

The Electromagnetic Spectrum

Q1.(2018)

How are radio waves produced?

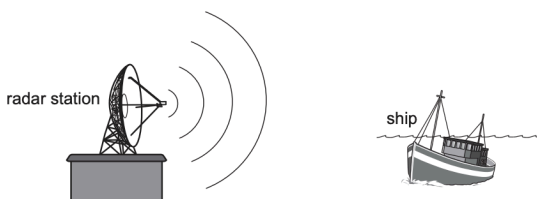
- A By alternating currents
- B By a radio
- C By a speaker
- D By steady currents

Your answer

[1]

Q2.a(2019)

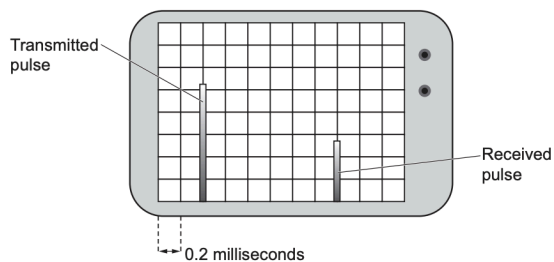
Radar stations can be used to find out where ships are.



At a radar station:

- a radar transmitter transmits pulses of microwaves
- the pulses are reflected by the ship
- a radar receiver detects the pulses.

(a) The diagram shows the radar signals on an oscilloscope screen:



(i) Calculate the time taken between the pulse being transmitted and received.

Time taken = ms [1]

Q2.b(2019)

A radar signal is sent from the radar station. The signal reflects off the ship and is detected 0.0006 s later.

The speed of the microwaves is 3.0×10^8 m/s.

Calculate the distance of the ship from the radar station.

Use the equation: distance travelled = speed $\times$ time

Distance = m [2]

Q2.c(2019)

The amplitude of the received pulse is lower than the transmitted pulse.

Suggest why.

.....

..... [1]

Q2.d(2019)

Radar stations use microwaves with a frequency of 200 MHz.

The speed of the waves is 3.0×10^8 m/s.

Calculate the wavelength of these waves.

Wavelength = m [4]

Q3.(2020)

Electromagnetic waves have many uses.

Which row in the table is correct?

	Electromagnetic wave	Use
A	Gamma rays	Tanning beds
B	Microwaves	Mobile phones
C	Radio waves	Killing bacteria
D	X-rays	Optical fibres

Your answer ☐

[1]

Q4.(2021)

Which property is the same for all electromagnetic waves in space?

- A Frequency
- B Time period
- C Velocity
- D Wavelength

Your answer ☐

[1]

Q5.a(2021)

Radio waves are electromagnetic waves and are used for communications.

(i) Suggest why gamma rays are **not** used for communications.

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

Q5.b(2021)

Name **one** other electromagnetic wave that is used for communications.

..... [1]

Q5.c(2021)

State **one** use of this electromagnetic wave in communications.

..... [1]

Q6.a(2021)

A TV transmitter emits electromagnetic waves with different frequencies.

Table 11.1 gives information about the waves emitted.

Name of wave	Frequency (MHz)	Wavelength (m)	Energy (10^{-18} J)
BBC A	562	0.533	3.72
ARQ A	571	0.526	3.78
D3&4	578	0.519	3.83
BBC B	586	0.511	3.88
ARQ B	594	0.505	3.94
SDN	691	0.435	4.57

Table 11.1

Using data from **Table 11.1** describe the relationship between **frequency** and **wavelength**.

.....
 [2]

Q6.b(2021)

How many significant figures are used in each value in **Table 11.1**?

..... [1]

Q6.c(2021)

Calculate the speed of the wave **ARQ B**.

Use the equation: wave speed = frequency $\times$ wavelength

Speed = m/s [3]

Q6.d(2021)

A TV transmitter has a useful output energy transfer of 100 kJ in 1 second.

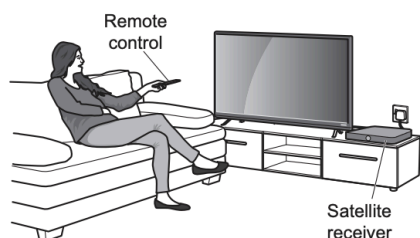
The input energy is 250 kJ in 1 second.

Calculate the efficiency of the TV transmitter.

Efficiency = [3]

Q7.a(2022)

A satellite receiver can be used to watch television channels. It works using a remote control.



(a) Channel 4 uses a wave with a frequency of 1.0714×10^{10} Hz.

The speed of the wave is 3.0×10^8 m/s.

Calculate the wavelength of the wave.

Use the equation: wave speed = frequency $\times$ wavelength
Give your answer to 3 decimal places.

