ST. NICHOLAS COLLEGE
HALF YEARLY SECONDARY EXAMINATIONS
February 2012

FORM 4 **PHYSICS Track 2** **TIME: 1 h 30 min**

Name: _____ Class: _____ Register Number: _____

Answer all questions.
All working must be shown. The use of a calculator is allowed.
Where necessary take acceleration due to gravity g = 10m/s^2.

You may find some of these equations useful:

Waves	$\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ $\eta = \frac{\text{real depth}}{\text{apparent depth}}$ $M = \frac{\text{height of image}}{\text{height of object}}$
Motion	speed = $\frac{\text{distance}}{\text{time}}$ $a = \frac{v - u}{t}$ total stopping distance = thinking distance + braking distance

For office use only:

Question No.	1	2	3	4	5	6	7	8	Total Mark	Practical Mark	Final Mark
Score											

1a. **Fig.1** shows a wave with parts labeled A B C D and E.

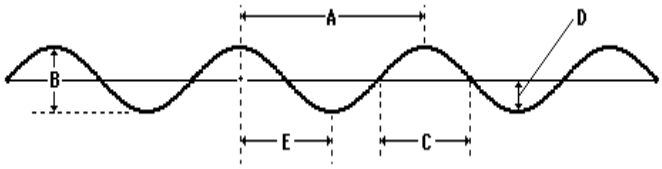


Fig.1

Which letter shows:

i. One whole wavelength _____ (1)

ii. The amplitude of a wave _____ (1)

iii. How many waves are drawn in **Fig.1** _____ (1)

iv. What type of wave is shown in **Fig.1** _____ (1)

b. **Fig.2** shows a slinky spring representing another wave

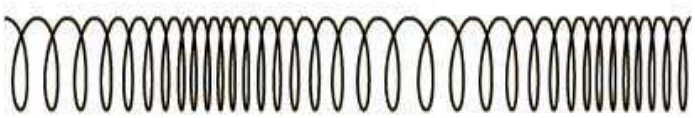


Fig.2

i. What type of wave does the slinky in **Fig.2** represent

_____ (1)

ii. Show on the diagram a **Compression** and a **Rarefaction**. (2)

c. Complete the sentence

Fig.3 shows waves passing through a narrow gap, we call this effect

_____ (1)

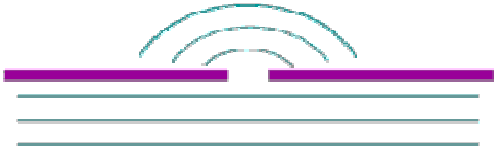


Fig.3

2a. This question is about reflection of light. On **Fig.4** below

i. Label the **incident ray** and **reflected ray** in the spaces provided. (2)
ii. Label the normal **N**. (1)
iii. Calculate **angle i** _____ (1)
iv. Calculate **angle r** .Give a reason for your answer.

_____ (2)

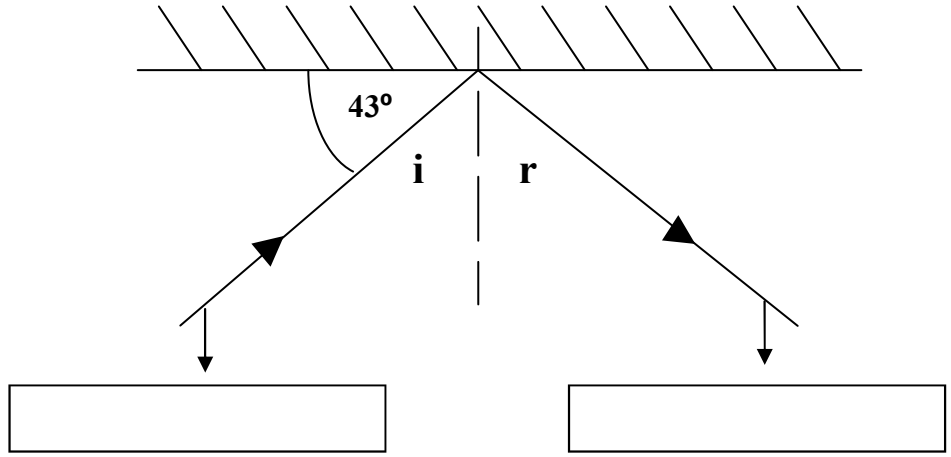


Fig.4

b. The word 'AMBULANCE' on an ambulance is written laterally inverted. Explain why it is written in such a way .

