

P3 X-Rays and Ultrasound Answers

1. Explain why it would not be safe to use X-rays to produce an image of an unborn child.

Because X-rays are ionising and kill cells or damage cells which can lead to cell mutations and cancer.

2. Give one use of ultrasound for medical treatment.

Removing kidney stones, repair of damaged tissue/muscles, removing plaque from teeth

3. Before switching on the X-ray machine, a radiographer goes behind a screen. Why?

X-rays are ionising. Any stray X-rays are absorbed by the screen so the dose received is less for the radiographer.

4. Explain the advantage of a CT scan compared to an X-ray.

CT scan can give a 3D image so the image can be observed from different directions.

5. Explain why a radiographer might wear an apron lined with lead.

X-rays do not go through lead which means the radiographer's cells will not be killed/damaged.

6. Why can X-rays be used to take pictures of bones?

Because they pass through tissue but are absorbed by bone.

7. What is ultrasound?

Sound with frequency above 20 000 hertz / 20 kHz; frequencies above (human) audible range

8. What is the range of frequencies most humans can hear?

From 20Hz to 20,000Hz

9. Explain why ultrasound can be used to clean jewellery immersed in cleaning fluid.

Fluid particles vibrate and knock off dirt particles.

10. Give an industrial use for ultrasound.

Cleaning of delicate objects such as jewellery.

11. What happens to ultrasound which reaches the boundary between two different media and is not reflected?

It is absorbed and transmitted.

12. Why can a dog hear a dog whistle but humans cannot?

The frequency is too high and in the ultrasound region.

13. Explain how ultrasonic waves are used to produce the image of an unborn baby.

Waves are partly reflected when they hit a boundary between two different media or substance or tissue. The time taken for a reflected wave to return is used to produce the image.

14. Write down the equation that links frequency, wavelength and wave speed.

Wave speed = frequency \times wavelength

15. Why is it important to have a very narrow beam of ultrasound waves when taking an ultrasound?

To show detail or to give a clear image/picture

16. Why is it possible to produce a very narrow beam with ultrasound but not with normal sound waves?

It has a much smaller wavelength.

17. Give two important pieces of information about an unborn baby which can be gained from the image produced by an ultrasound scan.

Gender, abnormalities, stage of development, general health, potential birth problems, size of head, multiple births

18. Sound travels through air, water and glass at different speeds. Through which of these materials does sound travel fastest/slowest?

Fastest: Glass; slowest: air; the closer the particles, the faster sound travels

19. Why can ultrasound be used to measure the thickness of a layer of fat on a pig?

Because ultrasound is reflected back at the fat-muscle boundary.

20. Why are we able to see the different parts of the foetus in an ultrasound scan?

Different tissues have different densities which means ultrasound travels at different speeds. The time taken to travel back after reflection at different tissue boundaries differs.