ST. NICHOLAS COLLEGE
HALF YEARLY SECONDARY EXAMINATIONS
February 2013

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

Name: _____ **Class:** _____

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	$\eta = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$ $\quad v = f\lambda$ $\eta = \frac{\text{real depth}}{\text{apparent depth}}$ $\quad f = \frac{1}{T}$ $m = \frac{\text{height of image}}{\text{height of object}}$ $\quad m = \frac{\text{image distance}}{\text{object distance}}$
Motion	average speed $= \frac{\text{total distance}}{\text{total time}}$ $\quad s = ut + \frac{1}{2}at^2$ $a = \frac{v-u}{t}$ $\quad s = \frac{(u+v)}{2}t$ $\quad v^2 = u^2 + 2as$ 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
Maximum Mark	8	8	8	8	8	15	15	15	85	15	100
Actual Mark											

Section A **This section carries 40 marks**

1. This question is about reflection.

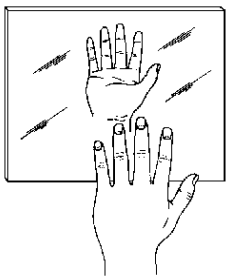
a. Answer by writing **true** or **false** next to each statement.

An image formed by a plane mirror is:

i. real _____ (1)

ii. enlarged _____ (1)

iii. upright _____ (1)



b. **Underline** the correct answer.

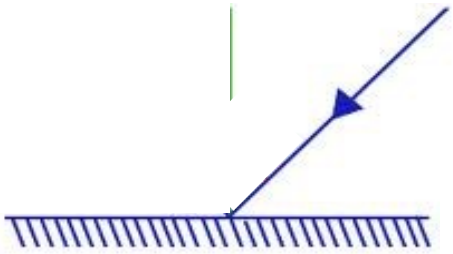
i. When the image of an object is seen in a plane mirror, the distance from the mirror to the image depends on:

- the wavelength of light used for viewing.
- the distance from the object to the image.
- the distance of both the observer and the object to the mirror. (1)

ii. If you stand three metres in front of a plane mirror, how far away would you see yourself in the mirror?

- 1.5m
- 3.0m
- 6.0m (2)

c. On the diagram below **draw** the path the light ray would follow as it travels. (2)



2. **Underline** the correct answer.

a. When a light ray passes between **air** and **glass** it bends, we say it is

- reflected
- diffracted
- refracted
- dispersed (1)

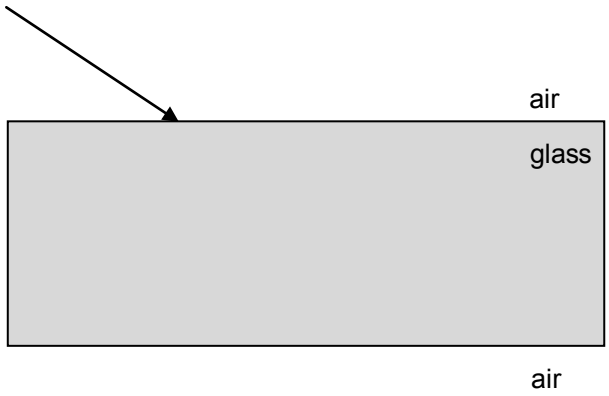
b. A light ray in air enters and passes through a block of glass.

How do you describe the **speed** of the light ray **after** it emerges from the block?

- speed is less than when in glass
- speed is less than before it entered
- speed is the same as that in glass
- speed is the same as that before it entered (2)

c. On the diagram draw

i. the normal
ii. the refracted ray
iii. the emergent ray



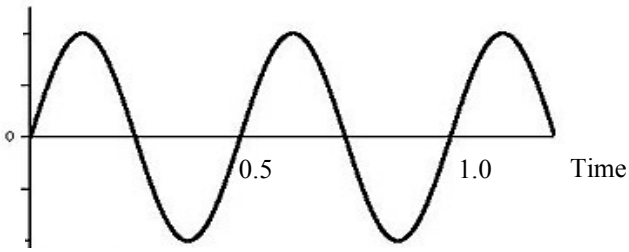
(3)

d. Underline the correct word:

- The ray bends (towards / away from) the normal when it goes into the glass.
- The ray bends (towards / away from) the normal when it leaves the glass.

