St.Thomas More College
Boys Junior Lyceum
Half Yearly Examinations - February 2012

KULLEĠĠ SAN TUMAS MORE

Form 4	Physics	Time: 1hr 30min

Name: _____ Class: _____ Index No. _____

Useful Formulae

Average speed = $\frac{\text{total distance}}{\text{total time}}$ Acceleration = $\frac{\text{change in velocity}}{\text{time}}$ g = 10 N/Kg

$v = u + at$ $v^2 = u^2 + 2as$ $s = ut + \frac{1}{2}at^2$ $s = \left(\frac{u+v}{2}\right)t$

Frequency, f = $\frac{\text{number of waves}}{\text{time}}$ Frequency, f = $\frac{1}{T}$

speed of wave, v = f λ

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

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

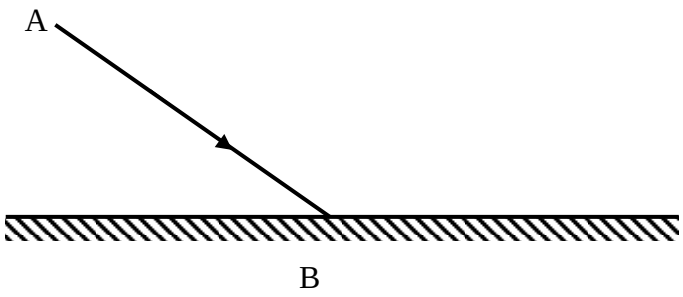
ANSWER ALL QUESTIONS

Give your answers correct to 1 decimal place where necessary.

1. Write the units of the following quantities ***(6 marks)***

Quantity	**Units**
Frequency	
Speed of a wave	
Periodic Time	
Amplitude	
Initial Velocity	
Acceleration	

2. A ray of light AB hits a mirror as shown in the following diagram. ***(6 marks)***



a) Ray AB is called the _____ ray.

b) Draw the normal, at the point of incidence.

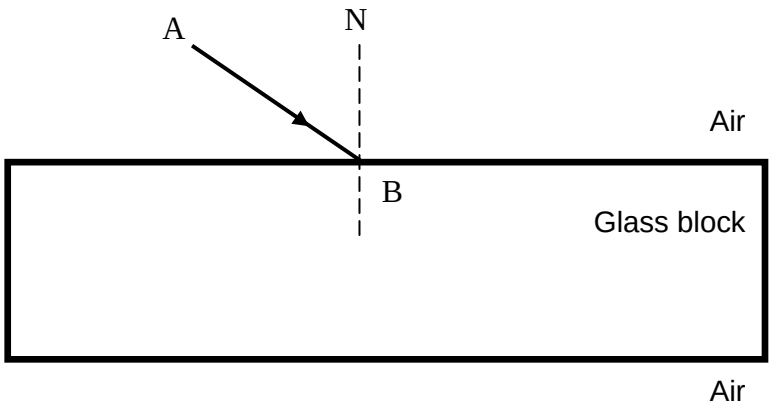
c) Mark the angle of incidence $\hat{i}$.

d) Draw the reflected ray.

e) Mark the angle of reflection $\hat{r}$.

f) One of the laws of reflection states that the angles of incidence and reflection are _____.