_____ (2)

3a. The bending of light passing from one medium to another is called

_____ (1)

b. **Fig.5** shows a ray of light passing from air to glass.

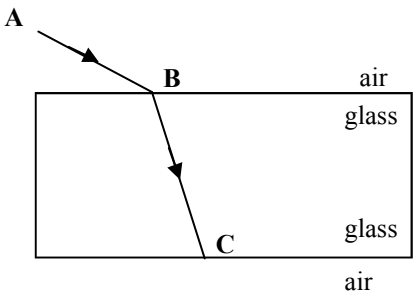


Fig.5

i. Which medium is more dense air or glass? _____ (1)

ii. What are the names of rays
AB _____
BC _____ (2)

iii. Explain why the ray BC bends.

_____

_____ (2)

iv. Draw the emergent ray from C (2)

4a. This question is about the electromagnetic spectrum.

i. Fill in the missing waves in the electromagnetic spectrum below. (2)

_____	X-rays	UV rays	Visible light	_____	Microwaves	Radio waves

ii. Which waves from the electromagnetic spectrum best describe the following?

- can be detected by our eyes _____
- are used to check for broken bones _____
- are used to kill cancer cells _____
- have the longest wavelength _____ (4)

b. Name **two** properties of electromagnetic waves.

_____

_____ (2)

5. Kelly looks at a water tank and according to her it is half full of water. The real depth of the water is 120 cm.

Fig.6

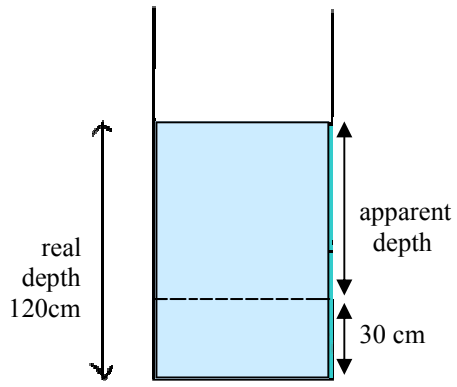
a. Underline the correct word

The water tank looks (**shallower / deeper**)

than it really is ,because light from

the bottom is refracted (**away from / towards**)

the normal on passing into air. (2)



b. Calculate the apparent depth of water using depths shown in **Fig.6**

_____ (1)

c. What is the refractive index of water ? (The formula is on the front page)

_____ (2)

d. Complete the diagram (**Fig.7)** to show how the fish appears to be closer to someone watching from above.

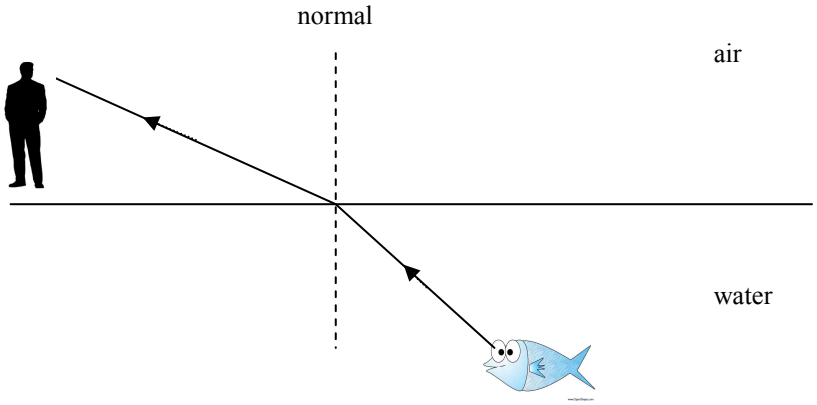


Fig.7

(3)

Section B : This section carries a total of 45 marks.

