



St. Thomas More College
Boys Junior Lyceum
Half Yearly Examinations - February 2011



Form 4

Physics

Time: 1hr 30min

Name: _____ Class: _____ Index No. _____

Useful Formulae

$$\text{Average speed} = \frac{\text{total distance}}{\text{total time}}$$

$$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time}}$$

$$g = 10 \text{ N/Kg}$$

$$v = u + at$$

$$v^2 = u^2 + 2as$$

$$s = ut + \frac{1}{2}at^2$$

$$s = \left(\frac{u + v}{2} \right) t$$

$$\text{Frequency, } f = \frac{\text{number of waves}}{\text{time}}$$

$$\text{Frequency, } f = \frac{1}{T}$$

$$\text{speed of wave} = f \times \lambda$$

$$\text{Refractive Index} = \frac{\text{speed of light in air}}{\text{speed of light in medium}}$$

$$\text{Refractive Index} = \frac{\text{real depth}}{\text{apparent depth}}$$

$$\text{Magnification} = \frac{\text{height of image, } h_i}{\text{height of object, } h_o} \quad \text{or} \quad \frac{\text{image distance, } d_i}{\text{object distance, } d_o}$$

ANSWER ALL QUESTIONS

Give your answers correct to 1 decimal place where necessary.

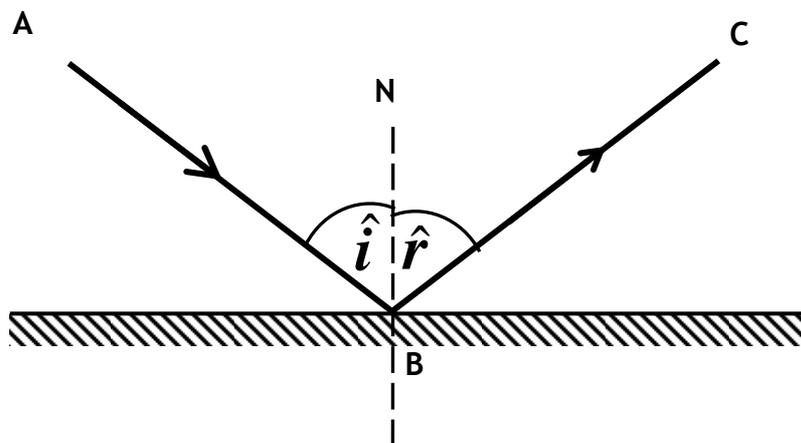
1. Write one word explaining the following sentences.

(6 marks)

<i>Description</i>	<u>One word answer</u>
When light bounces off a mirror.	
When light changes direction and speed	
When light separates into 7 different colours	
A high frequency sound which cannot be heard by the human ear	
The maximum distance of a wave from its rest position.	
The time taken for a wave to complete one cycle	

2. A ray of light AB hits the mirror as shown in the following diagram. Fill in:

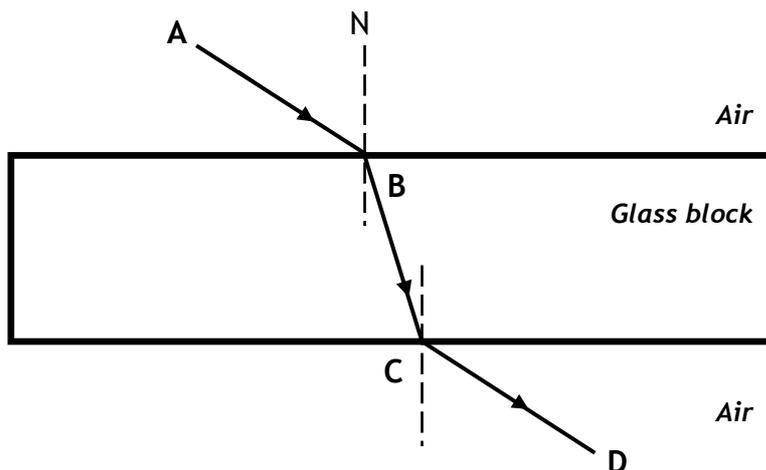
(5 marks)



- a) Ray AB is called the _____.
- b) Ray BC is called the _____.
- c) The Law of reflection states that: _____

- d) Line N is called the _____.