3. An incident ray of light AB hits a glass block as shown in the following diagram. ***(4 marks)***



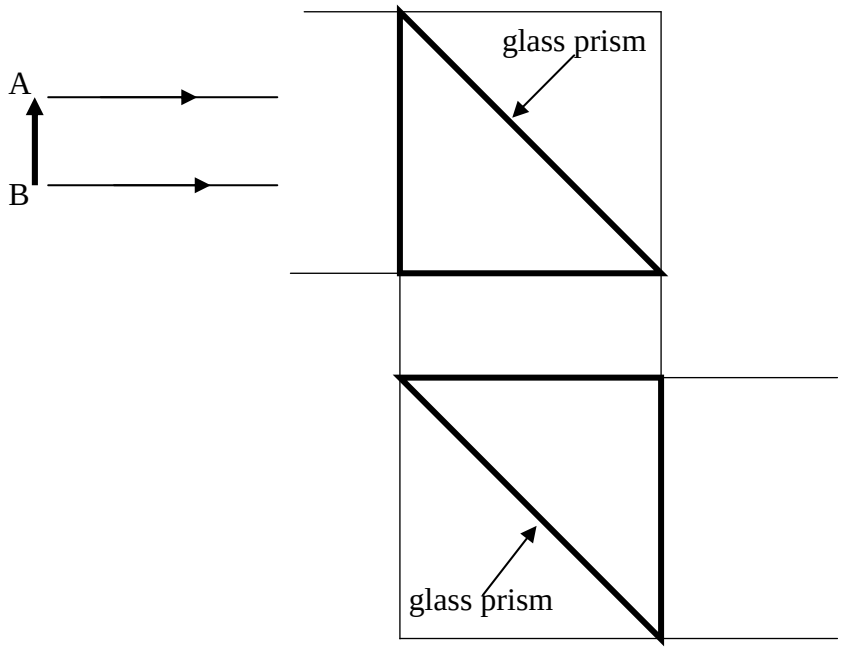
a. Draw the refracted ray.

b. Draw the ray coming out of the glass block.

c. The ray coming out of the class block is called the _____ ray.

d. Mark the angle of refraction $\hat{r}$.

4. Mr. Smith is the captain of a submarine. He uses the periscope, all the time in his ship. Continue the rays of light emerging from the object AB to show how Mr. Smith can see the world outside the submarine by using the periscope. This periscope is made of two 45^0 glass prisms. (Draw the position of the eye) ***(2 marks)***



5. The diagram below shows a section of the Electromagnetic Spectrum.

	X-rays		Visible Light		Microwaves	Radio Waves

a) Fill in the missing waves. ***(3 marks)***

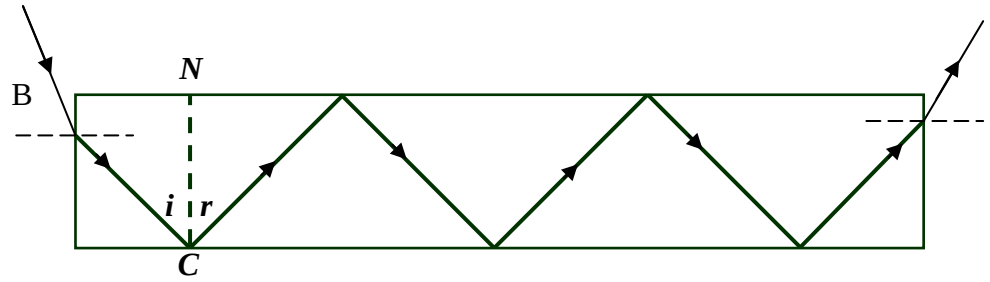
b) Give 2 properties which are common to all the electromagnetic waves. ***(2 marks)***

1. _____
2. _____

c) Which waves :-

1. have the shortest wavelength _____ ***(1 mark)***
2. have the lowest frequency _____ ***(1 mark)***
3. are used for the cure of cancer _____ ***(1 mark)***
4. are emitted from a hot body _____ ***(1 mark)***

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



a) Why does the light bend as it goes into the optical fibre ?

