

# SCIENCE

## INTERACTIVE ASSESSMENT QUESTIONS BASED ON STANDARD PRACTICAL EXERCISES FOR REVISION AND EXAMINATION PRACTICE

### Physics Part I

#### LEARNING VERSION

IN THIS LEARNING VERSION ANSWERS ARE IMMEDIATELY AND VISIBLY MARKED, CORRECT ANSWERS CAN BE REVEALED, AND END OF SECTION TOTALS AND PERCENTAGES SHOWN ON SCREEN.

SOME OF THE MORE DIFFICULT QUESTIONS HAVE DROP DOWN HELP BOXES WHICH REVEAL INFORMATION WHEN THE CURSOR IS PASSED OVER THE QUESTION MARK.

WHEN PRINTED OUT ONLY THE QUESTIONS SHOW, THEREFORE THIS CAN BE USED AS A PAPER VERSION FOR TESTS IF REQUIRED.

The questions are of the Multiple Choice style, where the phrase “Which ONE of the following ...” is implied, but is not always stated. So that students are reminded of the type of question that requires short written answers, which unfortunately cannot be automatically marked, each topic has one short passage with missing words, which must be identified in their correct sequence.

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**NB** The practical work presented should be familiar to students, either as a demonstration or as an experiment they might have carried out themselves in the lab. The illustrated material is NOT presented as a practical guide, and while the procedures were carried out according to recommended safety guidelines, specific safety issues are NOT dealt with.

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## CONTENTS

The following practical topics have been selected according to exam question frequency to form the basis of revision and examination practice.

FOR THE CORRECT FINAL TOTAL AND PERCENTAGE THE ENTER BUTTON AT THE BOTTOM LEFT OF EACH PAGE MUST BE CLICKED ON.

### Part 1

Refraction

Total Internal Reflection

Sound Waves

### Part 2

Transfer of Thermal Energy

Transfer of Electrical Energy

### Part 3

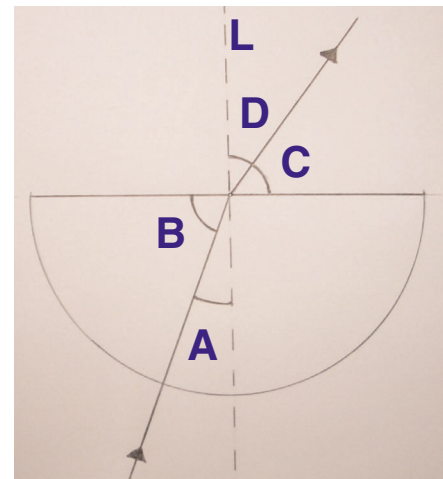
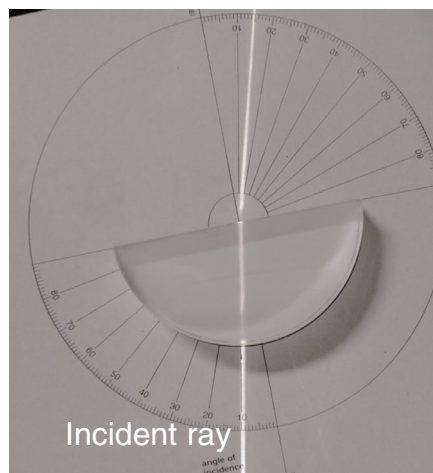
Series and Parallel Circuits

Voltage and Current Characteristics

Potential Divider Circuits

## ● Refraction

**Practical** - A ray box was used to shine a light ray through a semi-circular glass prism. The light ray enters the prism at an angle of 90 degrees and is therefore not refracted. However, as it leaves the prism, the light ray hits the glass/air boundary at an angle, and as it passes out of the glass into the air the ray is bent or refracted.



1. Which one of the following is the correct name for line L in the diagram?

- A - Incident line
- B - Normal line
- C - Refracted line
- D - Reflected line

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2. In the above diagram which one of the following is the angle of incidence?

- A - Angle A
- B - Angle B
- C - Angle C
- D - Angle D

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3. In the above diagram which one of the following is the angle of refraction?