6. This question is about lenses.
The lens of a projector is used to show an image on a screen.

a. i. On the diagram in **Fig.8** draw **two rays** to explain how an **image** is produced on a screen. (3)

ii. The focal length of the lens is _____ cm (1)

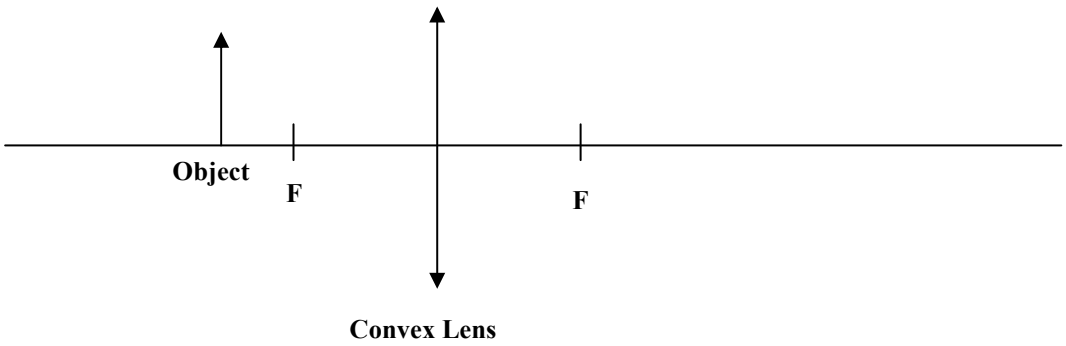


Fig.8

iii. Is the image produced:

- real or virtual? _____
- inverted or upright? _____
- diminished or magnified? _____ (3)

iv. Measure the **object height** and the **image height**. Then calculate the magnification of the lens.

Object height = _____ Image height = _____

Magnification =

_____ (3)

v. What happens to the image if the screen is moved away from the lens, assuming everything is unchanged.

_____ (2)

b. The refractive index of diamond is 2.5.

i. This means that the speed of light in air is 2.5 times greater than the speed of light in _____ (1)

ii. Calculate the speed of light in diamond given that the speed of light in air is 300 000 000 m/s.

_____ (2)

7. Rowena and Philip decide to use echoes from a tall building to measure the speed of sound. Philip stands in front of the building and bangs two blocks of wood together. Each time he hears an echo he bangs the pieces of wood together again. Rowena uses a stopwatch to time how long it takes to hear 10 echoes. They repeated the experiment 3 times.

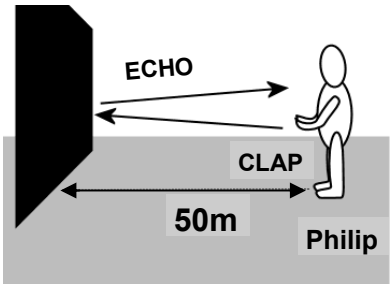
The results of the experiment are shown in Table below.

Experiment number	Time of ten echoes (s)
1	3.4
2	3.8
3	3.0

a. What would be the problem if Philip stood too far from the wall?

_____ (2)

b. Rowena measured the distance between Philip and the wall as 50 m.



i. Which of the following instruments should Rowena use to measure the distance ?

30 cm ruler metre ruler 25 metre tape measure (1)

ii. Give a reason for your choice.

_____ (3)

iii. What is the **average time** of 10 echoes? (Use results from the table to work out your answer.)

_____ (3)

iv. What is the distance travelled by the 10 '**clap-echo**' produced?

_____ (3)

v. Use the equation **speed** = $\frac{\textbf{distance}}{\textbf{time}}$ to calculate the speed of sound.

_____

_____ (3)

8. This question is about a car moving along a level road.

The following table shows the velocity of the car.

Velocity in m/s	Time in s
0	0
4	5
8	10
12	15
16	20
20	25
24	30
24	35
24	40

a. Plot a graph of velocity in m/s (y-axis) against time in s (x-axis) (5)

b. On your graph, label the part where the car moved:
   i. with an **acceleration**
   ii. with **constant speed** (2)

c. From your graph or otherwise find:

   i. the initial velocity of the car, u = _____ m/s (1)

   ii. the maximum velocity of the car, v = _____ m/s (1)

   iii. the time the car moved with an acceleration _____ s (1)

   iv. the acceleration. You may use the formula $\mathbf{a = \frac{v - u}{t}}$ (2)

d. Exactly after 40s,the driver notices a dog in the middle of the road and realizes that he has to stop the car. So, he applies the brakes and the car stops 5s later.

   i. If the driver takes 0.8s before he starts pressing the brake pedal, calculate the **thinking distance.**

   _____ (2)

   ii. If the **braking distance** is 20m, calculate the total stopping distance.

   _____ (1)