_____

_____

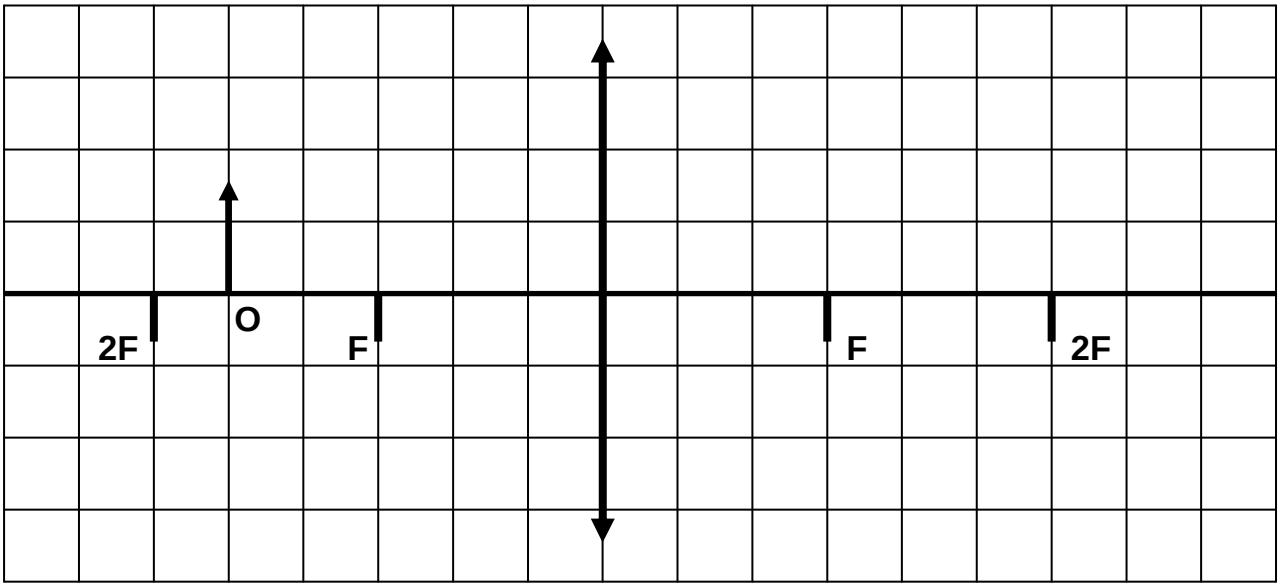
b) What is the effect at point C called ? _____

c) If angle $\hat{i}$ is 57^0, what is the size of angle $\hat{r}$? _____

d) Name one practical use of optical fibres. _____

7. During a lesson, a teacher wanted to use a slide projector to show the students some slides of Physics. The students were able to see the slide show on a screen. The following ray diagram represents the slide projector and the image seen on the screen. Each square is 1cm by 1cm.

Continue the ray diagram and mark the image produced. ***(5 marks)***



a) Write down 3 properties of the image formed. ***(3 marks)***

1. _____ 2. _____ 3. _____

b) Measure the image distance _____ cm. ***(1 mark)***

c) Find the magnification of the lens. ***(2 marks)***

_____

_____

8. A bat can hear sounds of frequency 50 KHz.

a) Write 50 KHz in Hz. _____ ***(1 mark)***

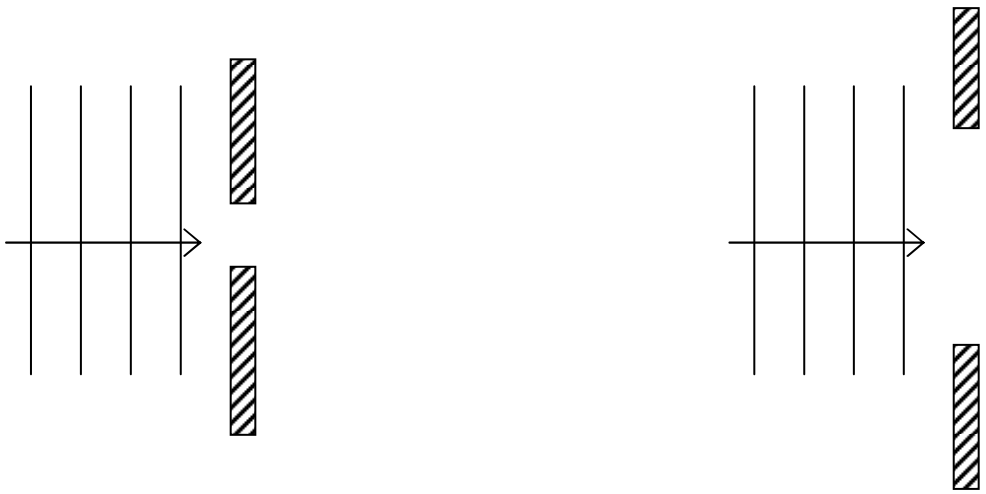
a) Calculate the wavelength of the waves produced if the speed of sound is 330m/s. ***(2 marks)***