3. A ray of light AB passes through a glass block as shown in the following diagram. (4 marks)



- Ray BC is called the _____
- Ray CD is called the _____
- Ray AB and Ray CD are always _____ to each other.
- Mark the angle of refraction on the diagram above with the letter \hat{r} .

4. The diagram below shows the Electromagnetic Spectrum.

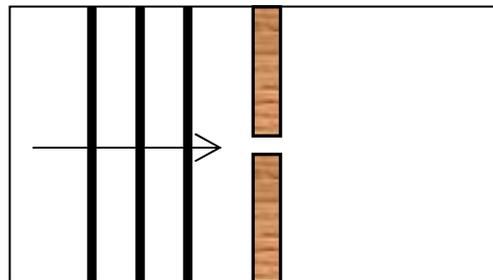
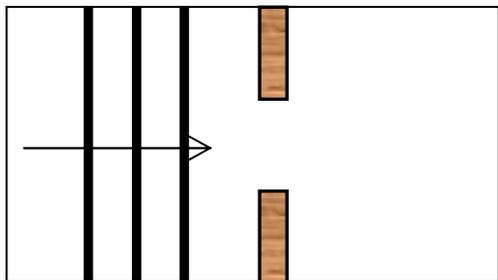
Gamma Rays	X-rays	Ultra Violet	Visible Light	Infra Red	Microwaves	Radio Waves
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- Give 2 properties which are common to all the electromagnetic waves. (2 marks)
 - _____
 - _____
- Which waves :
 - have the shortest wavelength _____ (1 mark)
 - have the lowest frequency _____ (1 mark)
 - are used to detect a broken bone _____ (1 mark)
 - causes our skin to tan _____ (1 mark)
 - are emitted from a hot body _____ (1 mark)

5. The following diagram shows the wavefronts of water waves passing through a gap.

a) Complete the following diagrams.

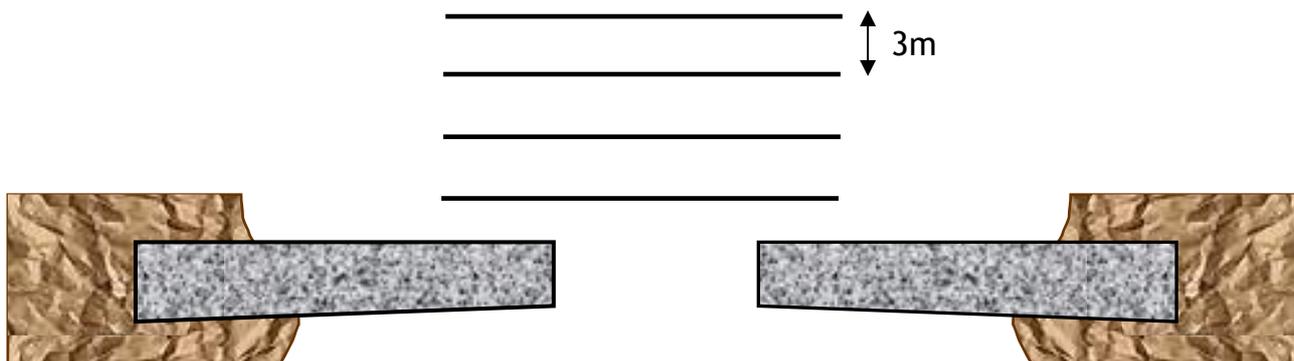
(4 marks)



b) What is this process called ? _____.

