



**KULLEGG MARIA REGINA
BOYS' SECONDARY MOSTA
HALF-YEARLY EXAMINATIONS 2012/2013**



SUBJECT: PHYSICS

Form 4

TIME: 1 HR 30 MIN

NAME : _____

CLASS : _____

INDEX NO : _____



Track 3

Answer ALL questions in the spaces provided on the exam paper.

All working must be shown. The use of a calculator is allowed.

Where necessary take the acceleration due to gravity, $g = 10 \text{ m/s}^2$.

Waves and Optics	$v = f \lambda$	$f = \frac{1}{T}$
	$m = \frac{v}{u}$	$m = \frac{\text{height of image}}{\text{height of object}}$
	$\eta = \frac{\text{speed of light (air)}}{\text{speed of light (medium)}}$	$\eta = \frac{\text{real depth}}{\text{apparent depth}}$
Forces and Motion	$W = mg$	$v^2 = u^2 + 2as$
	$v = u + at$	$s = ut + \frac{1}{2} a t^2$
	Average speed = $\frac{\text{Total Distance}}{\text{Total time}}$	$s = \frac{(u+v)}{2} t$

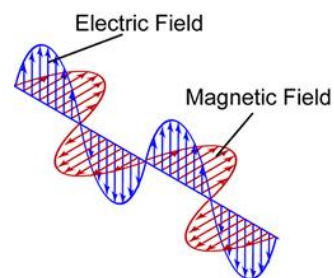
For examiner's use:

Number	1	2	3	4	5	6	7	8	Total
Maximum mark	8	8	8	8	8	15	15	15	85
Actual mark									

	Total Theory	Total Practical	Final Mark
Actual Mark			
Maximum Mark	85	15	100

SECTION A

This section carries 40 marks.



1. *This question is about the electromagnetic spectrum.*

Fill in the blanks using **some** of the words below.

<i>frequency</i>	<i>speed</i>	<i>ultraviolet</i>	<i>X-rays</i>	<i>wavelength</i>
<i>infra-red</i>	<i>vacuum</i>	<i>gamma rays</i>	<i>transverse</i>	<i>longitudinal</i>

Electromagnetic waves are all _____ waves. They are able to travel through a _____. They all travel at the same _____. However they all have a different _____ and _____. To detect fractures in bones we use _____. Night vision cameras make use of _____. Skin tanning is caused by _____. [8]

2. *This question is about sound.*



State whether the statement about sound is TRUE or FALSE.

	True / False
a) Sound is made up of longitudinal waves.	
b) A reflected sound is called an echo.	
c) Particles move up and down as sound travels through a medium.	
d) Sound travels faster in liquids than in gases.	
e) A quiet and a loud sound travel at the same speed.	
f) Sound can travel through a vacuum.	
g) Ultrasound is sound with a frequency higher than 10,000 Hz.	
h) Sound travels faster than light.	

[8]

3. This question is about fibre optics.

Fibre optics are very thin solid pipes used to transmit light from one place to another.

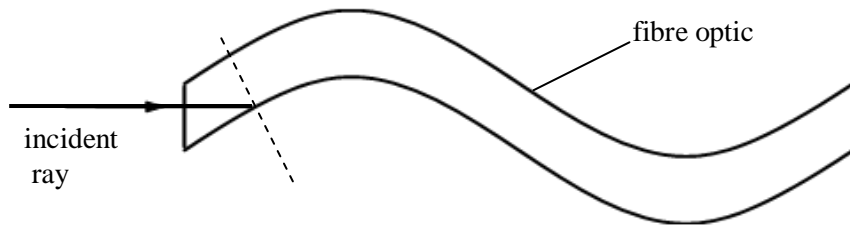


Figure 1

- a) Draw on Figure 1 the path taken by the incident ray. [2]
- b) The ray undergoes total _____ reflection, because the _____ angle is exceeded. [2]
- c) The speed of light inside the fibre optic is _____ than that in air. [1]
- d) Figure 2 shows how fibre optics can be used to transmit sunlight inside a building. The light from the sun is channelled to different parts of the building. State one advantage and one disadvantage of using such a system.

