Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Q1.

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

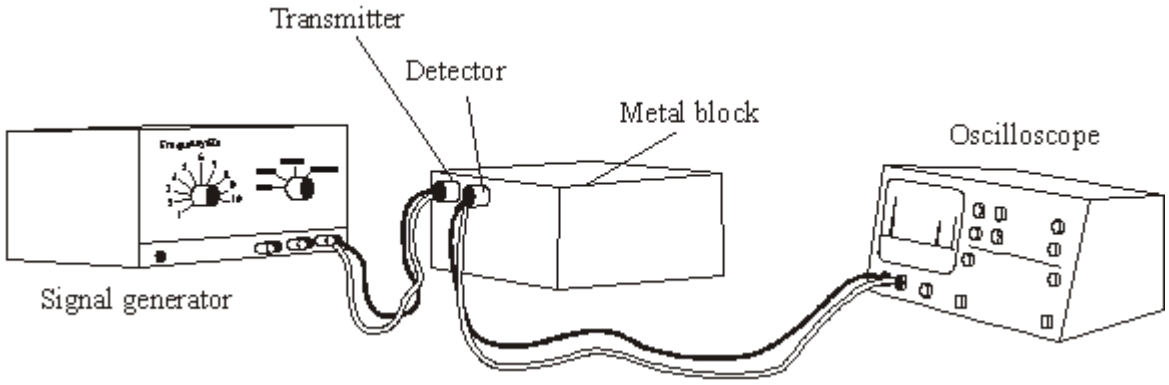
(a) State **two** features of ultrasound.

1. _____

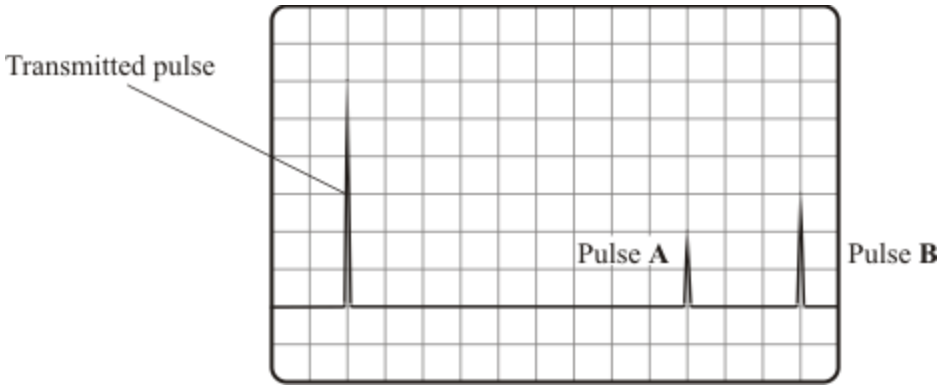
2. _____

(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?

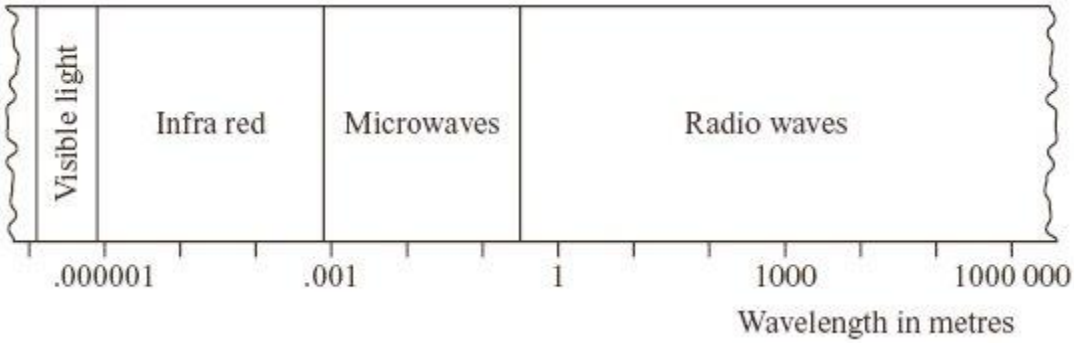
Distance = _____ mm

(1)

(Total 5 marks)

Q2.

The diagram represents part of the electromagnetic spectrum.



(i) Visible light travels through air at 300 000 000 m/s.

Why can we assume that radio waves travel through air at the same speed as light?

_____

(1)

(ii) A radio station broadcasts at a frequency of 200 kHz.

Calculate the wavelength of the waves broadcast by this radio station. Show clearly how you work out your answer.

_____

_____

Wavelength = _____ m

(2)

(iii) Draw a vertical line on the diagram above to show the position of this radio wave in the electromagnetic spectrum.

(1)

(Total 4 marks)

Q3.

(a) Satellites fitted with various telescopes orbit the Earth. These telescopes detect different types of electromagnetic radiation.

Why are telescopes that detect different types of electromagnetic waves used to observe the Universe?

_____

_____

(1)

(b) In 2005 a space telescope detected a star that exploded 13 billion years ago. The light from the star shows the biggest *red-shift* ever measured.

(i) What is *red-shift*?

_____

_____

(1)

(ii) What does the measurement of its red-shift tell scientists about this star?

_____

_____

(1)

(c) Red-shift provides evidence for the 'big bang' theory.

(i) Describe the 'big bang' theory.

_____

_____

_____

_____

(2)

(ii) Suggest what scientists should do if new evidence were found that did not support the 'big bang' theory.

_____

_____

_____

(1)

(Total 6 marks)

Q4.

(a) The new Tetra communications system to be used by the police transmits signals using microwaves of wavelength 75 cm.

Calculate the frequency of the microwaves used by the Tetra system. Show clearly how you work out your answer.

_____

_____

Frequency = _____ hertz

(2)

(b) Read the following extract from a newspaper and then answer the questions that follow.

Residents of Stag Hill Court, a luxury block of flats, are shocked at the plans to site a mobile phone mast on the roof of the flats. They oppose the mast on health grounds, quoting research in Germany that has found a possible increase in cases of cancer around mobile phone masts.

A spokesperson for the telecoms company said, 'The residents should not worry. The research carried out by our own scientists has found no link between ill health and mobile phone masts'.

This has not reassured the residents, who argue that new independent research is urgently needed.

(i) Explain why living near a mobile phone mast could cause ill health.

_____

_____

_____

_____

_____

_____

(3)

(ii) Suggest **two** reasons why the residents have **not** been reassured by the research carried out by the telecoms company.

1. _____

_____

2. _____

_____

(2)
(Total 7 marks)