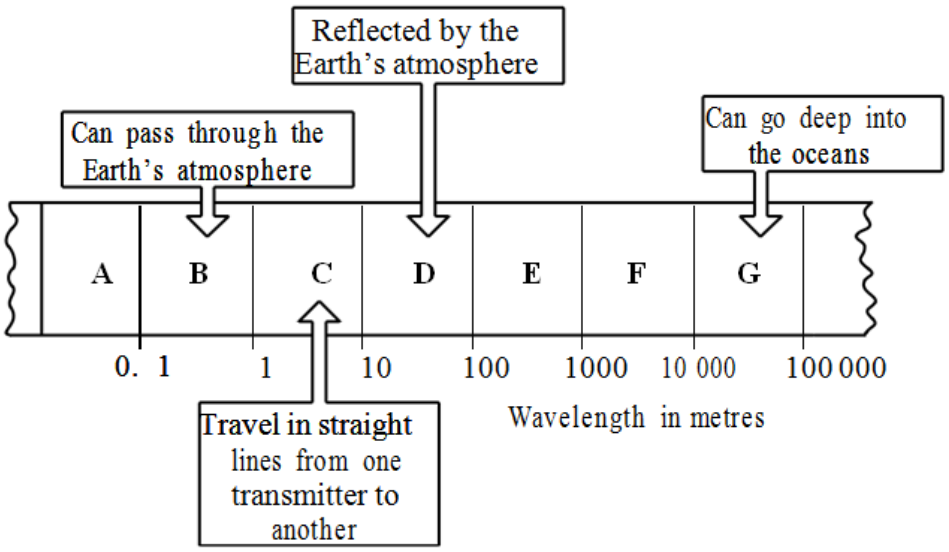
Electromagnetic waves 1

Q:1 The diagram shows a small part of the electromagnetic spectrum divided into seven sections. The different properties of the waves in each section make them useful in different ways.



The waves in which section, A, B, C, D, E, F or G, are:

(a)used to send a signal to a satellite in space

_____

(1 mark)

(b)used to communicate with a submarine under the water

_____

(1 mark)

(c)used by a radio station to broadcast programmes around the world

_____

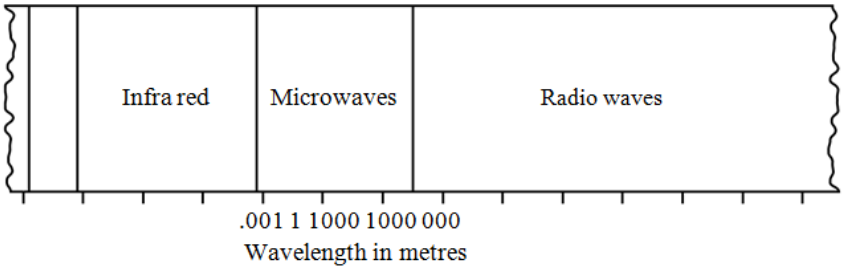
(1 mark)

(d)the waves with the shortest wavelength?

_____

(1 mark)

Q:2 **(a)** The diagram represents part of the electromagnetic spectrum.



(i) Visible light travels through air at 300 000 000 m/s. Why can we assume that radio waves travel through air at the same speed as light?

_____

(1 mark)

(ii)A radio station broadcasts at a frequency of 200 kHz.

Use the following equation to calculate the wavelength of the waves broadcast by this radio station. Show clearly how you work out your answer.

wave speed = frequency × wavelength

_____

_____

Wavelength =_____ m

(2 marks)

(iii) Draw a vertical line on the diagram above to show the position of this radio wave in the electromagnetic spectrum.

(1 mark)

(b)A student thinks that because energy cannot be destroyed it is not possible to waste energy. So he leaves his radio, TV and computer on all the time, even when there is no one in the house.Explain why he is wrong about not being able to waste energy.

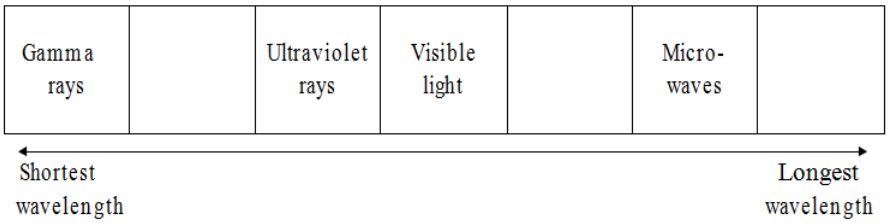
_____

_____

_____

(2 marks)

Q:3 The table shows the electromagnetic spectrum. Three types of wave have been missed out.



(a)(i) Use words from the box to complete the table.

infra red rays radio waves X-rays

(2 marks)

(a)(ii) Which one of the following gives a use of gamma rays?

