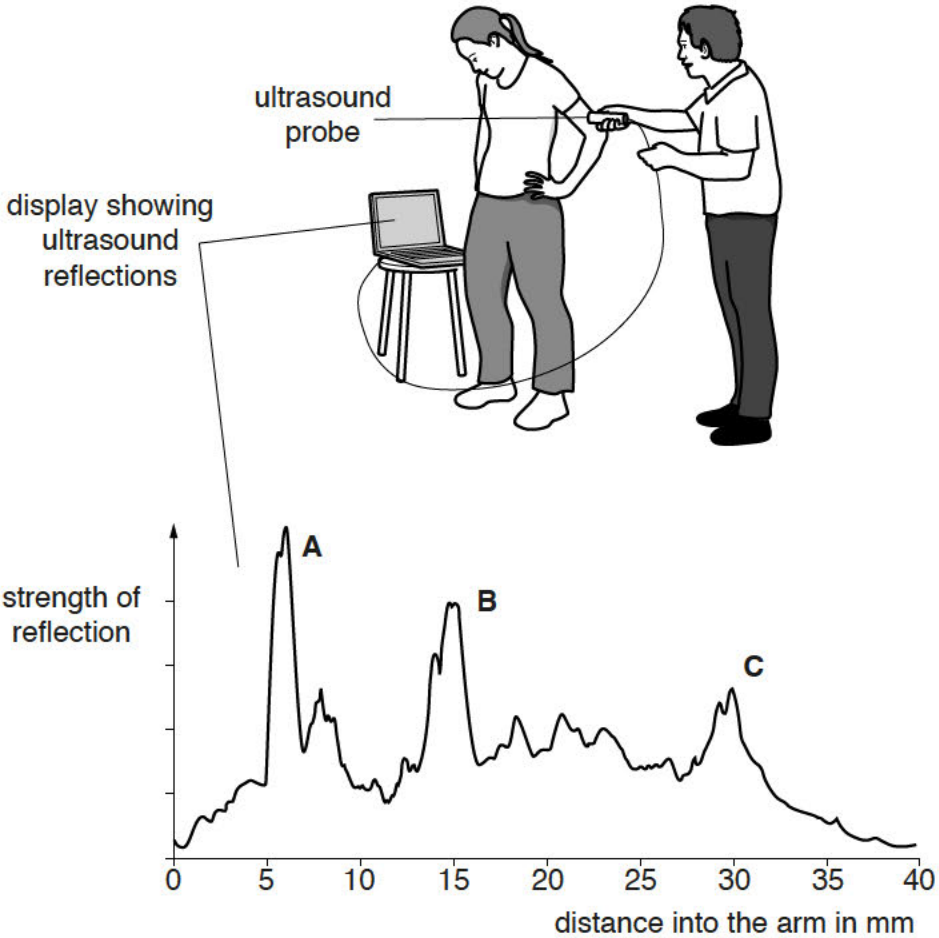
1 Ultrasound can be used on humans.

Becky has her body fat measured using ultrasound on her arm.



Ultrasound reflects strongly at different tissue layers inside the arm.

The body fat layer is just below the skin.

The different tissue layers in the arm are

- at-muscle layer
- uscle-muscle layer
- uscle-bone layer.

Why is ultrasound used rather than surgery or X-rays to measure body fat?

Explain what the display shows and how it can be used to find the thickness of body fat in Becky's arm.



The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

2 This question is about using electromagnetic waves for communication.

(a) Microwaves are used to communicate signals between Earth and satellites.
Sometimes when these signals are received they can be weak or of poor quality.

Suggest what engineers can do to the microwave dish on Earth to improve communication with a satellite. Explain why the improvements work.

Suggestion 1 .....

Explanation .....

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Suggestion 2 .....

Explanation .....

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[4]

(b) Electromagnetic waves are used for communication.
Look at the information about different waves.

Wave	Wavelength	Frequency
A	3.3 m	90 MHz
B	15 m	20 MHz
C	0.006 m	50 GHz

(i) Which wave is reflected by the ionosphere?

answer .....

Explain why you chose this wave.

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[2]

(ii) Which wave can pass through the Earth's atmosphere but is reduced in strength because of absorption and scattering?

answer .....

Explain why you chose this wave.

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[2]

3 Ultraviolet (UV) light comes from the Sun.
UV light is also used in sunbeds.

Many doctors are worried about the dangers to people who are exposed to UV light.
Skin cancer has been linked to UV light.