- A - Angle A
- B - Angle C
- C - Angle B
- D - Angle D

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Refraction

HELP BOX

PASS CURSOR OVER  
QUESTION MARK  
FOR HELP WITH  
QUESTION  
NUMBER 4

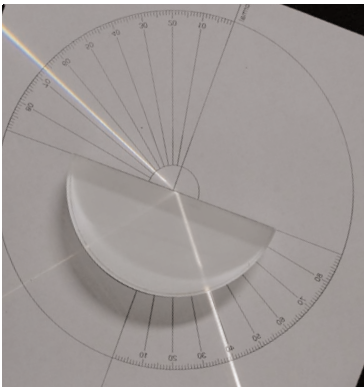
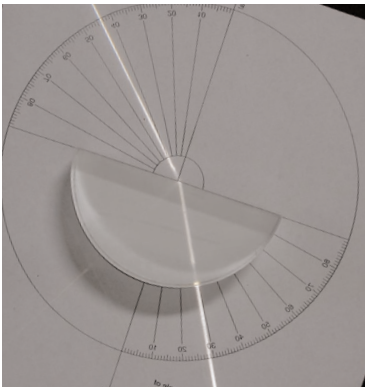
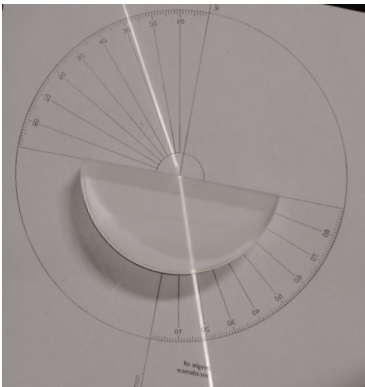
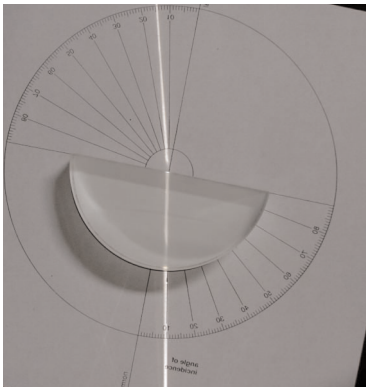


If a light ray hits a boundary where the density changes, its speed changes. The denser the material, the slower the speed. If the ray hits the boundary at an acute angle (less than 90 degrees), it will also change direction.

4. Which one of the following best explains why the light ray refracts (bends)?

- A - The light ray only appears to refract due to an optical illusion.
- B - The light slows down as it moves from the glass to the air
- C - Some of the light energy is lost as it moves from the glass to the air.
- D - The light speeds up as it moves from the glass to the air.

**Practical** - The ray box is arranged to shine a light ray at different angles of incidence. The sequence of photos shows how the light ray refracts as the angle of incidence is gradually increased. The angles of incidence and refraction were recorded and are shown in the table below left.



Angle of Incidence	Angle of Refraction
10°	14°
20°	29°
30°	43°
40°	68°



5. Which one of the following statements best describes the situation when you compare the angle of incidence with the angle of refraction of the light ray at the glass/air boundary?

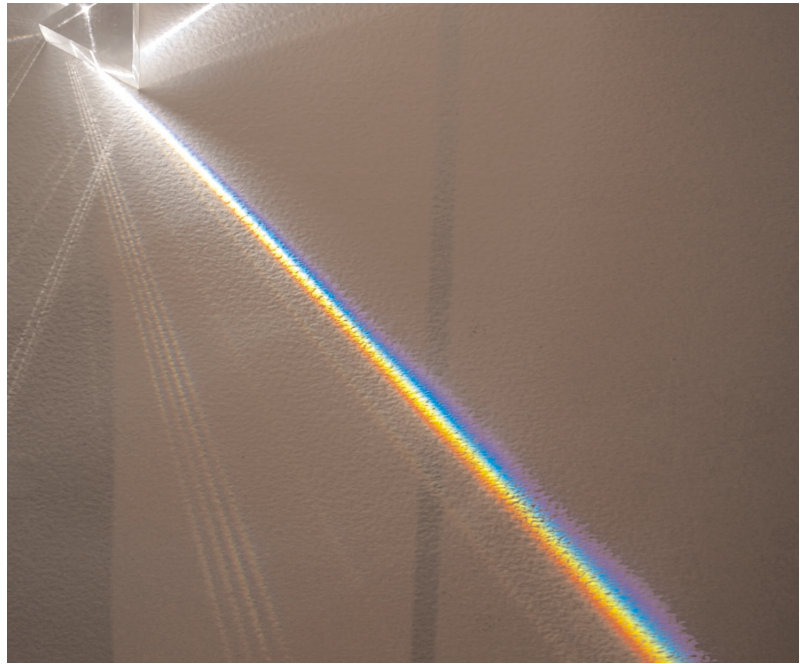
- A - The angle of incidence is larger than the angle of refraction.
- B - The angles are always the same.
- C - The angle of refraction is larger than that of incidence.
- D - There is no relationship between the two angles.