(2)

3. This question is about a transverse wave.



a. Use the diagram above to answer the following.

i. Label a crest with a capital letter C. (1)

ii. Label a trough with a capital letter T. (1)

iii. How many waves appear in the diagram? _____ waves (1)

iv. Mark the Amplitude with a capital letter A. (1)

v. What is the frequency of the waves ? _____ Hz (1)

vi. What is the Periodic time T ? _____ s (1)

b. Calculate the speed of a wave if it has a wavelength of 12m and a frequency of 4 Hz.

_____

_____ (2)

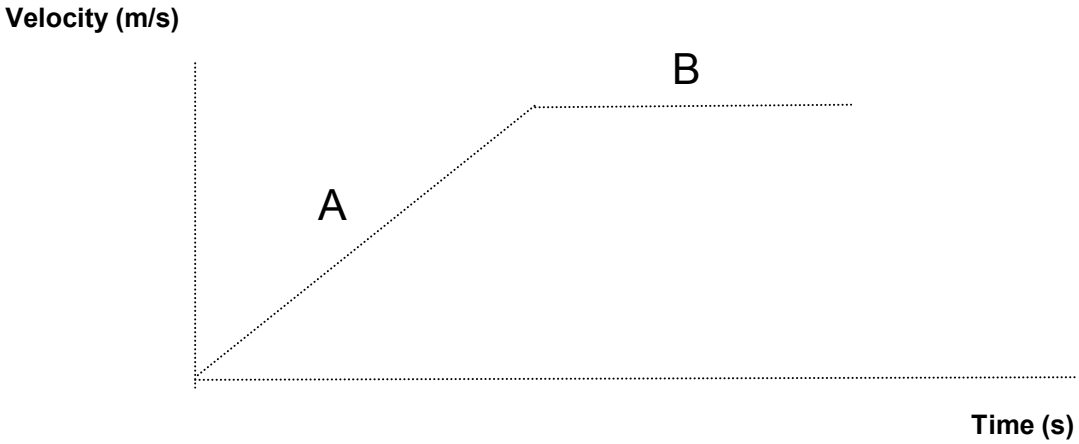
4. This question is about speed and acceleration.

a. An athlete runs a 400m race in 50s. Calculate his average speed.

_____

_____ (2)

b. Describe the motion of the athlete in the following graph



A _____

B _____ (4)

c. The initial velocity of the athlete is 2 m/s and the final velocity is 4.5 m/s . He covers this part of the journey in 5s. What is his acceleration?

