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**kickstart
tutors**

Student number

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Name _____

Date _____

Attempt/Time taken _____

GCSE PHYSICS

Topic Paper: 6.2 Electromagnetic waves, lenses, sound waves (Physics only)
Part 2

Time allowed: 35 minutes

Materials

For this paper you must have:

- the Periodic Table/Data Sheet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- All working must be shown.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The Periodic Table/Data Sheet is provided as in insert.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering questions you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully meets the requirements of the question
 - shows that each separate point or step supports the overall answer.



28 Marks



Q6. Ultrasound can be used in industry for detecting internal cracks in metals.

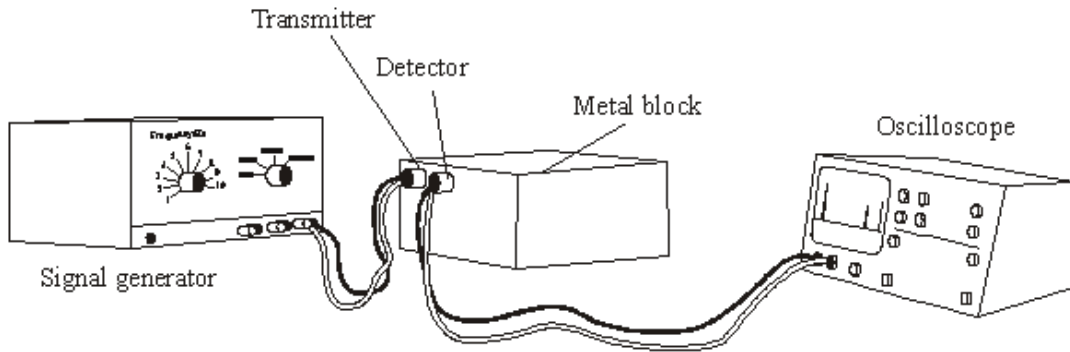
(a) State **two** features of ultrasound.

1

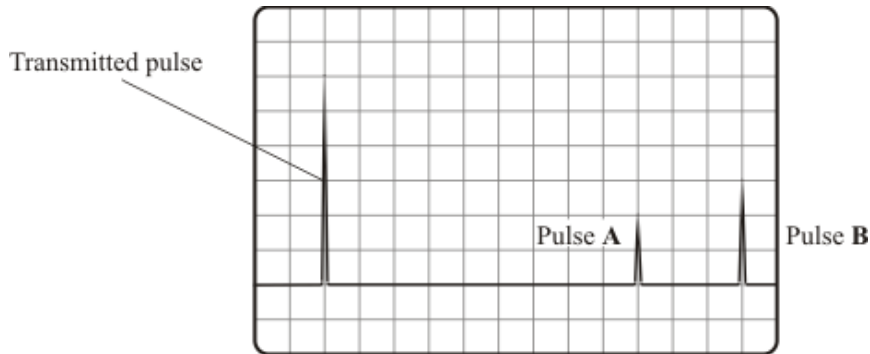
2

(2)

(b) The diagram shows an ultrasound transmitter and detector fixed to the front of a metal block. The block has an internal crack.



The diagram below shows the screen of the oscilloscope connected to the detector.



(i) Explain why pulse **A** and pulse **B** occur.

.....
.....
.....

(2)

(ii) The metal block is 120 mm from front to back. What is the distance, in mm, from the front of the block to the internal crack?

Distance = mm

(1)

(Total 5 marks)



- Q7.** (a) The diagrams show oscilloscope traces for the same musical note played on two different instruments. The oscilloscope settings are not changed.

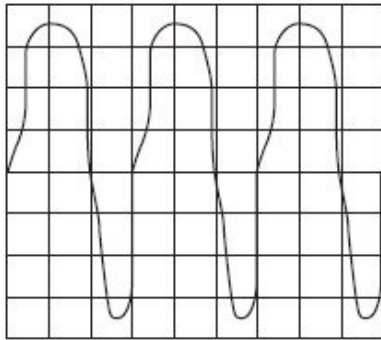


Diagram X

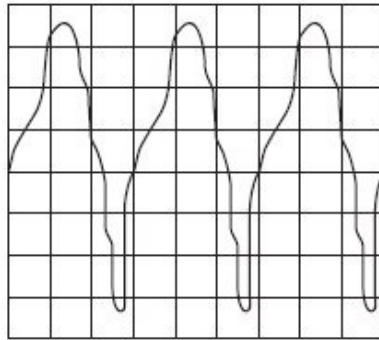


Diagram Y

- (i) How can you tell, from the diagrams, that it is the same musical note?