_____

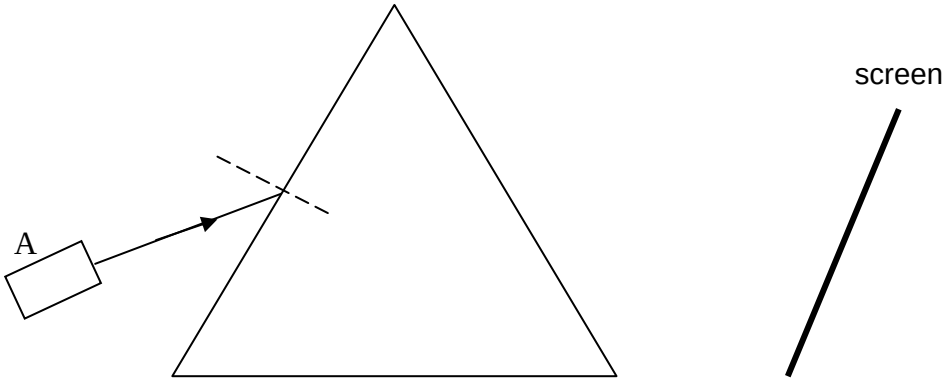
b) Calculate the periodic time (the time taken to make 1 complete wave). ***(2 marks)***

_____

9. The following diagram shows the wavefronts of water waves passing through a gap. Complete the following diagrams. ***(4 marks)***



10. The following diagram represents a ray of white light entering a prism. ***(5 marks)***



a) What is box A called ? _____.

b) Fill in:- White light separates into _____ different colours, the colours of the _____.

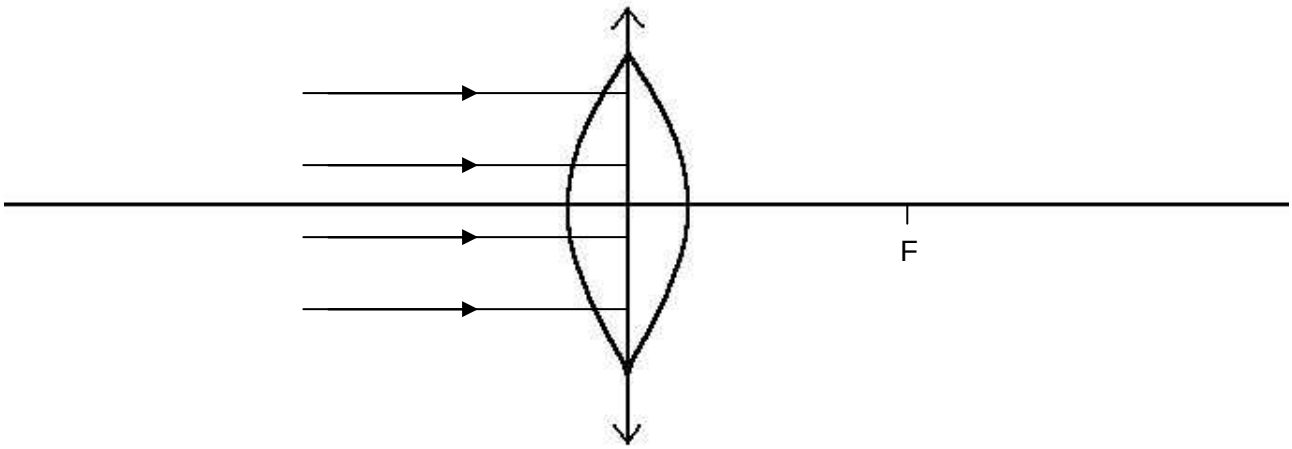
c) Continue the ray of light as it passes through the prism, and show what we see on the screen.