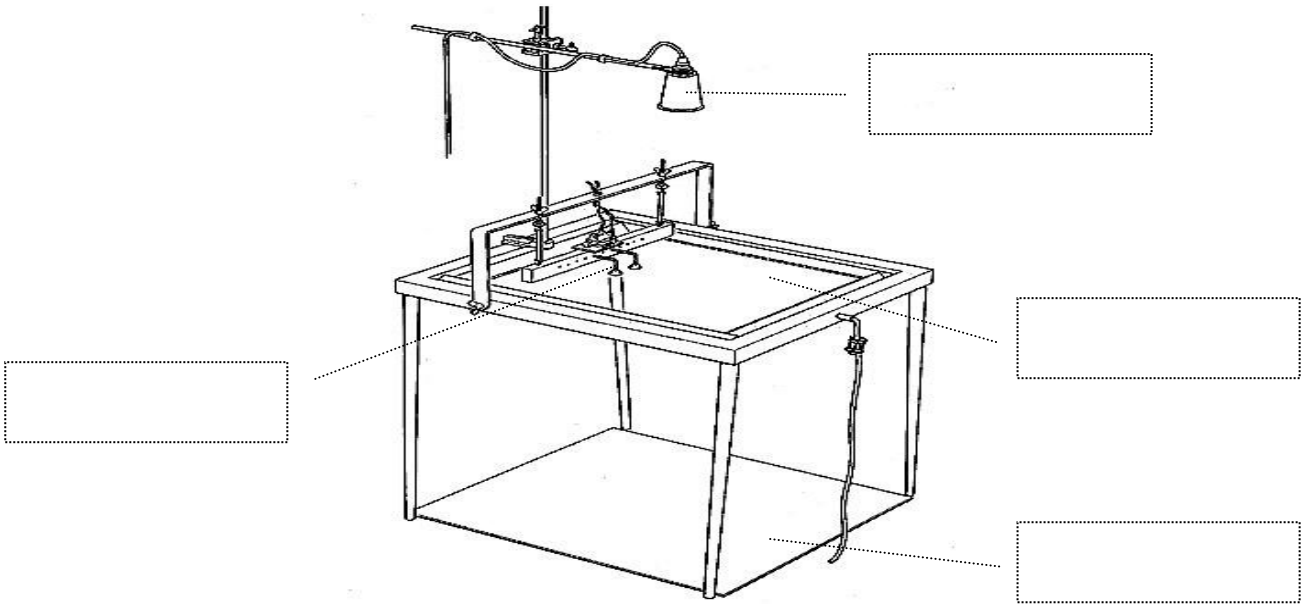
_____

_____ (2)

5. The diagram shows a laboratory Ripple Tank.

a. The Ripple Tank is used to observe _____ (1)

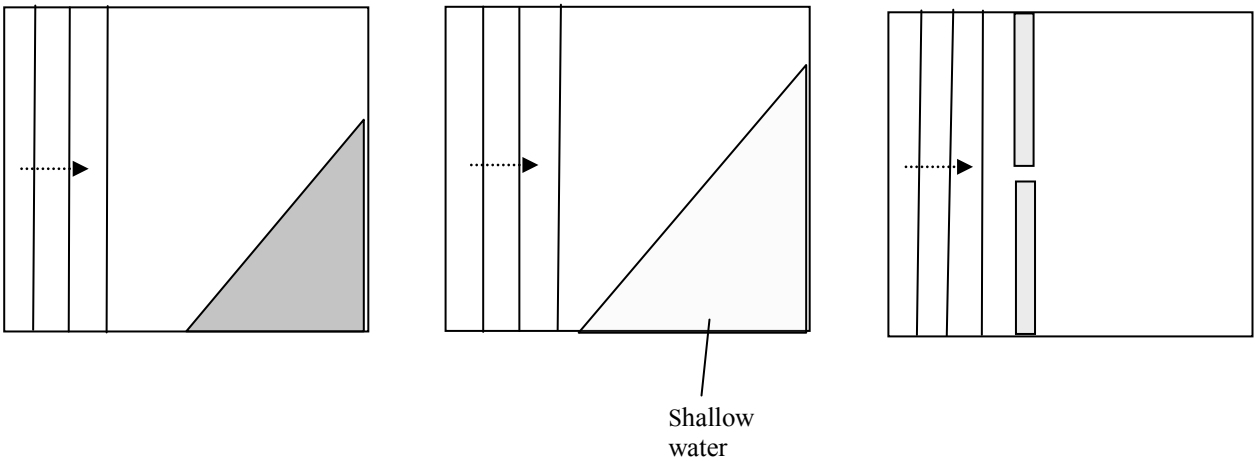
b. Label the main parts of the Ripple Tank in the diagram below



(4)

c. In the three boxes below, draw wave patterns

Reflection Refraction Diffraction



(3)

Section B
This Section carries 45 marks.

6. A car starts from rest .The table shows how the speed of the car varies over the first 30 seconds of motion.

Velocity (m/s)	0	4	8	12	16	20	24
Time (s)	0	5	10	15	20	25	30

a.i. Plot a graph of **velocity** on the **y axis** against **time** on the **x axis**. (6)

a.ii. Use the graph to calculate the **distance** travelled by the car in the first 30s.

_____

_____ (3)

b. The driver sees an accident and he suddenly brakes on the road and comes to a stop. Explain what is meant by:

i. The **thinking distance**

_____

_____ (1)

ii. The **braking distance**

_____

_____ (1)

c. State one road condition affecting the braking distance of the car.

_____ (1)

d. i. A car is travelling at a speed of 24 m/s .The driver has a reaction time of 0.7s. What is the **thinking distance** travelled by the car before he starts to brake?