.....

(1)

- (ii) How can you tell, from the diagrams, that the musical note has been played on different instruments?

.....

(1)

- (b) This passage is from an electronics magazine.

Electronic systems can be used to produce ultrasound waves. These waves have a higher frequency than the upper limit for hearing in humans. Ultrasound waves are partially reflected when they meet a boundary between two different media.

- (i) Approximately what is the highest frequency that humans can hear?

State the number and the unit.

.....

(1)

- (ii) What does the word *media* mean when it is used in this passage?

.....

(1)



- (iii) What happens to the ultrasound which reaches the boundary between two different media and is **not** reflected?

.....

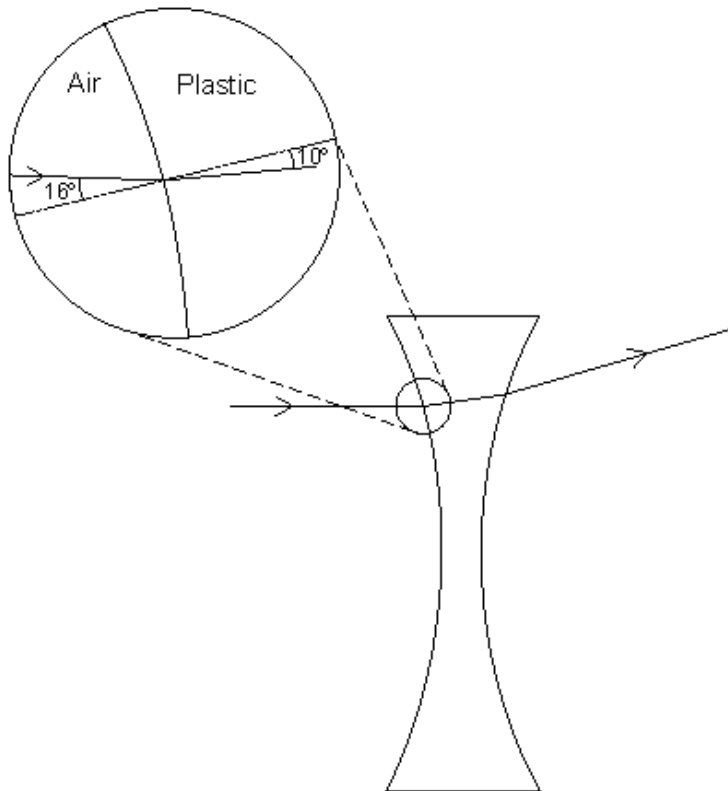
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(2)
(Total 6 marks)

- Q8.** The diagram shows a ray of light passing through a diverging lens.





- (a) Use the information in the diagram to calculate the refractive index of the plastic used to make the lens.

Write down the equation you use, and then show clearly how you work out your answer.

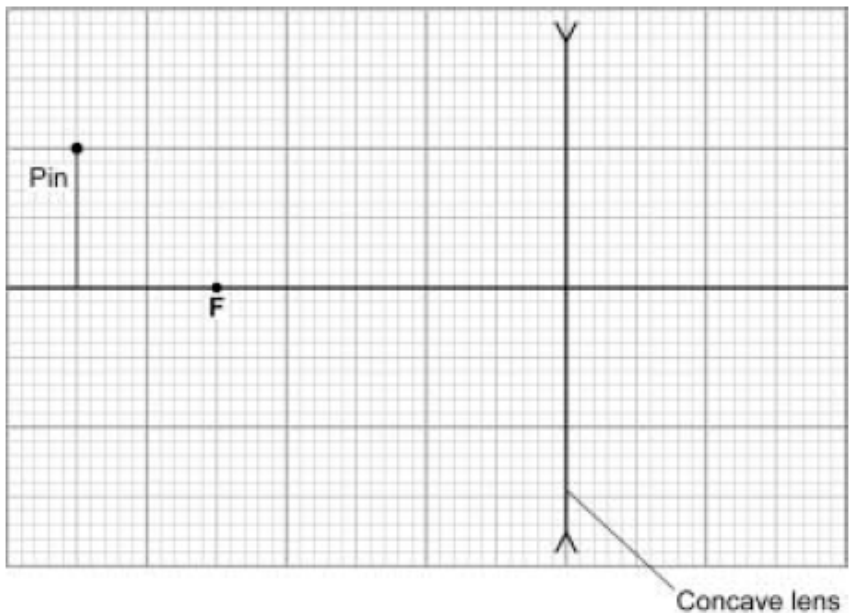
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Refractive index =

(2)

- (b) The focal length of the lens is 5 cm. A student looking through the lens sees the image of a pin.