11. The speed of light in air is 300,000,000 m/s (3×10^8 m/s). In plastic, the speed of light is equal to 225,000,000 m/s (2.25×10^8 m/s). Find the refractive index of plastic. ***(2 marks)***

_____

_____

12. A beam of light falls onto a lens as shown in the diagram below.

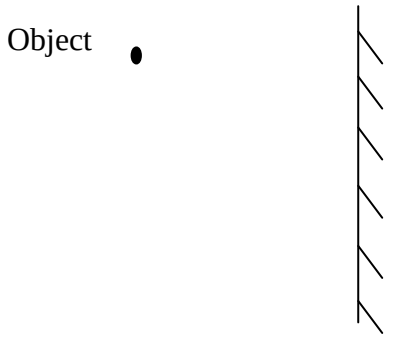


a) What type of lens is shown in the diagram ? _____ lens. ***(1 mark)***

b) Complete the diagram to show how light passes through and out of the lens. ***(2 marks)***

13. 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. ***(2 marks)***

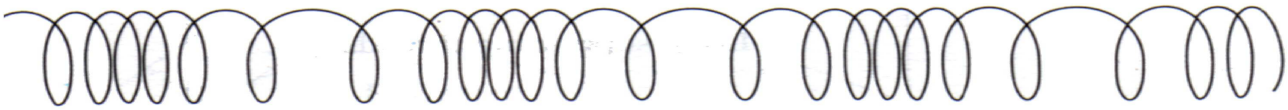


b) Write down ***2*** properties of the image produced by a plane mirror. ***(2 marks)***

a. _____

b. _____

14 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)***

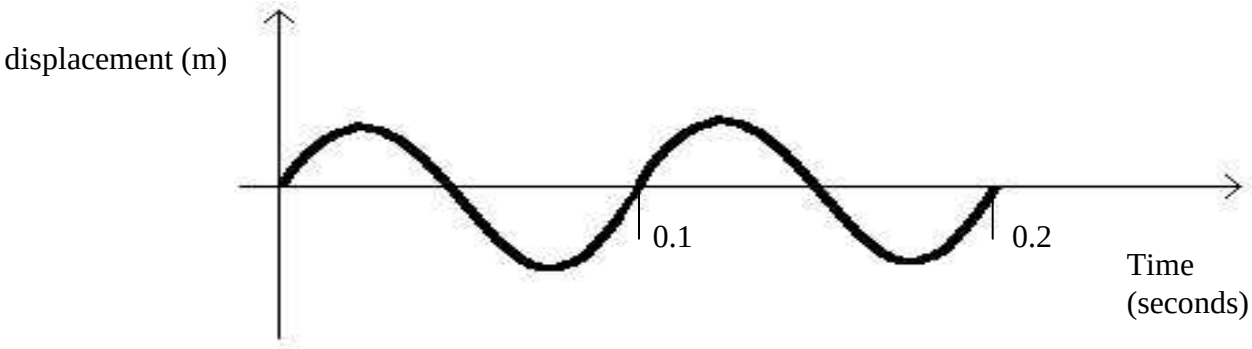
_____

iii. Mark on the above diagram the compressions ***C*** and rarefactions ***R***. ***(2 marks)***

iv. Give an example of such a wave. ***(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)***

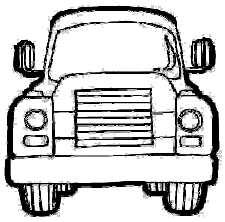
iii. Find the frequency of this wave. ***(2 marks)***