(1 mark)

The diagram below shows the break-water of a harbour. Answer the following questions:



c) What is the wavelength of the water waves? _____

(1 mark)

d) 4 waves hit the break-water every 20seconds. Find the frequency of the water waves:

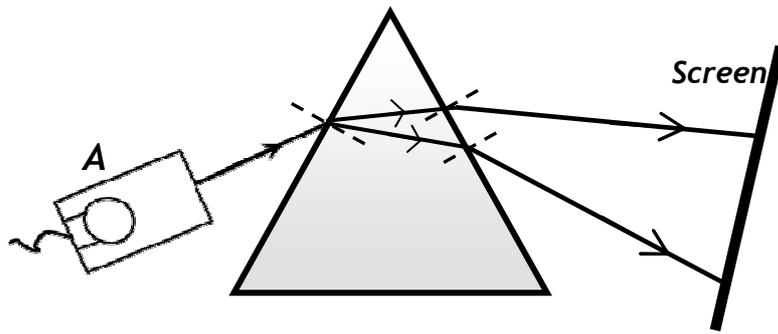
(2 marks)

e) Find the velocity of the water wave:

(2 marks)

6. The following diagram represents a ray of white light entering a prism.

(8 marks)

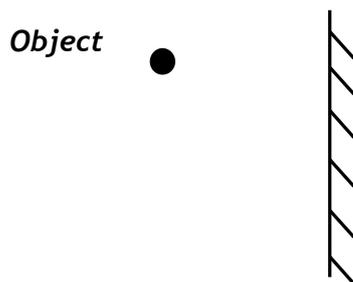


- a) What is 'box A' called ? _____.
- b) Fill in: White light separates into _____ different colours. These are red, _____, _____, green, _____, _____ and _____.
- c) The colours obtained on a screen are called the colours of the _____.
-

7. This diagram shows an object placed in front of a mirror.

- a) Draw rays of light to form the Image **I** on the other side of the mirror.

(3 marks)



- b) Write down **4** properties of the image produced by a plane mirror.

(4 marks)

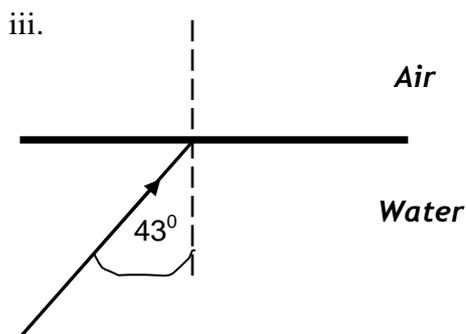
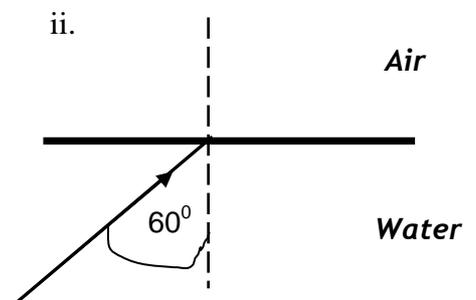
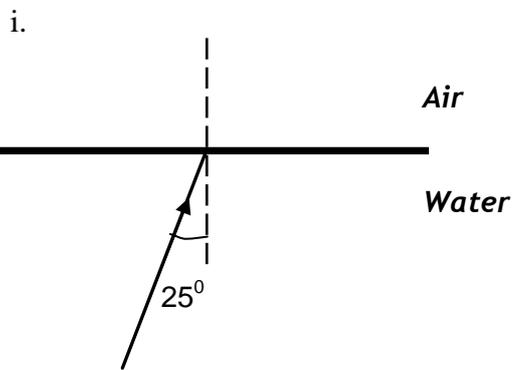
- i. _____
- ii. _____
- iii. _____
- iv. _____

8. The speed of light in air is $300,000,000 \text{ m/s}$ ($3 \times 10^8 \text{ m/s}$). In plastic, the speed of light is equal to $215,000,000 \text{ m/s}$ ($2.15 \times 10^8 \text{ m/s}$).

a) Find the refractive index of plastic.