Complete the ray diagram below to show how the image of the pin is formed.



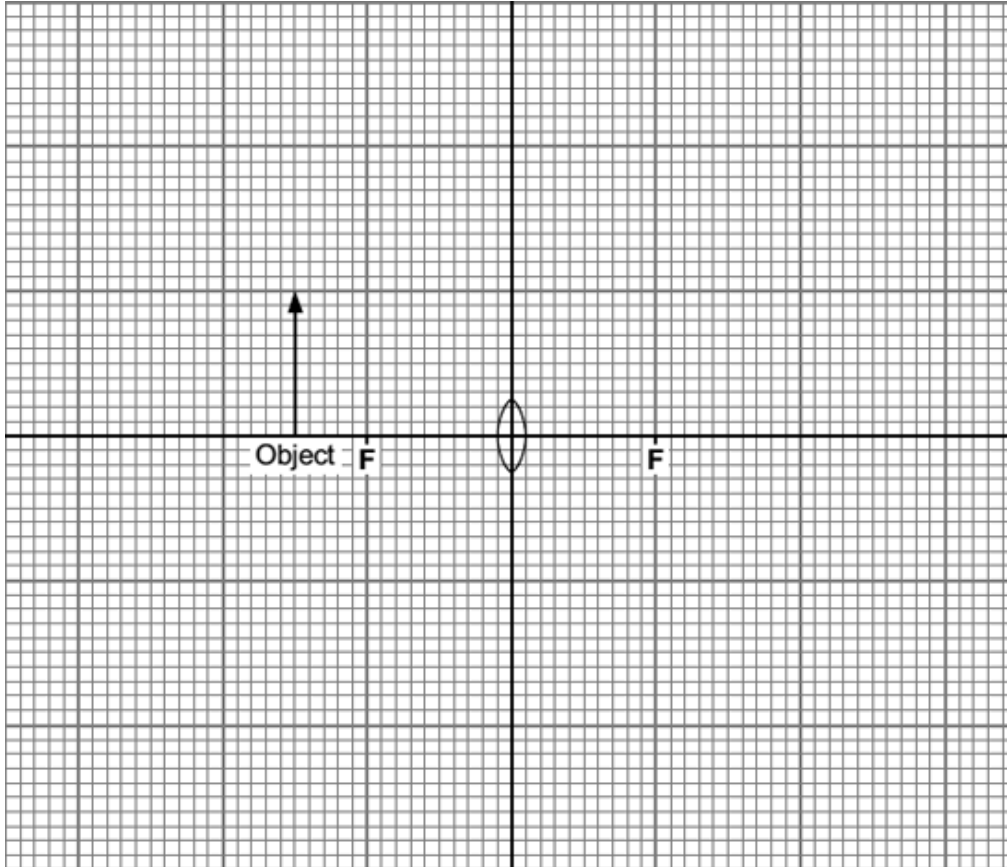
(3)
(Total 5 marks)



Q9. A student investigated how the nature of the image depends on the position of the object in front of a large converging lens.

The diagram shows one position for the object.

(a) Use a ruler to complete a ray diagram to show how the image of the object is formed.



Key: F = principal focus

(4)

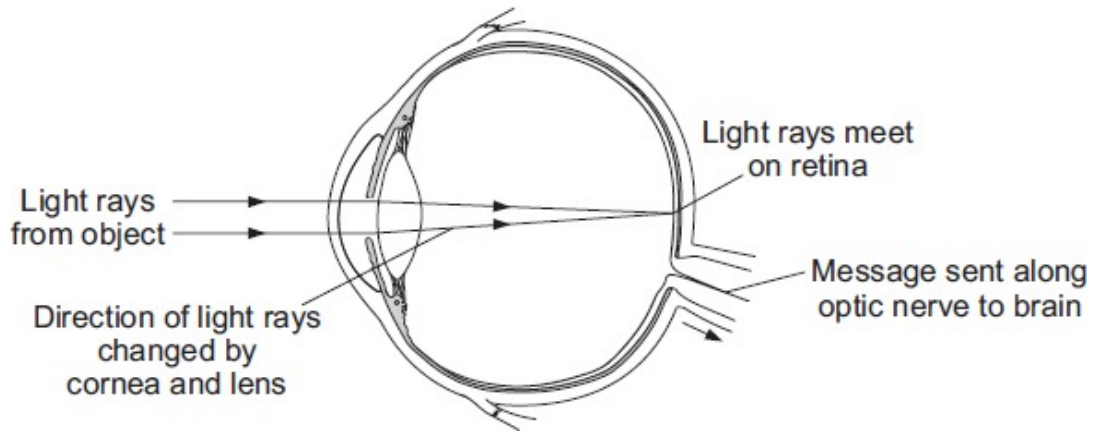
(b) Describe the nature of this image relative to the object.

