

Electromagnetic Waves Uses & Dangers 3

1(a) This information is from a science magazine.

Electronic systems can be used to produce ultrasonic waves.
These waves have a frequency higher than the upper limit for hearing in humans.

Complete the sentence by choosing the correct number from the box.

20 2000 20 000 200 000

The upper limit for hearing in humans is a frequency of _____ Hz.

(b) An electronic system produces ultrasound with a frequency of 500 kHz. What does the symbol kHz stand for?

(1 mark)

(c)(i) State one industrial use for ultrasound.

(1 mark)

(c)(ii) State one medical use for ultrasound.

(1 mark)

Q2 (a) Explain what an ultrasound wave is.

(2 marks)

(b) Ultrasound waves can be used to clean jewellery.

One method is to put the jewellery in a bath of cleaning fluid which contains an electronic oscillator. The electronic oscillator generates ultrasound waves in the cleaning fluid.

Suggest how these waves clean the jewellery.

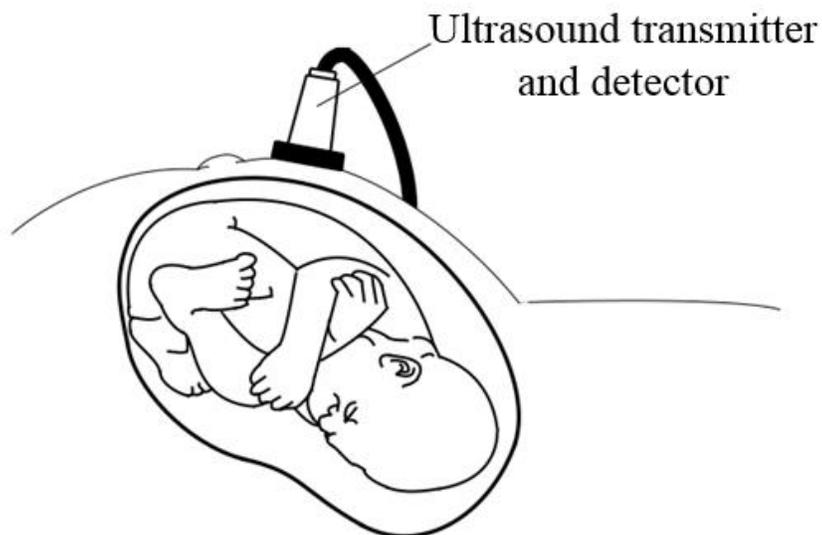
(2 marks)

(c) Ultrasound is used for pre-natal scanning. This is much safer than using X-rays. However, doctors were only sure it was safe after experiments on mice.

Explain whether or not you think that these experiments were justified.

(2 marks)

Q3. (a) An ultrasound scan can be used to make a picture of a baby in its mother's womb. An ultrasound transmitter and detector are placed above the mother's womb. Ultrasound goes into the body of the mother and into the body of the baby.



Use the correct words from the box to complete the sentences.

detector	reflection	refraction	sound	substance	transmitter
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(i) When the ultrasound crosses from one _____ to another,

some ultrasound becomes an echo caused by _____

(ii) This information is collected by the ultrasound and made into a picture on a screen.

(3 marks)

Q4. Ultrasound and X-rays are waves used in hospitals to create images of the inside of the human body. To produce the images below, the waves must enter the human body.

Ultrasound scan of an unborn child



X-ray of a broken bone



(a) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe the features of ultrasound and X-rays, and what happens to each type of wave after it has entered the human body.

(6 marks)

(b) It would not be safe to use X-rays to produce an image of an unborn child.

Explain why.

(2 marks)

(c) Ultrasound can be used for medical treatments as well as for imaging.

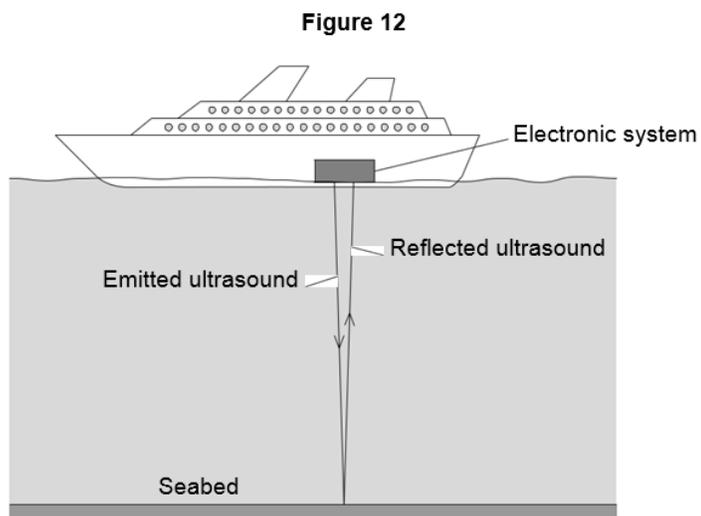
Give one use of ultrasound for medical treatment.

(1 mark)

Q 5. (a) What is ultrasound?

(1 mark)

(b)Figure 12 shows how ultrasound is used to measure the depth of water below a ship.



A pulse of ultrasound is sent out from an electronic system on-board the ship.

It takes 0.80 seconds for the emitted ultrasound to be received back at the ship.

Calculate the depth of the water.

Speed of ultrasound in water = 1600 m/s

Use the correct equation from the Physics Equations Sheet.

Depth of water = _____ metres

[3 marks]

(c) Ultrasound can be used in medicine for scanning.

State one medical use of ultrasound scanning.

(1 mark)

(d) Images of the inside of the human body can be made using a Computerised Tomography (CT) scanner. The CT scanner in Figure 13 uses X-rays to produce these images.

Figure 13



State one advantage and one disadvantage of using a CT scanner, compared with ultrasound scanning, for forming images of the inside of the human body.

Advantage of CT scanning

Disadvantage of CT scanning

[2 marks]

Q6 (a) Complete the following sentences.

Ultrasound waves have a minimum frequency of _____
hertz.

The wavelength of an X-ray is about the same as the diameter of

[2 marks]

(b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Figure 5 shows one medical use of ultrasound and one medical use of X-rays.

Figure 5



Compare the medical uses of ultrasound and X-rays.

Your answer should include the risks, if any, and precautions, if any, associated with the use of ultrasound and X-rays.

(6 marks)

Total: 42 marks