_____

_____ (2)

ii. Calculate the **stopping distance** of the car if the braking distance was 72m.

_____ (1)

7. This question is about the electromagnetic spectrum.

a. Underline the correct answer.

i. Electromagnetic waves are all (**transverse** / **longitudinal**) waves. (1)

ii. Gamma rays have the (**lowest / highest)** frequency . (1)

iii. Radio waves have the (**shortest / longest)** wavelength. (1)

b. Complete the electromagnetic spectrum by filling the empty spaces. (4)

Gamma Rays			Visible Light			Radio Waves

c. Give one use for the following:

i. Gamma Rays

_____ (1)

ii. Visible light

_____ (1)

iii. Ultra Violet

_____ (1)

d. Which part of the electromagnetic spectrum

i. makes the skin go darker

_____ (1)

ii. is used to check broken bones

_____ (1)

iii. is used to send an SMS

_____ (1)

e. A Radio station transmits radio waves at 500 kHz (500 000 Hz) with a wavelength of 600 m .Calculate the velocity of the Radio Waves in m/s .

_____

_____ (2)

8. This question is about lenses.

a. Underline the correct answer.

i. A converging lens is also called a (**convex / concave**) lens. (1)

ii. The (**thinner / thicker**) a converging lens is, the shorter is its focal length. (1)

b. An object is placed in front of a converging lens as shown in the diagram below.

i. Use a well-sharpened pencil to draw **TWO** rays from the top of the object O to complete this ray diagram also showing how the image forms. (3)

ii. Draw the image and label it as '**I**'. (1)

iii. Measure the height of the image._____ (1)

iv. The **image** formed is:

Real or Virtual ?_____ (1)

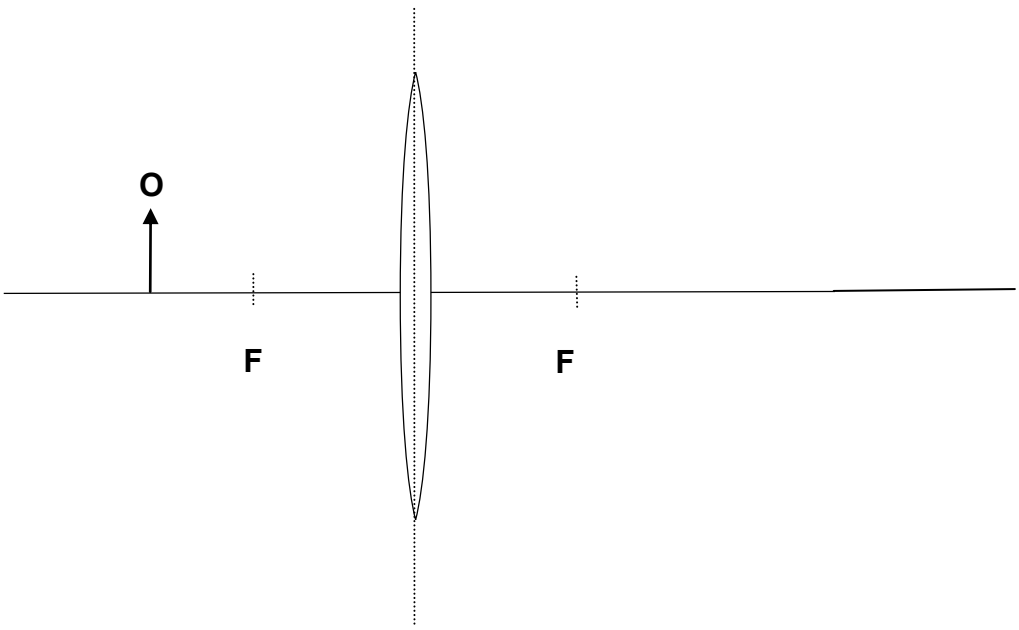
Inverted or Upright ?_____ (1)

Magnified or Diminished ?_____(1)

v. Calculate the magnification of the lens.

_____

_____ (2)



c. When a ray of white light passes through a prism, it splits into seven colours.

i. What is this band of seven colours called?

v_____ _____ (1)

ii. Continue the rays showing the least deviated colour by R and the most deviated colour by V. (2)