AQA - Electromagnetic waves – GCSE Combined Science Physics

1. June/2020/Paper_2F/No.3

0 3 X-rays and gamma rays are types of electromagnetic waves.

X-rays are used for medical imaging.

0 3 . 1 Which substance will **not** absorb X-rays?

[1 mark]

Tick (✓) **one** box.

Bone ☐ Metal ☐ Skin ☐

Table 1 shows the effect of exposure to different doses of radiation.

Table 1

Dose in mSv	Effect on the human body
100	slightly increased risk of cancer
1000	5% increased risk of cancer
5000	high risk of death

0 3 . 2 During one X-ray a person receives a dose of 0.100 mSv

Why is this dose unlikely to harm the person?

[1 mark]

_____

_____

0 3 . 3 A doctor takes an X-ray photograph of a person.

When taking the X-ray photograph, the doctor stands behind a screen.

Suggest why.

[1 mark]

0 3 . 4 Which of the following are gamma rays used for?

[1 mark]

Tick (✓) **one** box.

- Cooking food ☐
- Energy-efficient lamps ☐
- Sterilising medical equipment ☐

0 3 . 5 Why are gamma rays and X-rays harmful to humans?

[1 mark]

Tick (✓) **one** box.

- They are ionising ☐
- They are radioactive ☐
- They travel at the speed of light ☐

0 3 . 6 Electromagnetic waves are also used in communications.

Describe how microwaves and visible light are used in communications.

[4 marks]

Microwaves _____

_____

_____

_____

Visible light _____

_____

_____

_____

2. June/2020/Paper_2H/No.5

0 5 X-rays form part of the electromagnetic spectrum.

Radiographers use X-rays to produce images of bones inside the body.

0 5 . 1 Explain why X-rays can be used to produce images of the bones inside the body.

[2 marks]

0 5 . 2 **Table 2** shows the effect of exposure to different doses of radiation.

Table 2

Dose in mSv	Effect on the human body
100	slightly increased risk of cancer
1000	5% increased risk of cancer
5000	high risk of death

During an X-ray a person receives a dose of 0.5 mSv

The radiographer takes many X-ray images each day.

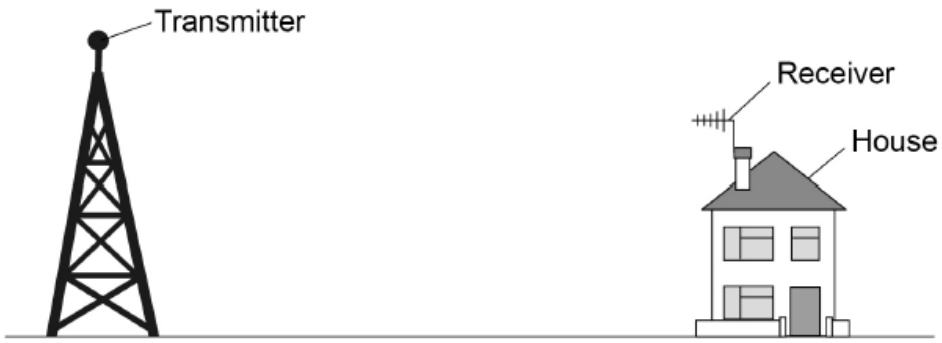
Explain why the radiographer stands behind a protective screen when taking an X-ray image.

[3 marks]

0 5 . 3 Radio waves form part of the electromagnetic spectrum.

Figure 10 shows one use of radio waves.

Figure 10



Explain how electrical signals in the transmitter produce a signal in the receiver.

[3 marks]

3. June/2019/Paper_2F/No.5

0 5 The Sun emits all types of electromagnetic waves.

Figure 7 shows the electromagnetic spectrum.

Figure 7

Radio waves	Microwaves	Infrared	Visible light	Ultraviolet	X-rays	Gamma rays

0 5 . 1 Complete the sentences.

Choose answers from the box.

[3 marks]

frequency	**mass**	**power**
velocity		**wavelength**

In a vacuum, all electromagnetic waves travel at the same _____ .

Gamma waves have the greatest _____ .

Radio waves have the greatest _____ .

0 5 . 2 Explain why it is important that the Earth's atmosphere absorbs gamma rays emitted by the Sun.

[2 marks]

_____

_____

_____

_____

0 5 . 3 Some microwaves are **not** absorbed by the Earth's atmosphere.

Why is this useful?