_____

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

_____

15. A driver decreased the velocity of his truck from 54 m/s to rest in 20 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 deceleration of the truck in these 20 seconds:

_____

_____

_____ ***(3 marks)***

d) Find the distance covered by the truck in these 20 seconds:

_____

_____

_____ ***(3 marks)***

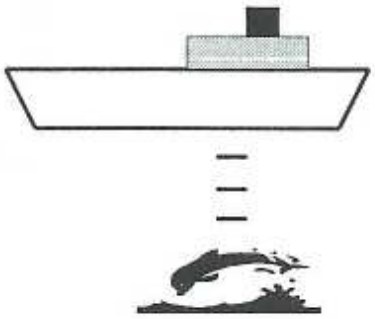
e) After resting for some time, the driver starts his truck again. This time, he increases his speed from rest to 40 m/s in 4 seconds. Find the acceleration now.

_____

_____

_____ ***(3 marks)***

16. The figure below shows a ship using sonar to monitor the movement of a dolphin. A short pulse of sound waves is emitted from the ship and the **echo** is detected **0.12s later**. The sound waves travel at 1500m/s.



a) How far has the pulse travelled in 0.12s? ***(2 marks)***

_____

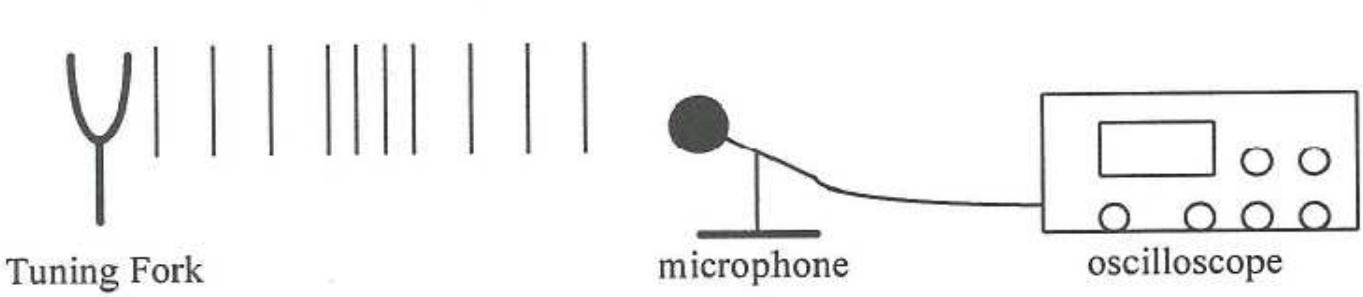
_____

b) How far below the surface is the dolphin? ***(2 marks)***

_____

_____

17. In the figure below a vibrating tuning fork sends out a wave which is picked up by the microphone and shows up on the oscilloscope.



a) Which type of wave is the tuning fork producing, longitudinal or transverse wave ?

_____ ***(1 mark)***

b) Which type of wave is shown on the screen of the oscilloscope, longitudinal or transverse ? _____ ***(1 mark)***

c) The figures below show two traces shown on the oscilloscope relating to different pitches.