.....
.....
.....

(2)
(Total 6 marks)



Q10. (a) The diagram shows the inside of the eye of a person with perfect vision.



Complete the sentence.

The process by which the cornea and lens change the direction of the light is called

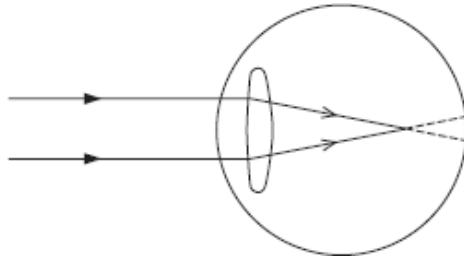
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(1)

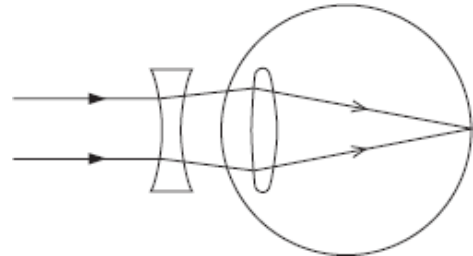


- (b) (i) Not everyone has perfect vision.
 A **short-sighted** person can only clearly see objects which are close.
 Light from distant objects meets in front of the retina.

The diagrams show how an additional lens will correct **short-sightedness**.

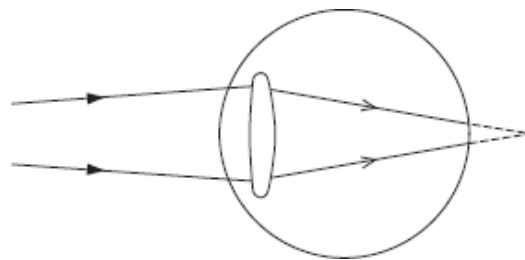


Uncorrected vision



Vision corrected with a diverging lens

The following diagram shows what happens when light from a close object enters the eye of a **long-sighted** person.



Light fails to come to focus on the retina

What type of additional lens will correct the vision of a **long-sighted** person?

.....

(1)

- (ii) The additional lens changes the direction of the light before it enters the eye.

Why does this correct the person's vision?

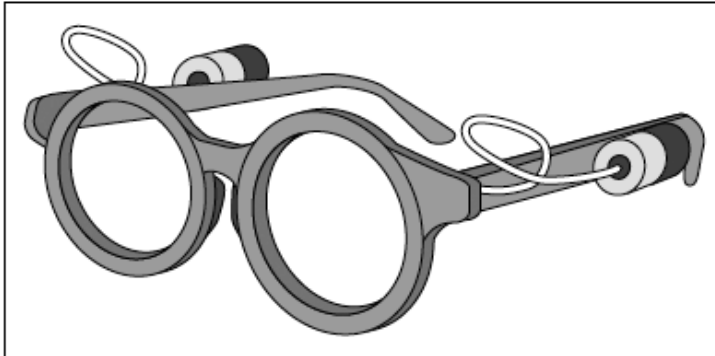
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(1)

(c) Read this passage from a magazine.

Professor's clear vision for the future

There are billions of poor people in the world who cannot see clearly and cannot afford the cost of having their eyesight corrected. A professor has invented adjustable glasses. They are cheap and a few minutes is all it takes for you to adjust them to suit your eyes.



When the adjusting screw is turned in one direction, silicone is pushed into the flexible lens which becomes thicker in the centre. Turning the screw in the opposite direction pulls silicone out, and the lens becomes thinner at the centre than at the edge.

Explain how these glasses are adjusted for a **short-sighted** person and how this adjustment allows the person to see distant objects clearly.

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.....

(3)
(Total 6 marks)