6. Which one of the following statements best describes the situation as the angle of incidence gets larger?

- A - The angle of refraction goes up in equal steps.
- B - The angle of refraction gets smaller.
- C - The light ray bends closer to the normal line.
- D - The light ray bends further away from the normal line.

## Refraction

**Practical** - When white light passes through a prism it separates into light of different colours.



7. Which one of the following is the name given to the range of different colours produced when white light passes through a prism?

- A - Spectrum
- B - Rainbow
- C - Dispersion range
- D - Interference fringes

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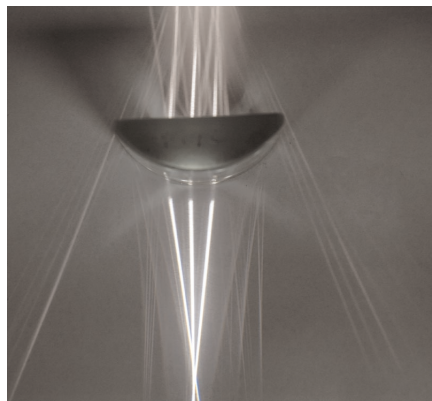
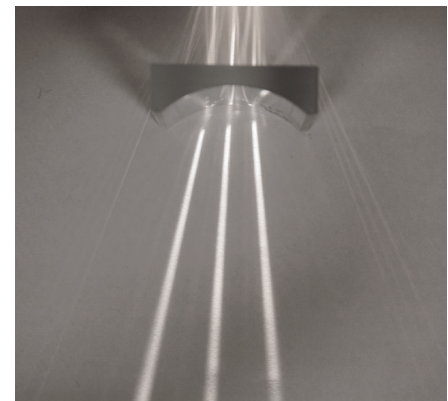
8. Which one of the following best describes why, when white light passes through a prism, it separates into light of different colours?

- A - Each colour of light derived from the white ray, reflects inside the prism until it reaches the critical angle.
- B - The prism changes the colour of the white light that passes through it.
- C - The prism focuses colours from around the room onto the screen.
- D - The light that passes through the prism consists of light of different colours, each of which is refracted by a different amount, so spreading them out.

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## ● Refraction

**Practical** - Light rays are refracted by lenses. In each of the two photos shown below, a triple slit has been attached to the ray box, to produce 3 parallel rays of light.

**Lens A****Lens B**

**9.** Choose the best combination and sequence of words listed below to complete the paragraph comparing the two lenses.



*Lens A is a \_\_\_\_ lens because it \_\_\_\_ the light rays. Lens B is a \_\_\_\_ lens because it makes the light rays \_\_\_\_ .*

- A** - Converging - focuses - diverging - spread out
- B** - Diverging - focuses - converging - spread out
- C** - Converging - spreads out - diverging - focus
- D** - Diverging - spreads out - converging - focus

● Total Internal Reflection

**Practical** - A ray box was used to shine a light ray through a semi-circular glass prism. At small angles of incidence the light ray is refracted. However, as the ray box is moved to give much larger angles of incidence at the glass/air boundary, note that something different happens.

