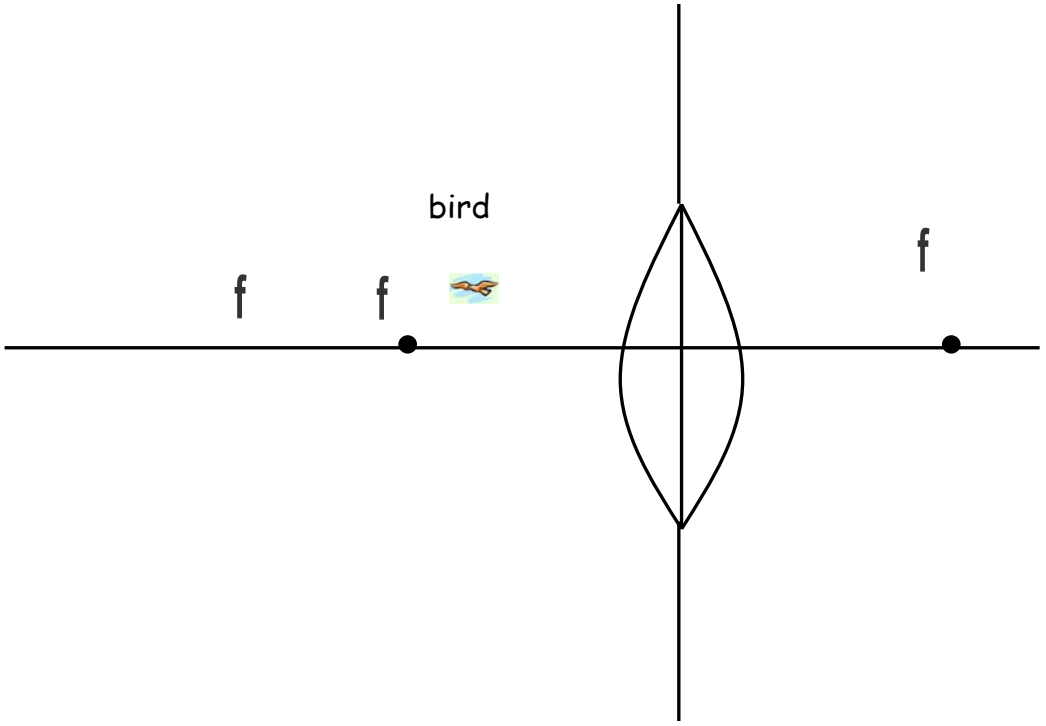
Assessor's use only

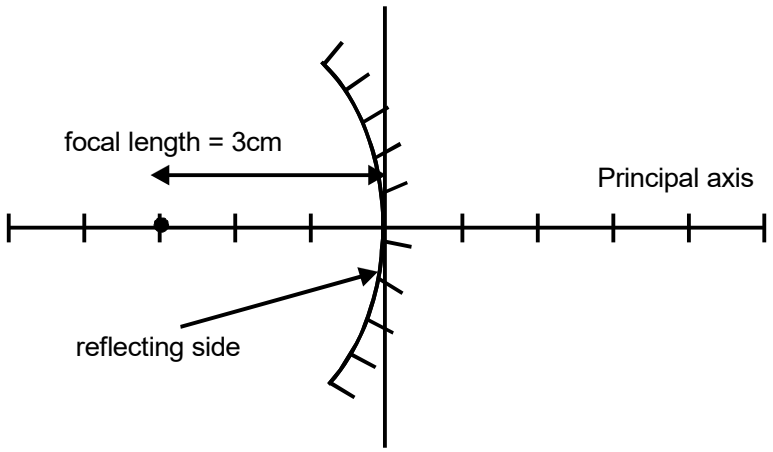
A sparrow flies past outside, close to the window during the fireworks display.

(e) Complete the ray diagram to show the image of the sparrow flying past.



QUESTION TWO: TORCHES AND LENSES

Torches use concave mirrors to maximise the brightness of the beam of light they emit. The focal length of a concave mirror in a torch light is **3.0 cm**.



(a) Calculate the position of the **centre of curvature** of the mirror**.**

_____

_____

(b) On the above diagram, use the letter **B,** to show where the light bulb should be placed to provide a **parallel** beam of light.

(c) Explain why the **position** for the light bulb you chose in (b) will provide a parallel beam of light.

_____

_____

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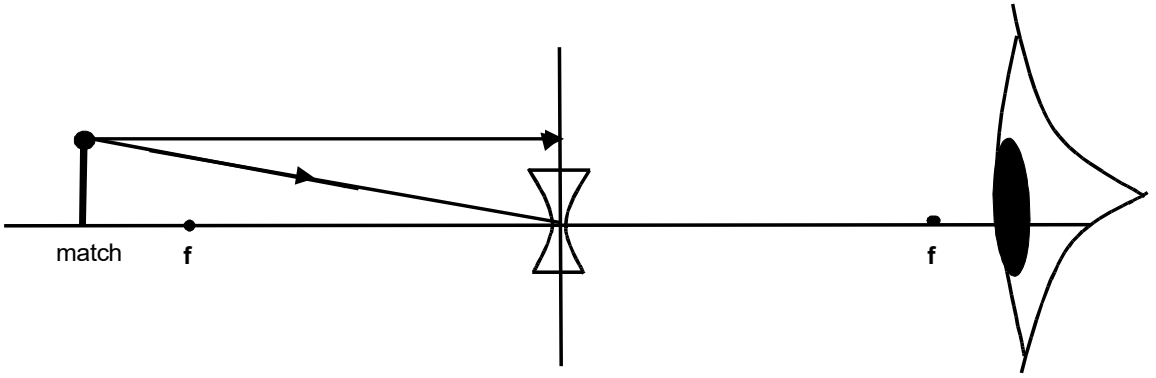
Assessor's use only

Jane uses a **concave lens** to see a match as shown in the diagram below.

Two light rays coming from the top of the match are shown on the diagram below.



(d) On the above diagram complete the paths of the rays after passing through the lens.

(e) On the same diagram show how and where these rays will create the **image** of the match stick. Draw the image of the match.

(f) Describe two **properties** of the image of the match.

1)_____ 2)_____

Jane now moves the match to a distance of **4.1 m** from the lens.
The focal length of her lens is **0.42 m**.

(g) Calculate the distance of the image from the lens.

_____

_____

_____

_____

_____

Distance to lens = _____

(h) Calculate the magnification of the image.

_____

_____

_____

Magnification = _____

(i) Calculate how far the match needs to be placed from the lens to obtain a virtual image **half the size** of the match.

_____

_____

_____

_____

_____

Distance to lens = _____