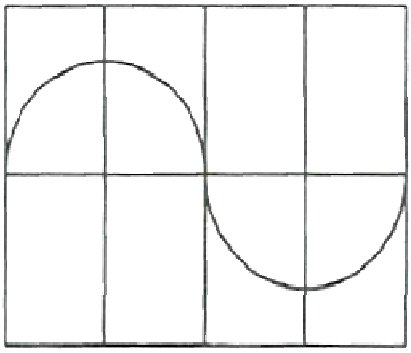


Figure 1

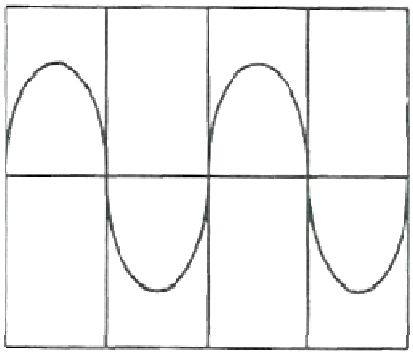


Figure 2

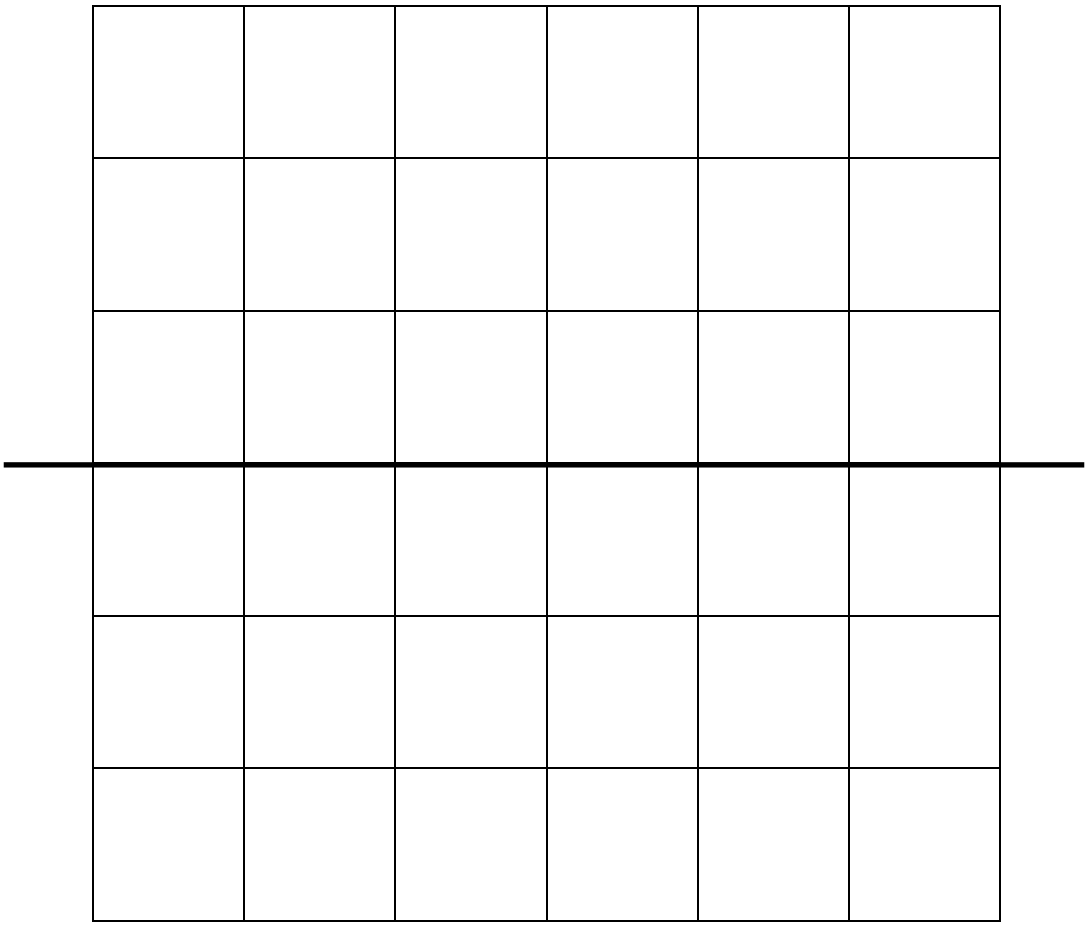
Which of the two figures is of low pitch? _____ ***(1 mark)***

d) Fill in:-

i) The pitch of a note depends on the _____ of the wave. ***(1 mark)***

ii) The loudness of a note depends on the _____ of the wave. ***(1 mark)***

e) Sketch two notes on the same axis showing different loudness. ***(2 marks)***



f) Briefly describe how sound waves travel to your ear through air. ***(2 marks)***