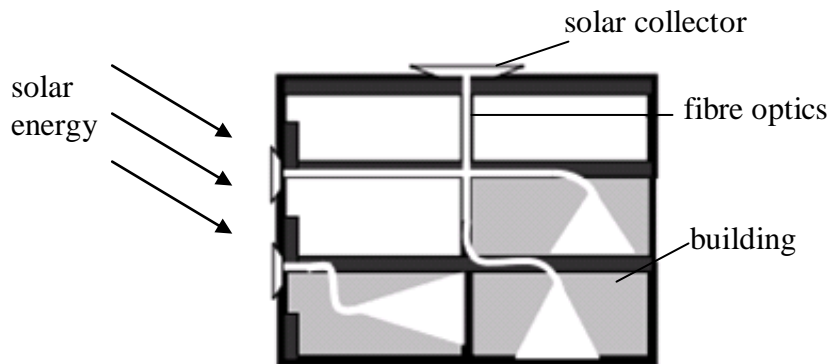


Figure 2

- (i) Advantage _____ [1]
- (ii) Disadvantage _____ [1]
- e) Name one **other** use of fibre optics. _____ [1]

4. This question is about water waves.

Figure 3 shows water wavefronts approaching a harbour's breakwater. The water depth inside and outside the harbour is the same.

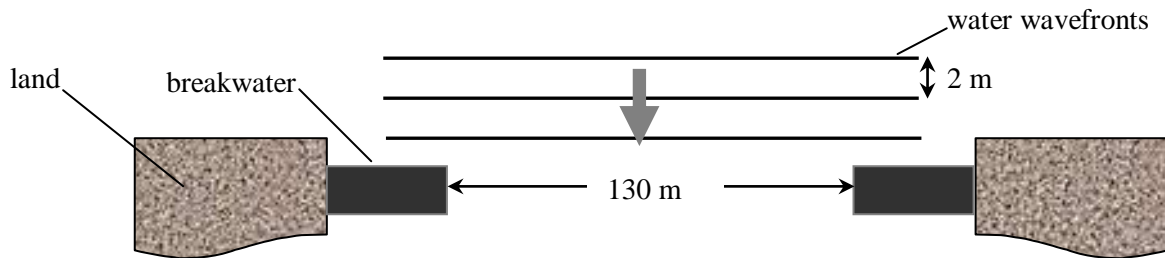


Figure 3

a) Water waves are _____ waves. [1]

b) The wavelength of the waves = _____ m. [1]

c) Draw on Figure 3 the wavefronts **after** they pass through the gap. [2]

d) What is the effect shown called?
_____ [1]

e) Describe what would happen to the waves if the gap is much narrower.
_____ [1]

f) Calculate the frequency of the water waves if 24 waves hit the breakwater every 60 seconds.

_____ [2]

5. This question is about reflection in a plane mirror.

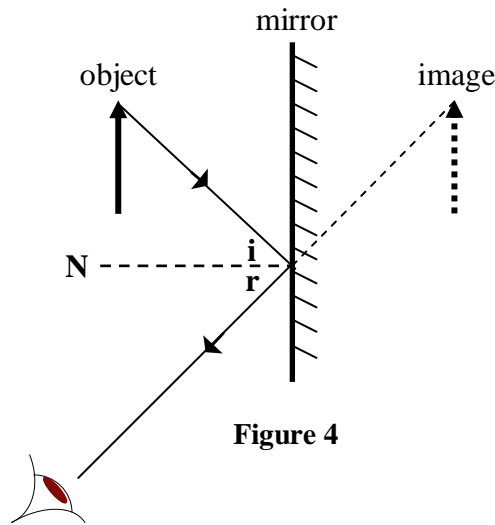
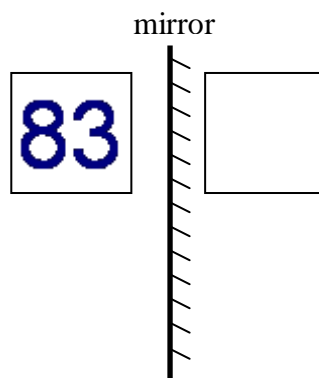


Figure 4

An image can be formed in a plane mirror as shown in Figure 4.

- The mirror is said to be plane because it is _____. [1]
- The angle 'i' is called the angle of _____ while the angle 'r' is the angle of _____. N is called the _____. [3]
- The distance between the object and the mirror is always _____ to the distance between the image and the mirror. [1]
- The image obtained in a plane mirror cannot form on a screen because it is _____. [1]
- It is difficult to read words and numbers formed in a plane mirror because they are laterally inverted. In the space below draw the number 83 laterally inverted. [1]



[2]

SECTION B

This section carries 45 marks.

6. This question is about refraction of light.

A fish appears to be at a different depth when observed as shown in Figure 5.