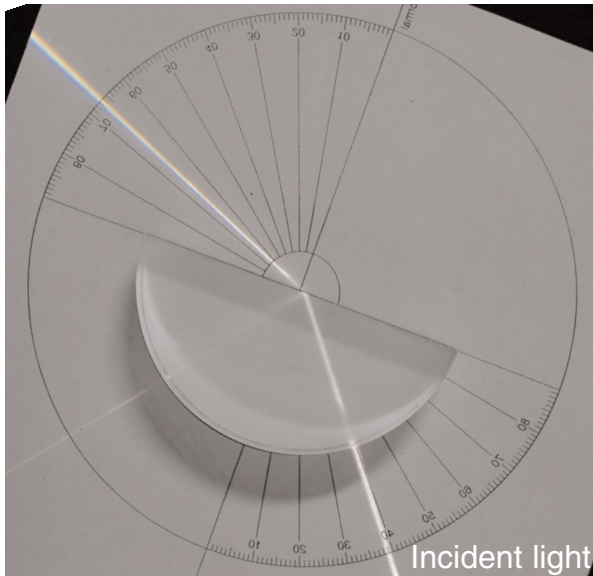


Photo 1

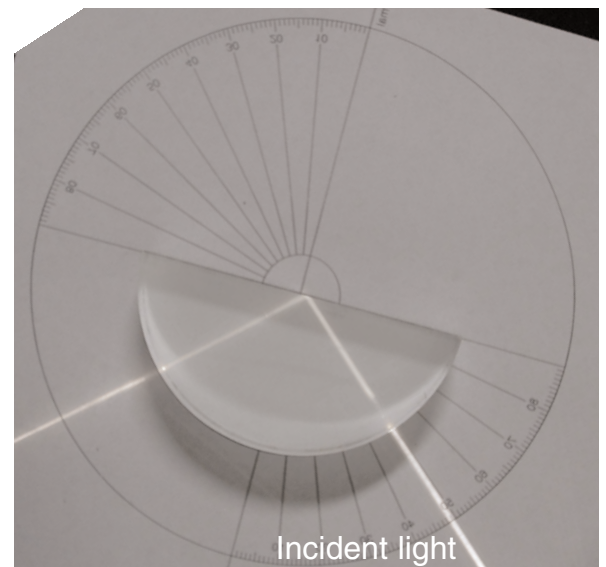


Photo 2

### HELP BOX

PASS CURSOR OVER  
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FOR HELP WITH  
QUESTION  
NUMBER 10



The critical angle is the angle of incidence which produces an angle of refraction of 90 degrees. If the angle of incidence is equal to or greater than the critical angle the light is internally reflected.

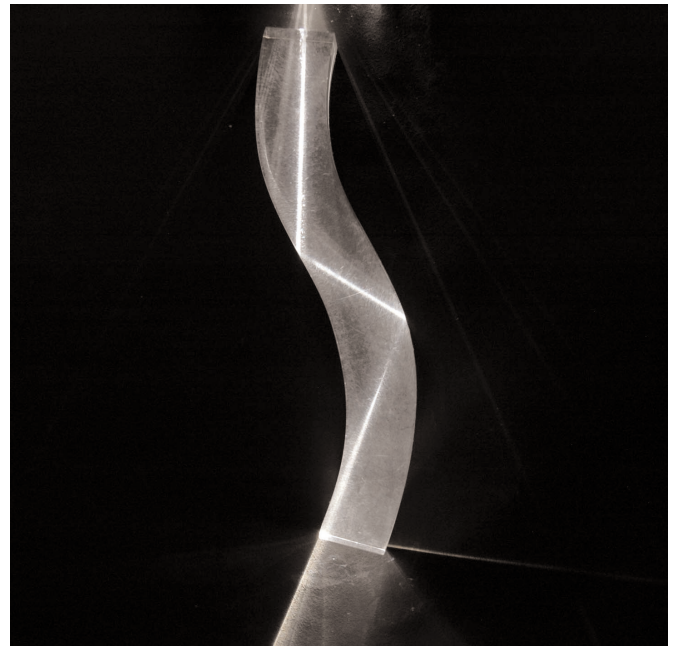
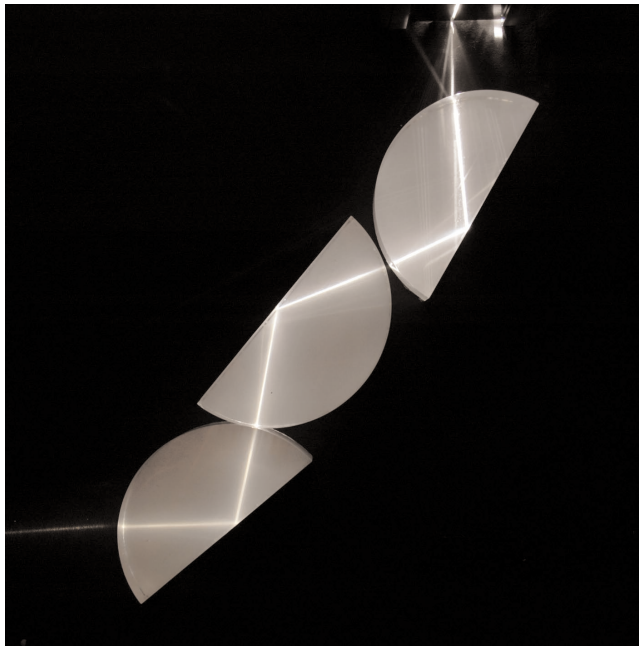
**10.** Which one of the following statements about the behaviour of the light ray passing through the prism in the above photographs is NOT correct?