[1 mark]

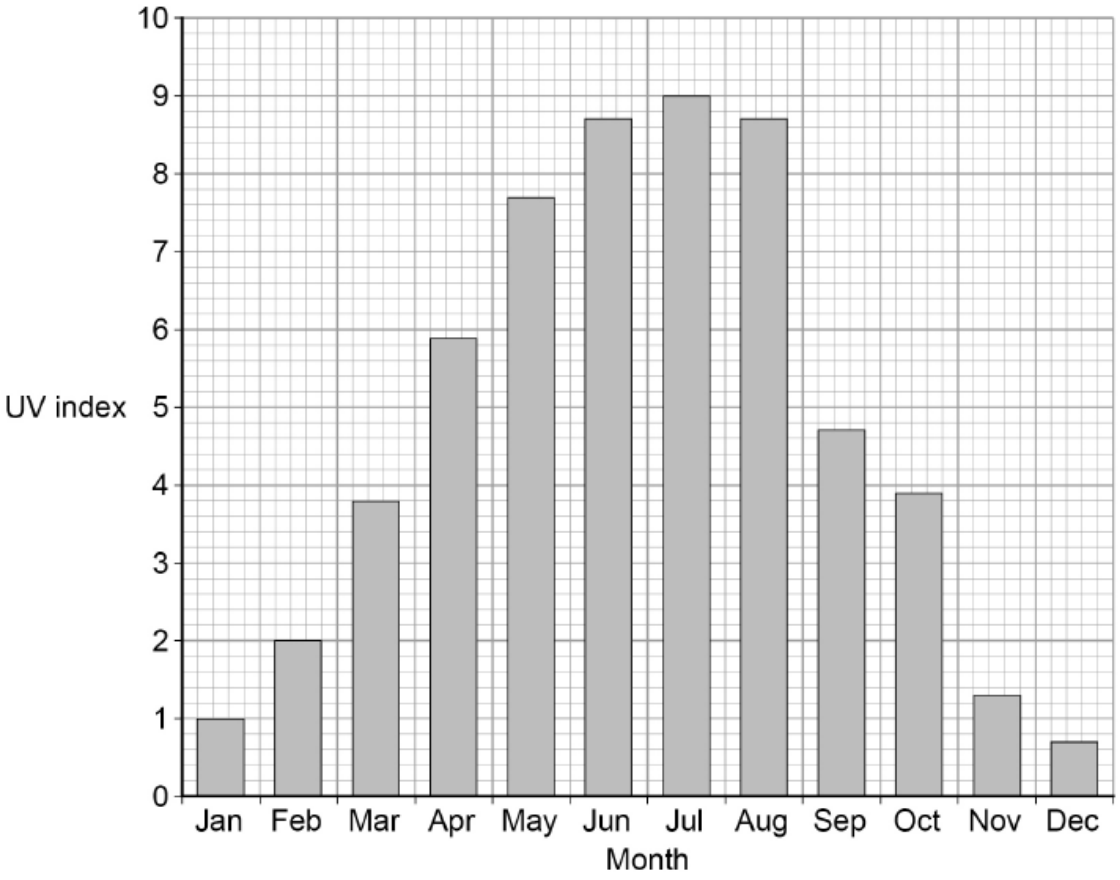
_____

Some ultraviolet (UV) radiation from the Sun passes through the atmosphere and reaches the surface of the Earth.

The amount of UV radiation that reaches the surface of the Earth can be measured on a scale called the UV index.

Figure 8 shows the average midday UV index in the UK for 1 year.

Figure 8



0 5 . 4 Why is exposure to UV radiation harmful to humans?

[1 mark]

0 5 . 5 Compare the risk from UV radiation at different times of year in the UK.

Use data from **Figure 8**.

[2 marks]

4. June/2019/Paper_2H/No.1(1.3_1.6)

The smart watch and mobile phone are connected to each other by a system called Bluetooth.

Bluetooth is wireless and uses electromagnetic waves for communication.

0 1 . 3 Suggest why the phone and watch being connected by a wireless system is an advantage when running.

[1 mark]

0 1 . 4 Write down the equation that links frequency, wave speed and wavelength.

[1 mark]

0 1 . 5 The electromagnetic waves have a frequency of 2 400 000 000 Hz

The speed of electromagnetic waves is 300 000 000 m/s

Calculate the wavelength of the electromagnetic waves.

[3 marks]

Wavelength = _____ m

0 1 . 6 **Table 1** shows some information about four types of Bluetooth.

Table 1

Type	Power in milliwatts	Range in metres
1	100	100
2	2.50	10.0
3	1.00	1.00
4	0.50	0.50

Mobile phones use type **2** Bluetooth to communicate with other devices.

Suggest **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____