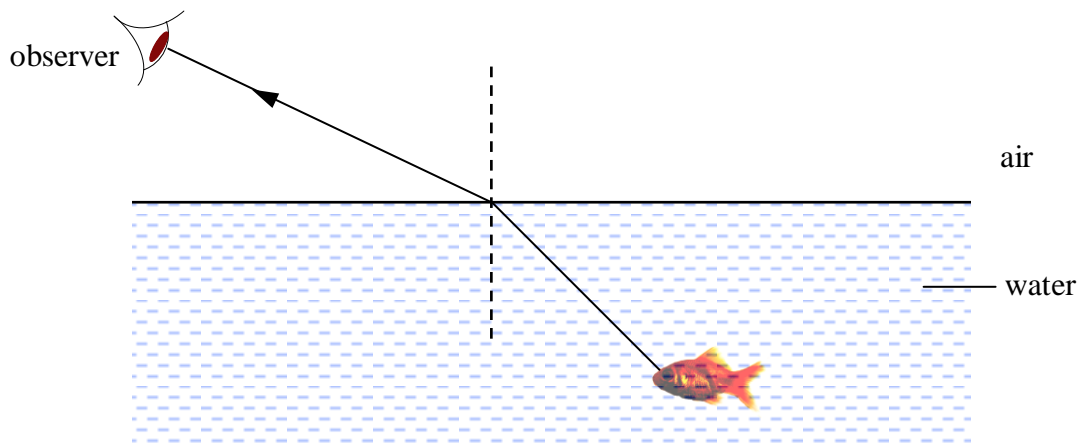


Figure 5

a) On Figure 5:

- (i) mark with letter 'X' the position where the fish appears to be. [1]
- (ii) label the refracted ray. [1]
- (iii) label with letter 'r' the angle of refraction. [1]

b) Does the fish appear to be slightly larger or smaller? Explain.

_____ [2]

c) Why is the ray of light refracted at the water surface?

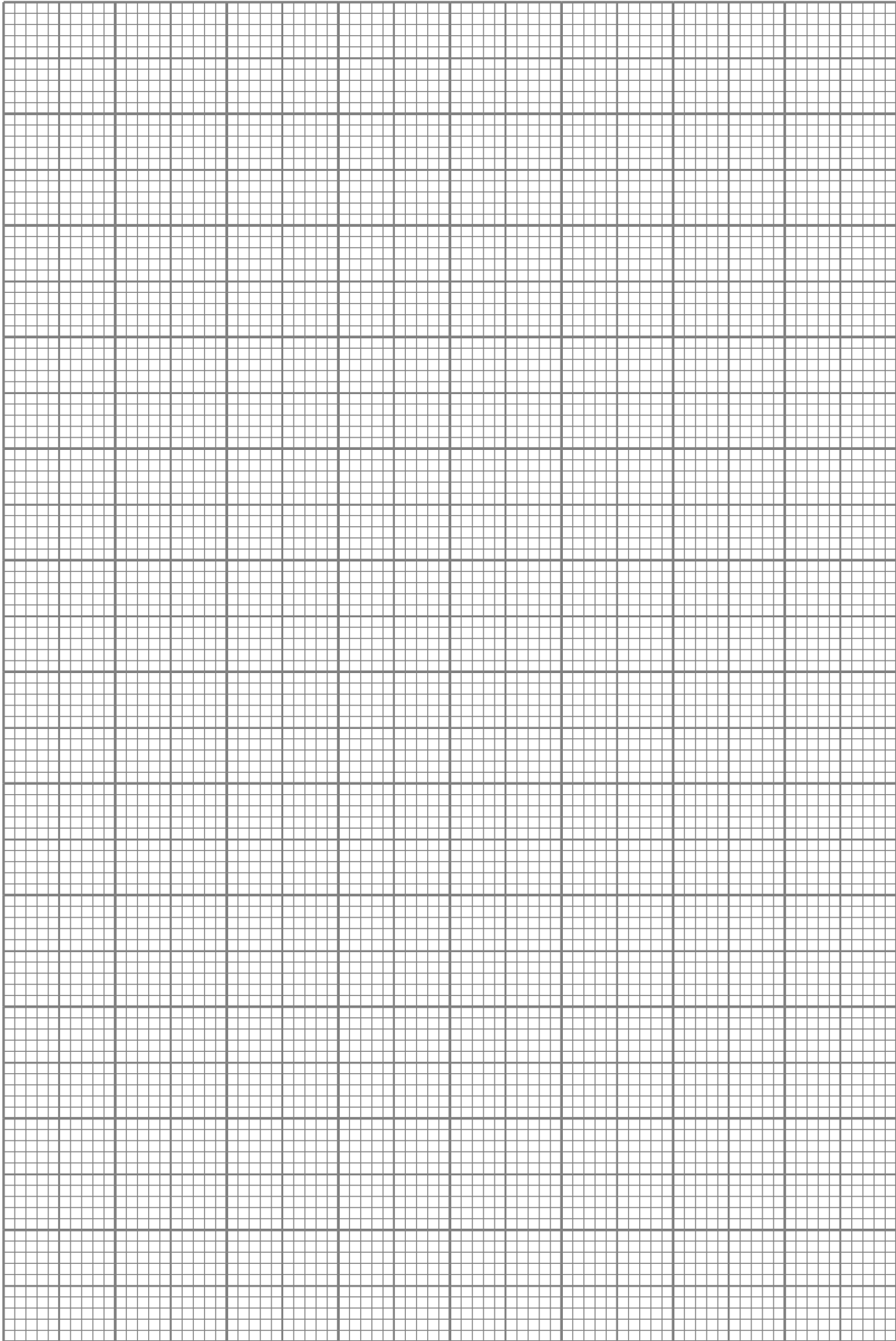
_____ [1]