Put a tick (☒) in the box next to your choice.

to communicate with satellites ☐

to see objects ☐

to kill cancer cells ☐

(1 mark)

(a)(iii) Complete the following sentence by drawing a ring around the correct word in

the box.

All electromagnetic waves move | energy / gases / particles | from one place to another.

(1 mark)

Q:4 **(a)** Microwaves are one type of electromagnetic wave.

(a)(i) Which type of electromagnetic wave has a lower frequency than microwaves?

_____

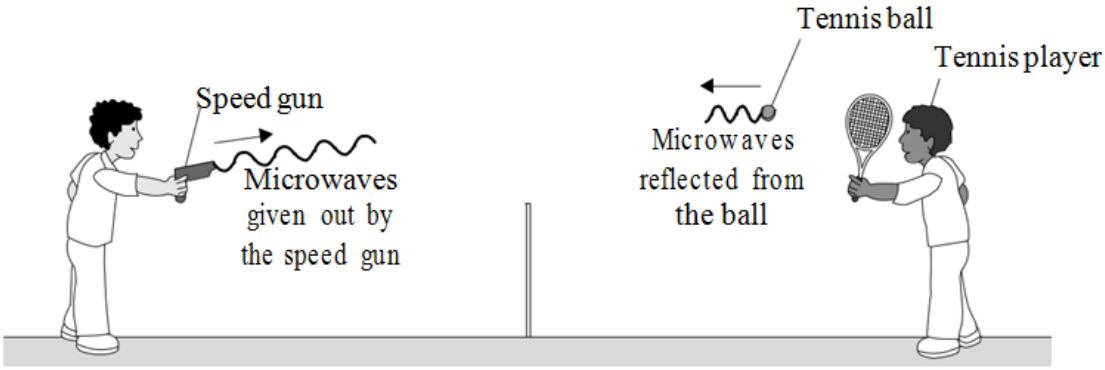
(1 mark)

(a)(ii) What do all types of electromagnetic wave transfer from one place to another?

_____

(1 mark)

(b) The picture shows a tennis coach using a speed gun to measure how fast the player serves the ball.



(b)(i) The microwaves transmitted by the speed gun have a frequency of 24 000 000 000 Hz and travel through the air at 300 000 000 m/s.Use the equation in the box to calculate the wavelength of the microwaves emitted from the speed gun.

wave speed = frequency × wavelength

Show clearly how you work out your answer.

_____

_____

Wavelength = _____ m

(2 marks)

(b)(ii) Some of the microwaves transmitted by the speed gun are absorbed by the ball.

What effect will the absorbed microwaves have on the ball?

_____

_____

(1 mark)

(b) (iii) Some of the microwaves transmitted by the speed gun are reflected from the moving ball back towards the speed gun.

Describe how the wavelength and frequency of the microwaves change as they are reflected from the moving ball.

_____

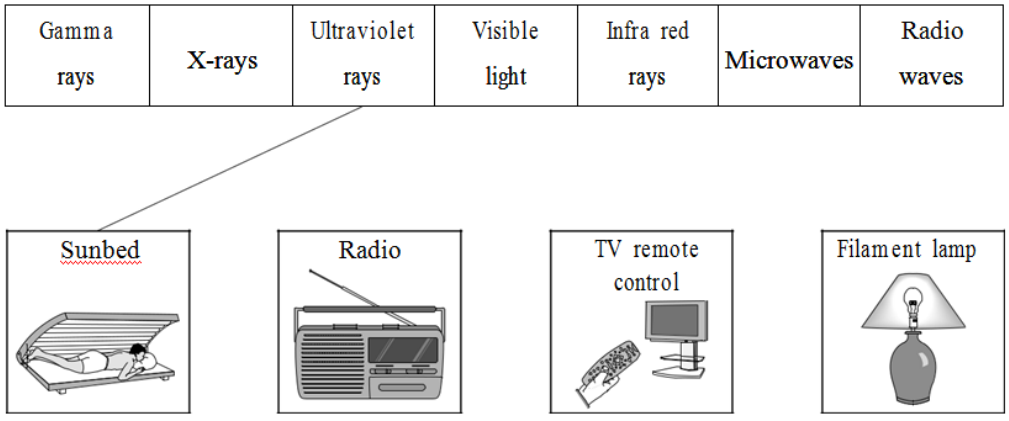
_____

_____

(2 marks)

Q:5 **(a)** The diagram shows the electromagnetic spectrum.The pictures show four devices that use electromagnetic waves. Each device uses a different type of electromagnetic wave. Draw a line from each device to the type of electromagnetic wave that it uses.

One has been done for you.



