

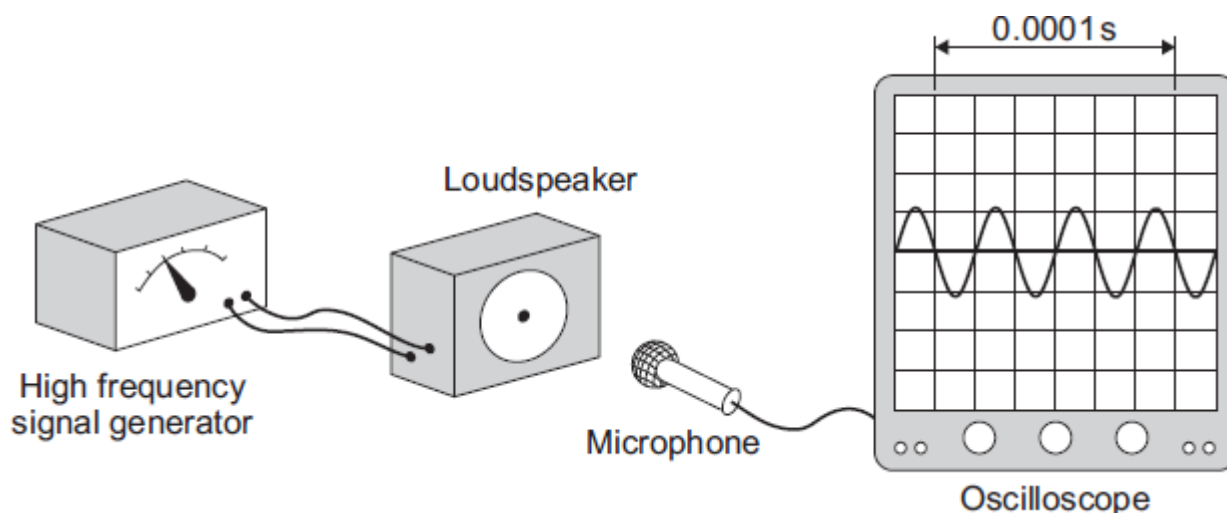
Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

- (a) The diagram shows a microphone being used to detect the output from a loudspeaker. The oscilloscope trace shows the wave pattern produced by the loudspeaker.



- (i) How many waves are produced by the loudspeaker in 0.0001 seconds?

(1)

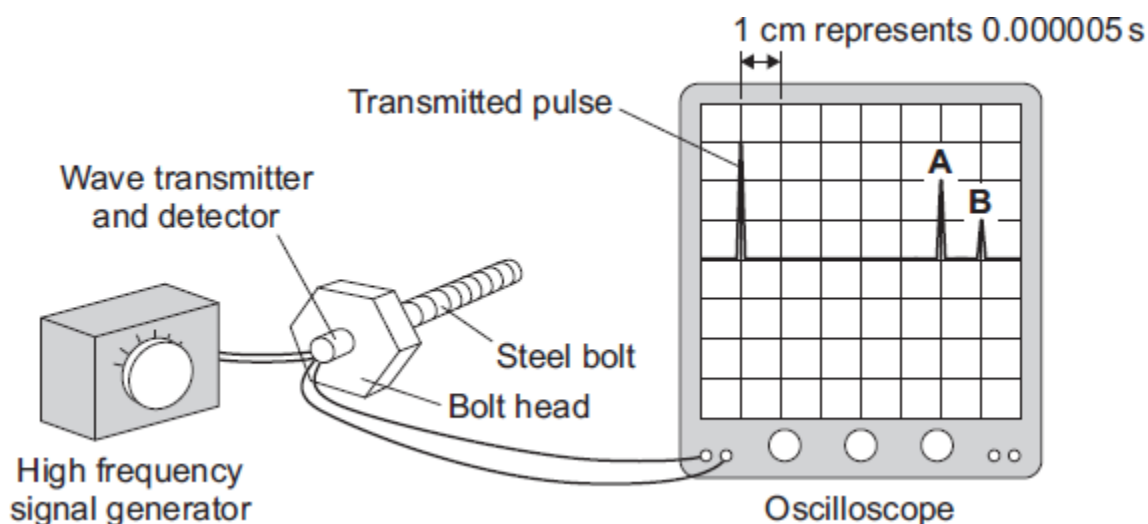
- (ii) How many waves are produced by the loudspeaker every second?
Assume the input to the loudspeaker does not change.

(1)

- (iii) A person with normal hearing cannot hear the sound produced by the loudspeaker.
Explain why.

(2)

- (b) The diagram shows how a very high frequency sound wave can be used to check for internal cracks in a large steel bolt. The oscilloscope trace shows that the bolt does have an internal crack.



- (i) Explain what happens to produce pulse **A** and pulse **B**.

(2)

- (ii) Use the information in the diagram and the equation in the box to calculate the distance from the head of the bolt to the internal crack.

$\text{distance} = \text{speed} \times \text{time}$

Speed of sound through steel = 6000 m/s

Show clearly how you work out your answer.

(3)

(Total 9 marks)

Q2.

Radio waves and microwaves are two types of electromagnetic wave.