d) The table below shows how the real and apparent depths of the fish change.

Real depth (cm)	10	20	30	40	50	60
Apparent depth (cm)	7.5	15.0	22.5	30.0	37.5	45

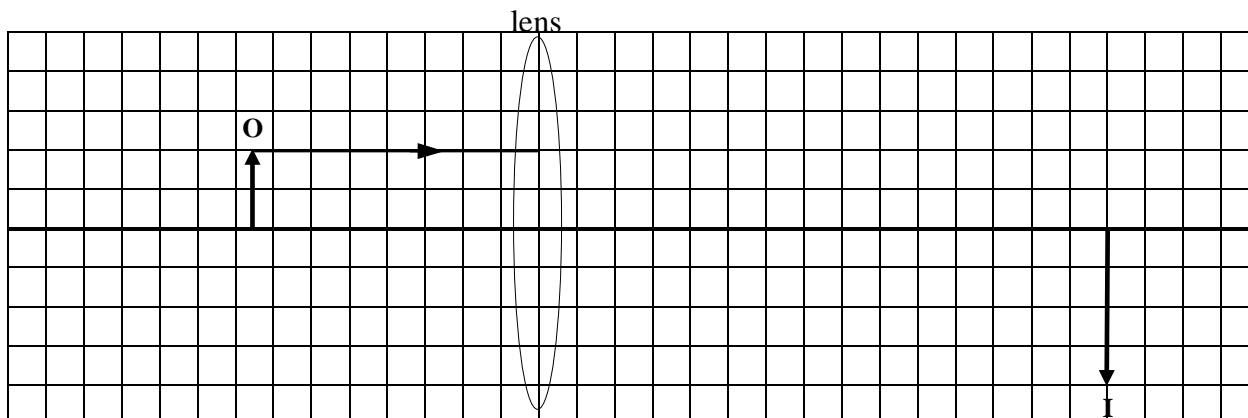
- (i) Plot a graph of **apparent depth** (on y-axis) against **real depth** (on x-axis). [5]
- (ii) The apparent depth and real depth are _____ proportional. [1]
- (iii) When the fish is at a depth of 32 cm, it appears to be at a depth of _____ cm. [1]
- (iv) Calculate the refractive index of water

_____ [2]



7. This question is about lenses and the electromagnetic spectrum.

a) The diagram below shows how a lens can be used to produce an enlarged image.



(i) The lens used is a _____ lens. [1]

(ii) Complete the ray diagram by drawing missing rays to show how the image forms. [3]

(iii) Mark with a letter 'F' the position of the principal focus. [1]

(iv) Measure with your ruler the:

• object distance = _____ cm [1]

• image distance = _____ cm [1]

• focal length = _____ cm [1]

(v) Apart from being enlarged, the image is also _____ and _____. [2]

(vi) Calculate the magnification of the lens. _____ [2]

b) White light is made up of seven different colours.

(i) The effect in which white light is split up into seven different colours is called _____. [1]

(ii) Calculate the velocity of orange light in air, if it has a frequency of 5×10^{14} Hz and a wavelength of 6×10^{-7} m. _____ [2]

8. This question is about objects in motion.

a) Complete the table by adding the missing symbol or unit.

	SYMBOL	UNIT
acceleration	a	
distance		m
initial velocity		m/s
final velocity		

[5]

b) Starting **from rest** a car reaches a speed of 24 m/s in 6 seconds.

Calculate the:

(i) acceleration of the car.



[2]

(ii) distance travelled by the car.

[2]

(iii) average speed of the car.

[2]

c) A baseball catcher stops a ball travelling at 162 km/h in 0.2 seconds.

(i) Change 162 km/h to m/s.



[2]

(ii) Calculate the deceleration of the ball.

[2]

END OF PAPER