(2 marks)

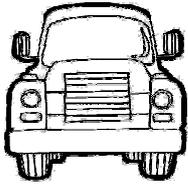
b) The *critical angle* of water is 43° . Continue the light rays in each of the following: (3 marks)



c) Which medium has the greatest refractive index: water or glass? Why? _____

(2 marks)

9. A driver increased the velocity of his truck from rest to 56 m/s in 8 seconds.



a) What is the initial velocity of the truck? _____ (1 mark)

b) What is the final velocity of the truck? _____ (1 mark)

c) Find the acceleration of the truck in these first 8 seconds:

_____ (3 marks)

d) Find the distance covered by the truck in these 8 seconds:

_____ (3 marks)

e) The driver was afraid that he going to arrive late at work, so he changed his velocity from 56m/s to 70m/s. He covered a distance of 9m. Find the acceleration of the truck:

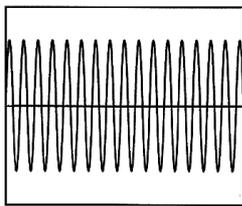
_____ (3 marks)

10. A loudspeaker, connected to an oscilloscope, produces sound waves of frequency 210Hz.

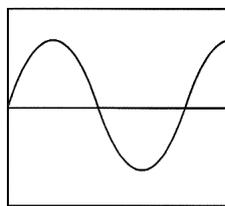
a) Calculate the periodic time. Give answer to 4 decimal places. (2 marks)

b) If a louder sound is produced, how will the wave on the oscilloscope change? (1 mark)

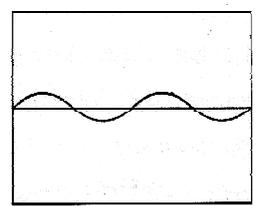
The oscilloscope was then connected to an electric guitar. It produced three waves:



A



B

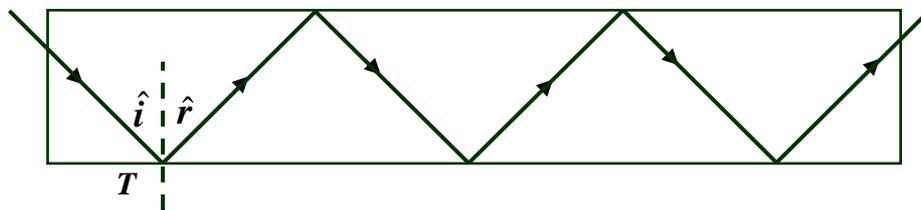


C

c) Which wave represents the sound with the lowest volume? _____ (1 mark)

d) Which wave represents the sound with the highest frequency? _____ (1 mark)

11. The diagram shows a section through an optical fibre. (4 marks)



a) What is the effect at point T called? _____

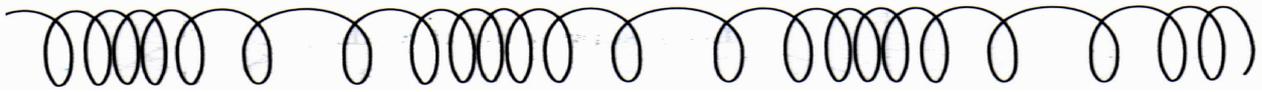
b) If angle i is 57° , what is the size of angle \hat{r} ? _____

c) Name two practical uses of optical fibres. i. _____ ii. _____

12. This question is about waves.

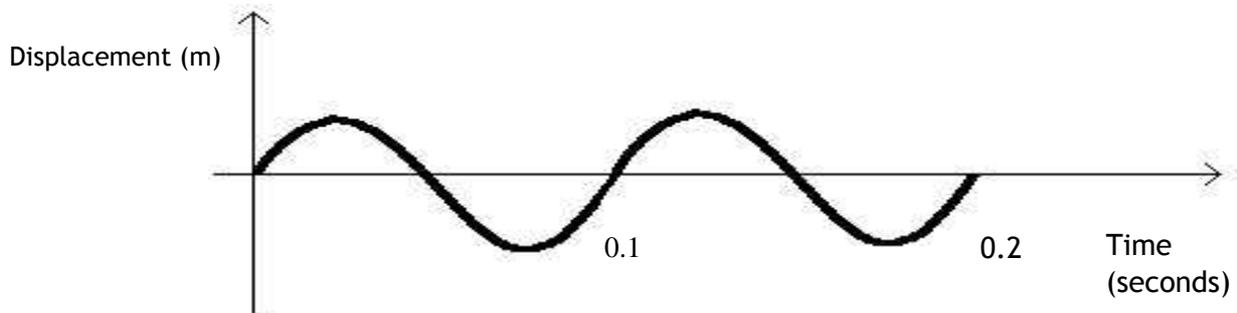
(13 marks)

a) The figure below shows a wave travelling in a slinky spring.



