

GCSE Combined Science: Trilogy

Worksheet: Uses and applications of electromagnetic waves

TIME 15 min	TOTAL 16 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Uses and applications of electromagnetic waves

NAME	CLASS	DATE
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- Use black ink or black ball-point pen. Pencil should only be used for drawing.
- Answer all questions in the spaces provided.
- In all calculations, show clearly how you work out your answer.
- The marks for questions are shown in brackets.

0	1
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0	1	.	1
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 Give **one** reason why infrared, rather than visible light, is used in a TV remote control.

[1 mark]

0	1	.	2
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 Give **one** reason why gamma rays, rather than visible light, are used to sterilise medical equipment sealed inside plastic packaging.

[1 mark]

0 2

0 2 . 1

A television remote control sends signals to the television.
Which type of electromagnetic wave does it normally use?

Tick (✓) **one** box.

Gamma rays

☐

Infrared

☐

Microwaves

☐

X-rays

☐

[1 mark]

0 2 . 2

A wireless (WiFi) router sends data to a laptop.
Which type of electromagnetic wave does it use?

Tick (✓) **one** box.

Infrared

☐

Microwaves

☐

Radio waves with a very long wavelength

☐

Ultraviolet

☐

[1 mark]

0 2 . 3

Night-vision goggles form an image of a person in the dark by detecting the radiation the person emits.

Which type of electromagnetic wave do they detect?

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[1 mark]

0 3

Different types of electromagnetic wave have different uses.

0 3 . 1

Name the type of electromagnetic wave used for each application.

Fibre optic communications

Satellite communications

Sun tanning

Producing images of broken bones

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[4 marks]

0 3 . 2

Give **one** use of infrared radiation.

.....

.....

[1 mark]

0 4

A WiFi router in a house uses microwaves to send data to devices in different rooms. A remote control for a television uses infrared, and it only works when it is in the same room as the television.

0 4 . 1

Explain why WiFi can work between different rooms, whereas the TV remote control only works in the same room as the television.

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[3 marks]

0 5

Table 1 compares three wireless technologies.

Table 1

Technology	Typical range	Typical use
Bluetooth	Up to about 10 m	Connecting a phone to headphones
WiFi	Up to about 50 m	Connecting devices within a building
Satellite communication	Thousands of km	Television broadcasts, global positioning

0 5 . 1

Use Table 1 to explain why satellite communication, rather than WiFi, is used to broadcast television signals across a whole country.

.....

.....

.....

.....

[2 marks]

0 5 . 2

Satellite communication uses microwaves.

Suggest why microwaves, rather than radio waves with a very long wavelength, are used to communicate with satellites.

[1 mark]

END OF QUESTIONS

Original practice questions written to match the specification. Not produced by, affiliated with or endorsed by AQA.

Mark scheme

GCSE Combined Science: Trilogy · Worksheet: Uses and applications of electromagnetic waves · 16 marks

Question 1 (2 marks)

01.1 [1 mark]

Answer: It is invisible (or it reflects usefully off surfaces to reach the receiver).

- infrared is not visible, so it does not distract people / infrared reflects off walls and ceilings, helping the signal reach the television (1)
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01.2 [1 mark]

Answer: Gamma rays penetrate the sealed plastic packaging to kill microorganisms inside.

- gamma rays can pass through the plastic packaging (visible light largely cannot) and kill microorganisms inside (1)
-
-

Question 2 (3 marks)

02.1 [1 mark]

Correct: Infrared

02.2 [1 mark]

Correct: Microwaves

02.3 [1 mark]

Answer: Infrared

- infrared (1)
-

Question 3 (5 marks)

03.1 [4 marks]

Answer: visible light; microwaves; ultraviolet; X-rays

- fibre optic communications: visible light (1)
- satellite communications: microwaves (1)
- sun tanning: ultraviolet (1)
- images of broken bones: X-rays (1)

Notes: Allow infrared for fibre optic communications.

03.2 [1 mark]

Answer: Electric heaters (or cooking, or infrared cameras).

- electrical heaters / cooking food / infrared cameras (1)
-

Question 4 (3 marks)

04.1 [3 marks]

Answer: Microwaves pass through walls reasonably well, but infrared is absorbed (or reflected) by walls, so the remote control's signal cannot reach another room while WiFi can.

- the microwaves used by WiFi can pass through walls (materials such as brick and plasterboard) to a useful extent (1)
 - infrared is much more strongly absorbed (or reflected) by walls and solid objects, so it cannot usefully pass through them (1)
 - so the infrared from the remote control cannot reach a television in another room, but the WiFi microwaves can reach devices in other rooms (1)
-

Question 5 (3 marks)

05.1 [2 marks]

Answer: WiFi's range is only tens of metres, but a single satellite can cover an area thousands of kilometres across.

- WiFi only has a range of tens of metres, far too short to cover a whole country (1)
- a satellite can broadcast signals over an area of thousands of kilometres from a single transmitter (1)

05.2 [1 mark]

Answer: Microwaves pass through the atmosphere to and from the satellite; very long-wavelength radio waves are reflected by the upper atmosphere.

- microwaves can pass through the Earth's atmosphere to reach the satellite (and back), whereas radio waves with a very long wavelength are reflected by the upper atmosphere / do not pass through it (1)
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