(a) One type of skin cancer is called malignant melanoma.
Look at the table about patients that have this cancer.
It shows the percentage of malignant melanomas found in each body area.

Body area	Males	Females
Head and neck	23%	14%
Chest and back	41%	20%
Arms	18%	23%
Legs	13%	39%
Other	5%	4%

Tara looks at the information.
She suggests, 'Males have a higher percentage of malignant melanomas on their head and neck because, on average, males have shorter hair than females.'
Explain how shorter hair may increase the risk of malignant melanomas.

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..... **[1]**

(b) Scientists are unsure whether exposure to the sun or sunbeds has the highest risk of causing skin cancers.

Suggest how scientists could gather evidence to find out which has the highest risk.

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(c) Pale and darker skins can both be affected by UV light.

(i) Darker skins reduce the risk of skin cancer.
Explain why.

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..... **[2]**

(ii) Look at the table. It shows information for different skin types.

Recommended safe time for being in the sun in hours			
Skin type A	**Skin type B**	**Skin type C**	**Skin type D**
1.0	0.4	0.7	0.2

If factor 10 sunscreen is used, which skin types will be safe for being in the sun for 5 hours?

Skin types ..... **[1]**

[Total: 6]

4 Microwave ovens can be used to cook potatoes.

Conventional ovens can also cook potatoes, using infrared waves.

(a) Infrared waves crisp the skin of the potato, but the microwaves do not.
Explain why.

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..... **[2]**

(b) The microwave oven cooks the potato more quickly.
Explain why.

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..... **[2]**

(c) Some ovens combine microwave and infrared cooking.

Look at the information about a combination oven.

Setting	Energy used per second in joules	Time to cook a 500 g potato in minutes	Result
Microwaves only	1 200	8	fully cooked
Infrared only	2 000	60	fully cooked and crispy on outside
Combination microwave and infrared	3 200	8	fully cooked and crispy on outside

The combination setting provides more energy per second.

Suggest why the combination setting still takes 8 minutes to cook the potato.

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[Total: 6]

5 Electromagnetic waves have a range of wavelengths.

(a) Look at the list of electromagnetic waves.

gamma

infrared

visible light

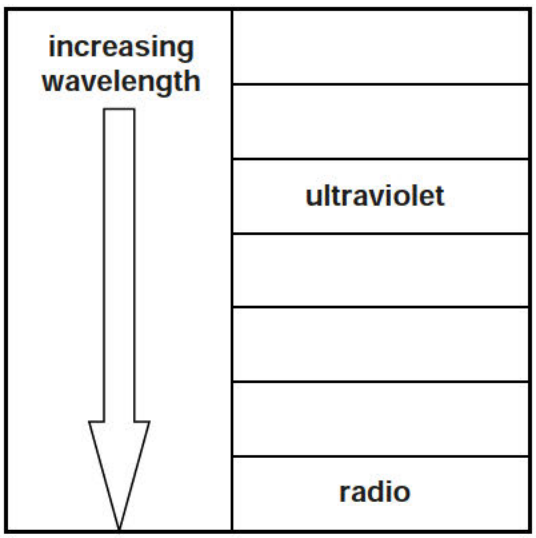
microwave

radio

ultraviolet

X-rays

Complete the table. Put the waves in order of **increasing** wavelength. Two waves have been done for you.



[2]

(b) What is meant by the **frequency** of a wave?

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..... **[1]**

(c) Infrared waves have different wavelengths.
They have a range of wavelengths from 0.74×10^{-6} m to 300×10^{-6} m.

The speed of infrared waves in a vacuum is 3.00×10^{8} m/s.

Show that the frequency range of these waves is 4.04×10^{14} Hz.

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[Total: 7]

6 Sam has a microwave oven and a convection oven in her kitchen.

She is going to cook a ready meal for her dinner.

Look at the cooking instructions.

Microwave oven heating	***Convection oven heating***
Pierce the lid several times. *Place on a microwaveable plate and cook on full power (850W) for 3 minutes. Remove lid and stir. Cook on full power for a further 1 minute. Leave to stand for 1 minute before serving.* *ENJOY*	*Pierce the lid several times.* *Place in the centre of a preheated oven (200 °C) for 25 minutes.* *ENJOY*

Explain why **microwave** cooking is quick and why the food is stirred and allowed to stand before it is ready.


The quality of written communication will be assessed in your answer to this question.

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[Total: 6]