- A** - The incident light ray is not refracted as it enters the glass prism.
- B** - The angle of incidence at the glass/air boundary is less than the critical angle in Photo 1.
- C** - The angle of incidence at the glass/air boundary is greater than the critical angle in Photo 2.
- D** - The angle of incidence at the glass/air boundary is less than the critical angle in Photo 2.



● Total Internal Reflection

**Practical** - A series of glass prisms can be arranged in such a way that a ray of light is reflected internally through them one after another. This provides a model for the way in which optical fibres transmit light or infra red rays.



11. Which one of the word sequences below best completes the following sentences?

*The light ray hits the internal edge of the prism at an angle \_\_\_\_ the critical angle. This makes the ray \_\_\_\_ .*

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- A - Less than - diffract
- B - Greater than - refract
- C - Greater than - reflect
- D - Less than - reflect

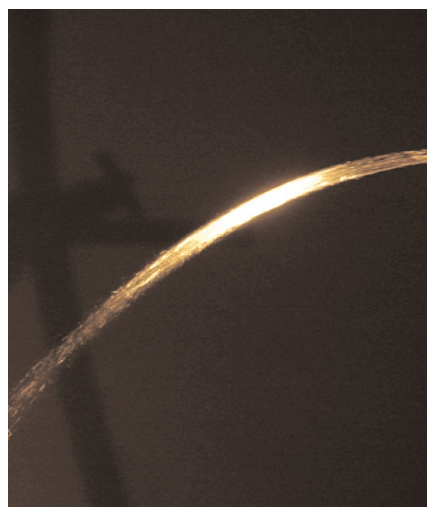
12. Which one of the following is **NOT** an advantage of using glass fibre optical cables for communication, rather than electrical wires?

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- A - There is reduced signal interference.
- B - There is no need for the signal to be boosted along the way.
- C - Glass fibre does not corrode in contact with water.
- D - Digital signals can be used, so more information can be sent at once.

● Total Internal Reflection

**Practical** - The photo below on the left shows the apparatus used to produce a thin stream of water. A light ray is shone into the source of the stream, and the room blacked out. The photo on the right shows how the light ray follows the curved path of the water.



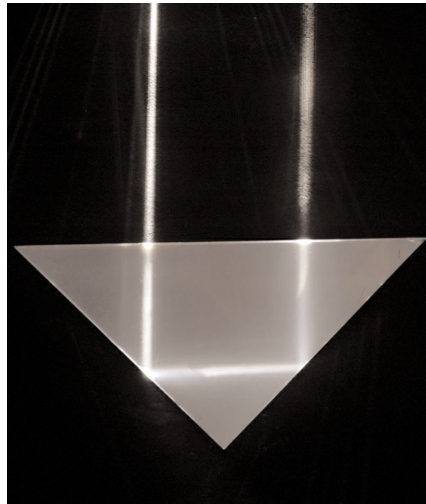
**13.** Which one of the following is the best explanation of the fact that light can be transmitted along a curved stream of water?

- A** - Light rays are being bent by gravity.
- B** - Water carries light in solution.
- C** - The stream of water is acting in the same way as optical fibres.
- D** - Light rays are being refracted externally.