Wavelength = m [4]

Q7.b(2022)

The remote control emits infra-red or radio waves when a button is pressed.

The remote control also contains a light which flashes when a button is pressed.

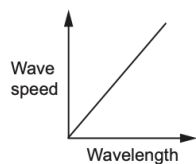
Explain why the light is needed to show when a button is being pressed.

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

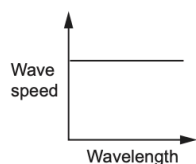
Q8.(2023)

Which graph shows how wave speed varies with wavelength for electromagnetic waves in space?

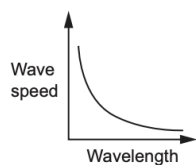
A



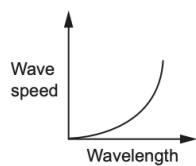
B



C



D



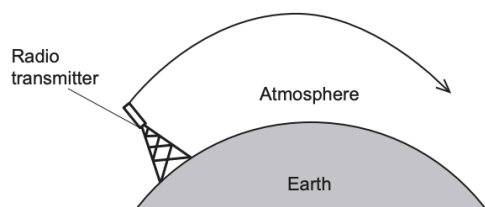
Your answer

☐

[1]

Q9.(2023)

In summer, a layer of warm air forms above a layer of dense cool air in the atmosphere. This causes radio waves to bend instead of travelling in straight lines.



Which statement explains why the radio waves bend?

- A The frequency of the wave changes.
- B The speed of the wave changes.
- C The wave is absorbed by the cool air.
- D The wave spreads out.

Your answer

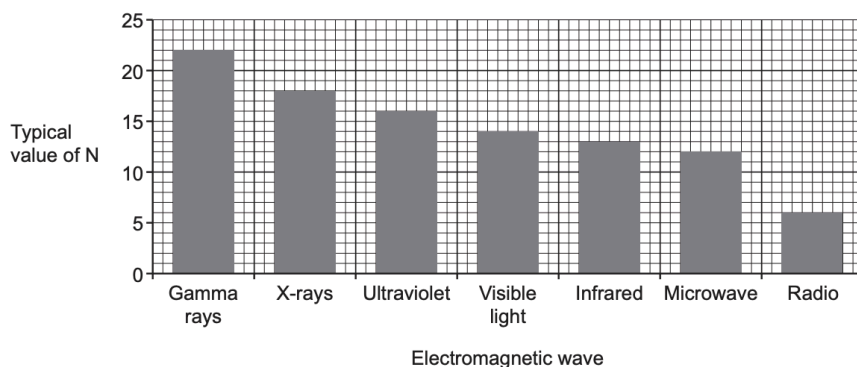
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[1]

Q10.a(2023)

The frequency of electromagnetic waves can be written as $1 \times 10^N \text{ Hz}$.
N is an integer (a whole number).

The graph shows the typical values of N for different electromagnetic waves.



(a) Which electromagnetic wave has the **highest** frequency?

..... [1]

Q10.b(2023)

Which electromagnetic wave is the **most** dangerous?

..... [1]

Q10.c(2023)

Ultraviolet waves have a greater frequency than visible waves.

How many times greater?

Put a ring around the correct answer.

10^2 10^3 10^{13} 10^{14} 10^{16}

[1]

Q10.d(2023)

What is the frequency of a typical radio wave on the graph?

Write your answer as an ordinary number without standard form.

Frequency = Hz [2]

Q10.e(2023)

Which sentence is true about electromagnetic waves?

Tick (✓) **one** box.

Infrared waves do not have any harmful effects on human body tissue.

Only microwaves transfer energy.

Our eyes can detect all electromagnetic waves.

They are transverse waves.

☐
☐
☐
☐

[1]

Q10.f(2023)

A 0.8 kW microwave oven is used to cook food.

The microwave oven transfers 0.56 kWh when it is used to cook food.

Calculate the time the microwave oven is used for.

Use the equation: energy transferred = power $\times$ time

Time = h [3]

Q11.(2024)

Wave **X** and wave **Y** are two electromagnetic waves in space.

The frequency of wave **X** is double the frequency of wave **Y**.

Which answer describes the wavelength of wave **X**?

A Double the wavelength of wave **Y**

B Half the wavelength of wave **Y**

C Quadruple the wavelength of wave **Y**

D The same as the wavelength of wave **Y**

Your answer

☐

[1]

Q12.(2024)

OCR [Physics] | Higher
Topic [1]: [Waves in Matter]

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A radio wave has a frequency of 88 MHz.

What is 88 MHz converted to kHz?

- A** 0.088 kHz
- B** 88 000 kHz
- C** 88 000 000 kHz
- D** 88 000 000 000 kHz

Your answer

[1]