(3 marks)

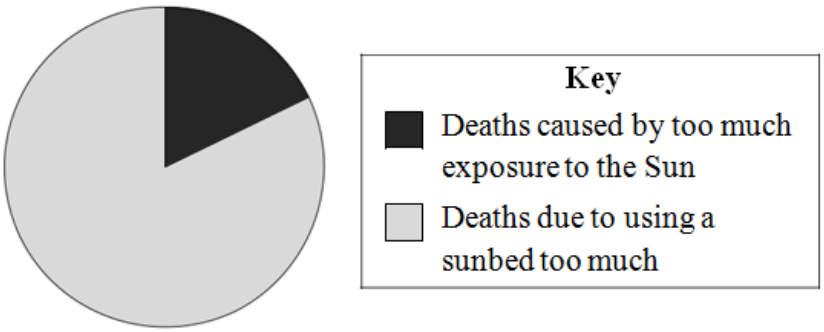
(b) A headline from a recent newspaper article is shown below.

(b)(i) What serious health problem may be caused by using a sunbed too much?

_____

(1 mark)

(b) (ii) The pie chart compares the number of deaths in Britain each year, which may have been caused by using sunbeds too much, with those which may have been caused by too much exposure to the Sun.



It is difficult for a doctor to be certain that a person has died because of using a sunbed too much.

Suggest why.

_____

_____

(1 mark)

(b)(iii) A spokesperson for a leading cancer charity said:

'We want people, especially young people,to know the possible dangers of using a sunbed.'

Why is it important that you know the possible dangers of using a sunbed?

_____

_____

(1 mark)

Q:6 (a) The diagram below shows six of the seven types of wave that make up the electromagnetic spectrum.

Gamma rays		Ultraviolet	Visible light	Infrared	Microwaves	Radio waves

(a) (i) What type of electromagnetic wave is missing from the diagram?

_____

(1 mark)

(a) (ii) Which of the following electromagnetic waves has the most energy?

Draw a ring around the correct answer.

gamma rays radio waves visible light

(1 mark)

(a) (iii) Which of the following electromagnetic waves is given out by a TV remote control? Draw a ring around the correct answer.

Infrared microwaves ultraviolet

(1 mark)

(b) Draw a ring around the correct answer in the box to complete the sentence.

Microwaves travel through a vacuum at

a slower speed than
the same speed as
a faster speed than

radio waves.

(1 mark)

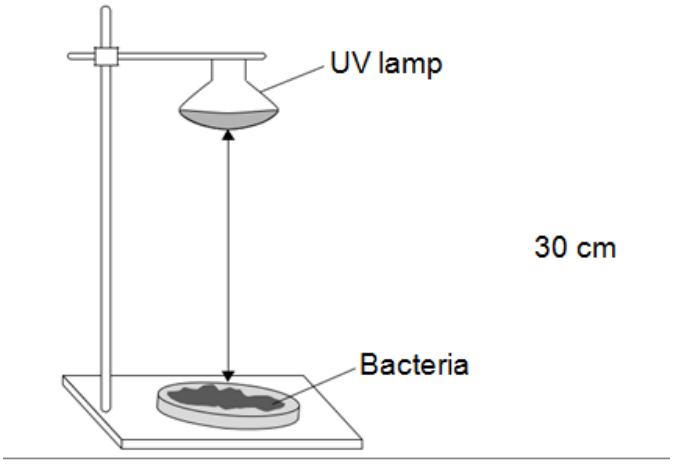
Q:7 (a) List A gives names of four types of wave. List B gives information about different types of wave.Draw a line to link each type of wave in List A to the information about that type of wave in List B.

Draw only four lines.

List A Type of wave	List B Information about waves
	is **not** part of the electromagnetic spectrum
infrared	
	used to produce images of broken bones
light	
	can cause sunburn
sound	
	can be used to cook food
X-rays	
	used by our eyes to see

(4 marks)

(b) A scientist investigated the use of ultraviolet (UV) radiation for killing one particular type of bacteria.



The scientist exposed the bacteria to the UV radiation for different amounts of time.

She then measured the amount of bacteria still living.

(b) (i) Which of the following was a control variable in this investigation?

Put a tick (✓) in the box next to your answer.

the distance between the UV lamp and the bacteria ☐

the time the bacteria were exposed to the UV radiation ☐

the amount of bacteria still living after exposure to the UV radiation ☐

(1 mark)

(b) (ii) The results obtained by the scientist are given in the table.

Time of exposure to UV radiation in minutes	Percentage (%) of bacteria still living after exposure to UV radiation
1	100
5	95
20	40
30	15
45	0

What is the pattern linking the time of exposure to UV radiation and the percentage of bacteria still living after exposure?

_____

_____

(1 mark)

(b) (iii) The scientist concluded that:

'Exposure to UV radiation for 45 minutes will kill all types of bacteria.'

It is wrong to conclude that 45 minutes of exposure to UV radiation will kill all bacteria.

Why is it wrong to conclude this?

_____

_____

(1 mark)

TOTAL MARKS=38