● Total Internal Reflection

**Practical** - The following photo shows light being reflected internally inside a glass prism:



**14.** In which of the following is total internal reflection used?

- A** - Pin-hole camera
- B** - Optical fibres
- C** - Glasses for long sight
- D** - Glasses for short sight



## Sound Waves

### HELP BOX

PASS CURSOR OVER  
QUESTION MARK  
FOR HELP WITH  
QUESTION  
NUMBERS **15**  
& **16**

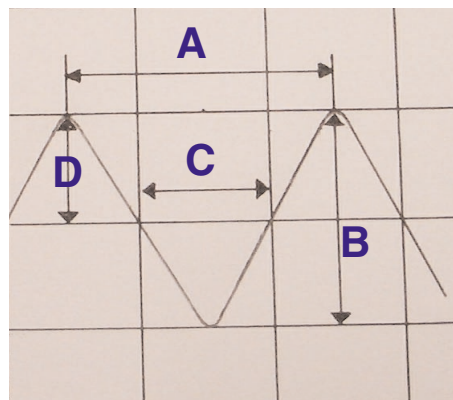


**Q15.** The amplitude of a wave is the maximum displacement from the origin.

**Q16.** The time period is the time taken for a complete wave to pass. Remember that the oscilloscope produces a displacement-time graph, NOT a displacement-distance graph

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**Practical** - The apparatus was set up as shown in the photo below on the left. The microphone detects sound waves in the air which come from the tuning fork, and produces an electrical signal, which is transmitted to the oscilloscope. The oscilloscope displays a graph showing how this signal varies over time, like the one shown on the right.



**15.** Which letter on the diagram labels the amplitude of the wave?

- A** - D
- B** - C
- C** - B
- D** - A

**16.** Which letter on the diagram labels the time period of the wave?

- A** - D
- B** - B
- C** - C
- D** - A

**17.** Which one of the following statements about the wave is NOT correct?

- A** - The frequency of the wave determines how loud the sound is.
- B** - The frequency of the wave is the number of waves per second.
- C** - The frequency of the wave is 1 divided by the time period.
- D** - The frequency of the wave determines the pitch of the sound.

**HELP BOX**

PASS CURSOR OVER  
QUESTION MARK  
FOR HELP WITH  
QUESTION  
NUMBER **18**



The frequency of the sound wave relates to how quickly the tuning fork vibrates. The faster the vibration, the higher the frequency. A high frequency sound has a high pitch.

**Sound Waves**

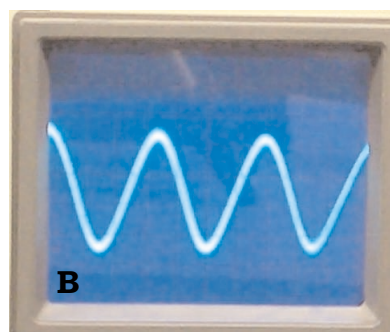
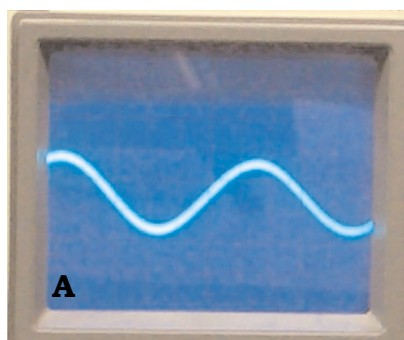
**Practical** - Two tuning forks were struck on a rubber bung to compare the sounds they make. A photo of the forks is shown below:

**A****B**

**18.** Which sentence best describes the correct pattern?

- A** - The shorter the tuning fork, the lower the pitch.
- B** - The longer the tuning fork, the lower the pitch.
- C** - The longer the tuning fork the higher the frequency.
- D** - The shorter the tuning fork, the louder the sound.

**Practical** - The microphone and oscilloscope were used to compare the sound waves produced by the two tuning forks. Oscilloscope Trace A is shown below left and Trace B on the right.



**19.** Which sentence correctly identifies the tuning fork with its trace and why?

- A** - Fork B produced trace A because it had the slowest vibration.
- B** - Fork A produced trace B because the frequency of the waves is low.
- C** - Fork A produced trace A because the sound waves are further apart.
- D** - Fork B produced trace B because it has the greatest time period.

**HELP BOX**

PASS CURSOR OVER  
QUESTION MARK  
FOR HELP WITH  
QUESTION  
NUMBER **19**



The time base on the oscilloscope is the same in both pictures, so the more the wave peaks are spread out, the longer the time period. This means the frequency of the sound is lower.



- Refraction
- Total Internal Reflection
- Sound Waves

**SECTION TOTAL****SECTION PERCENTAGE**