Both waves:

- can be used for communications
- travel at the same speed through air.

(a) Give **two** more properties that are the same for both radio waves and microwaves.

1. _____

2. _____

(2)

(b) Some satellites are used to transmit television programmes. Signals are sent to, and transmitted from, the satellites using microwaves.

What is the property of microwaves that allows them to be used for satellite communications?

(1)

(c) Electromagnetic waves travel at a speed of 3.0×10^8 m/s.

A radio station transmits waves with a wavelength of 2.5×10^2 m.

Calculate the frequency of the radio waves.

Show clearly how you work out your answer and give the unit.

Frequency = _____

(3)

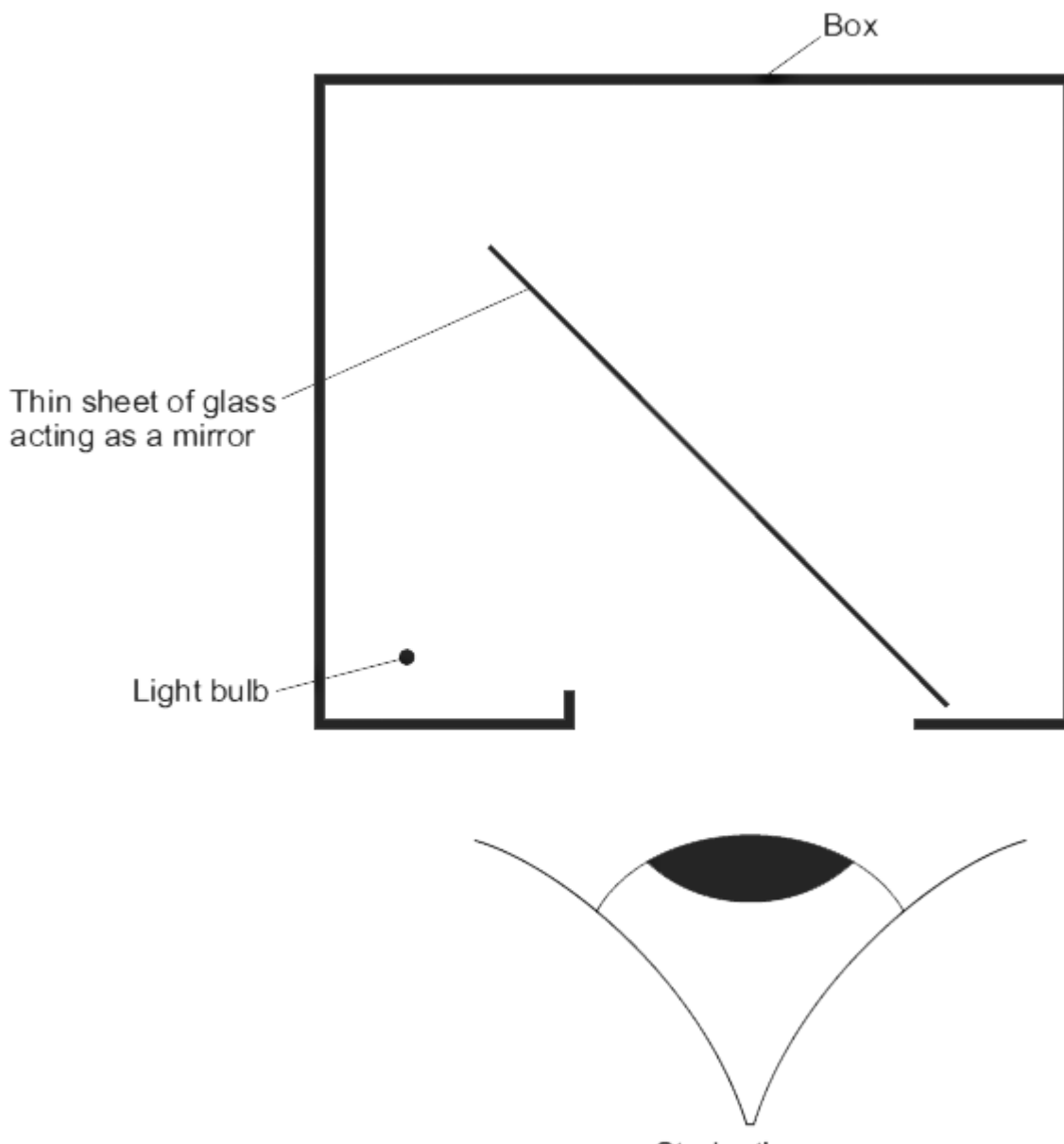
(Total 6 marks)

Q3.

The diagram shows a model used to demonstrate an illusion known as 'Pepper's Ghost'.

A small light bulb and thin sheet of glass are put inside a box. The thin sheet of glass acts as a mirror. Although the light bulb is switched on, a student looking into the box cannot see the bulb. What the student does see is a virtual image of the bulb.

View from above



- (a) Use a ruler to complete a ray diagram to show how the image of the light bulb is formed. Mark and label the position of the image.

(4)

- (b) The image seen by the student is virtual.

Why?

(1)
(Total 5 marks)