

Radio Waves

Warm-Up

Tick the appropriate boxes to sort the radio-wave facts from the fiction.

Long-wave radio can be transmitted across long distances.

True False

☐	☐
--------------------------	--------------------------

Long-wave radio uses diffraction to follow the curve of the Earth's surface.

☐	☐
--------------------------	--------------------------

Short-wave radio can only be used over short distances.

☐	☐
--------------------------	--------------------------

Radio waves with very short wavelengths do not travel well through obstacles.

☐	☐
--------------------------	--------------------------

- 1* Describe how an electrical signal generates a radio wave in a TV signal transmitter. Explain how this radio wave can generate an electrical signal in a distant TV aerial.



.....

.....

.....

.....

.....

.....

[Total 4 marks]

- 2* A family from northern England are on holiday in France. Explain why they are unable to listen to their local FM radio station from back home, but are still able to listen to the same long-wave radio broadcasts as they do at home.



.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[Total 6 marks]



EM Waves and Their Uses

- 1 A student uses a microwave oven to cook a jacket potato.



- 1.1 Describe how microwaves cook the potato in the microwave oven.

.....

.....

[3]

- 1.2 The potato is placed in the microwave oven on a glass plate.
Explain why the glass plate does not get hot when the microwave oven is used.

.....

.....

[2]

- 1.3 Name one other type of electromagnetic radiation which is commonly used to cook food.

.....

[1]

- 1.4 Microwaves can also be used to communicate with satellites. Explain why the microwaves used for communications must have different wavelengths to those used in microwave ovens.

.....

.....

.....

.....

[4]

[Total 10 marks]

- 2 A police helicopter has an infrared camera attached to its base. The camera can be used to detect people trying to hide in the dark. Explain the advantages of using an infrared camera rather than a normal camera for this purpose.



.....

.....

.....

[Total 3 marks]



More Uses of EM Waves

Warm-Up

Sort the EM uses below into the table. Some of the uses may appear in more than one column.

Uses of EM waves	UV Rays	Visible Light	X-rays	Gamma Rays
A artificial tanning				
B fibre optic data transmission				
C energy efficient light bulbs				
D revealing invisible ink				
E medical imaging of bones				
F cancer treatment				

- 1 X-rays and gamma rays can both be used in medical imaging.



- 1.1 Briefly describe how a medical tracer can be used to create an internal body image.

.....

.....

.....

[2]

- 1.2 Explain why gamma rays are suitable for medical imaging.

.....

.....

[1]

- 1.3 Explain how X-rays are used to form images of a patient's skeleton.

.....

.....

.....

[3]

- 1.4 Exposure to both X-rays and gamma rays can be dangerous to humans. Suggest **one** precaution taken by medical workers who use X-rays or gamma rays when imaging patients.

.....

[1]

[Total 7 marks]

Exam Practice Tip

You may be asked to explain why a given electromagnetic wave is suited to a particular use. So make sure you understand the properties of the different electromagnetic wave types, and know some of their most common uses.



Dangers of Electromagnetic Waves

- 1 Some types of electromagnetic wave can be harmful to people.



- 1.1 Describe how X-rays and gamma rays can cause cancer.

.....

.....

[2]

- 1.2 Another type of harmful electromagnetic radiation is ultraviolet radiation.
Give **two** damaging effects of ultraviolet light.

.....

.....

[2]

[Total 4 marks]

- 2 **Table 1** lists the radiation doses for some common medical procedures.



Table 1

Procedure	Typical effective dose (mSv)	Lifetime additional risk of fatal cancer per examination
X-ray image of skull	0.07	1 in 300 000
X-ray image of lower spine	1.3	1 in 15 000
CT scan of head	2	1 in 10 000

- 2.1 The lifetime additional risk of fatal cancer from a CT scan of the chest is 1 in 2500.
Use **Table 1** to estimate the typical effective dose of a CT scan of the chest.

Typical effective dose = ... mSv
[2]

- 2.2* Nuclear medicine scans use gamma rays to create images of internal organs, but have a high effective radiation dosage. Discuss the risks involved in performing this type of scan, and why the procedure might go ahead despite the risks.

.....

.....

.....

.....

.....

.....

.....

.....

[6]

[Total 8 marks]