- i. Is this a longitudinal wave or a transverse wave? _____ (1 mark)
- ii. Describe the motion of the hand to produce this wave. _____ (1 mark)
- iii. On the above diagram, mark the **compressions C** and **rarefactions R**. (2 marks)
- iv. Give an example of such a wave: _____ (1 mark)
- v. On the diagram mark the wavelength of this wave. (1 mark)
- vi. The wavelength is _____ cm long. (1 mark)

b) The following diagram shows a water wave.



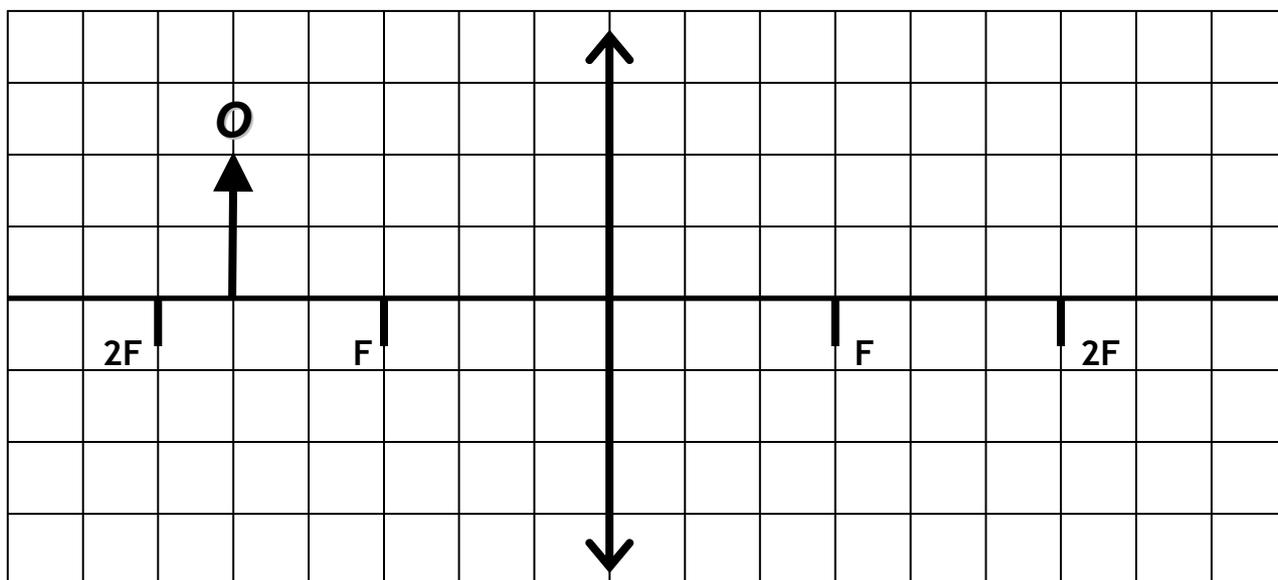
- i. Mark the amplitude a on the above graph. (1 mark)
- ii. What is the periodic time (the time of 1 wave) of this wave? _____ (1 mark)
- iii. Find the frequency of this wave. (2 marks)

- iv. If the wavelength is 0.03m, find the speed of this wave. (2 marks)

13. This question is about lenses and ray diagrams.

(13 marks)

This diagram represents an object placed in front of a convex lens. Each square is 1 cm by 1 cm.



a) What is the focal length of the lens ? _____ cm (1 mark)

b) Draw rays of light from the object to form an image. (4 marks)

c) Write down 3 properties of the image formed: (3 marks)

i. _____ ii. _____ iii. _____

d) Measure the object distance and the image distance: (2 marks)

$d_o =$ _____ cm $d_i =$ _____ cm

e) Find the magnification of the lens: (2 marks)

f) Write down an application of this ray diagram (when the object is placed between F and 2F):

_____ (1 mark)