NAME: ……..……..……

SCHOOL:……

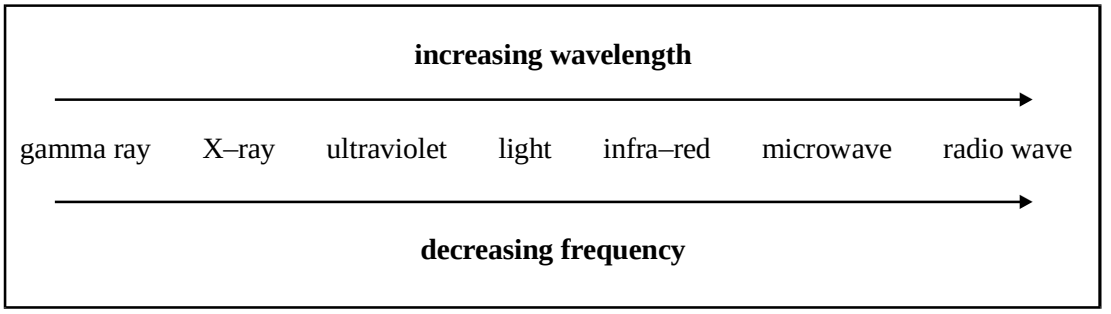
DATE: .....

ELECTROMAGNETIC WAVES

INSTRUCTIONS TO CANDIDATES

*Answer **ALL** questions in this paper in the spaces provided.*

1. The diagram shows the waves that make up the electromagnetic spectrum.



(a) In going from light to radio waves, describe how:

(i) the wavelength changes;.....

.....

(ii) the frequency changes. .....

.....

(2)

(b) Which TWO waves in the spectrum are most harmful to humans?

1.....

2.....

(2)

(c) Choose ONE of the waves shown in the diagram.
Name ONE use for the wave that you choose and describe how it is used.

Wave.....

Use.....

Description of use.....

.....

.....

(3)
(Total 7 marks)

2. The diagram shows the electromagnetic spectrum.

gamma rays	X-rays	ultra-violet	visible		micro-waves	radio waves

(a) Write the name of the missing radiation on the diagram.

(1)

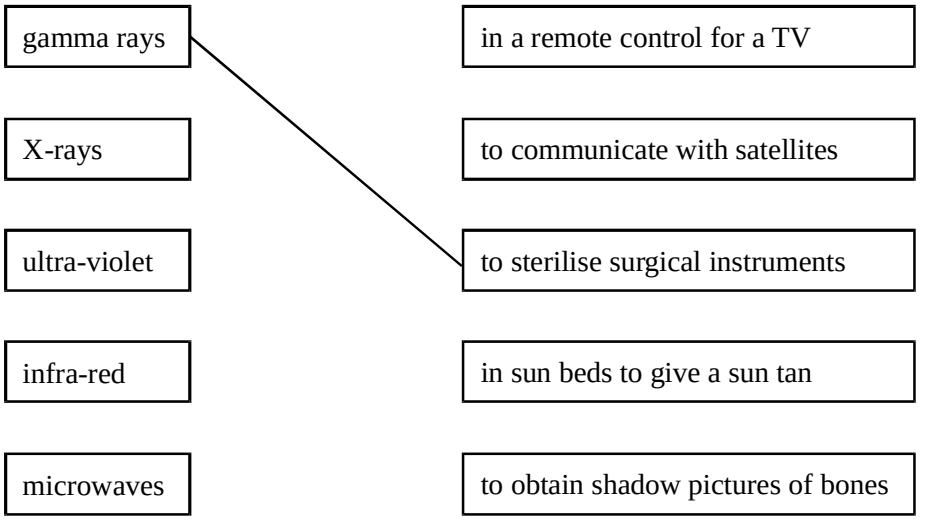
(b) Name **one** use for this radiation.

.....

(1)
(Total 2 marks)

3. The boxes on the left show types of electromagnetic radiation.
The boxes on the right show some uses of electromagnetic radiation.

Draw **one** line from each type of radiation to its use.
The first has been done for you.



(3)
(Total 3 marks)

4. The table shows some information about the electromagnetic spectrum

Low frequency ... High frequency

radio waves	micro-waves	infra-red	light **A** **B**	ultraviolet	X-rays	gamma rays

(a) State **two** characteristics of all electromagnetic waves.

1 .....

2 .....

(2)

(b) (i) What is the colour of the light at **A**?

.....

(1)

(ii) What is the colour of the light at **B**?

.....

(1)

(c) (i) State **one** use of ultraviolet radiation.

.....

(1)

(ii) State **one** use of gamma radiation.

.....

(1)

(d) Ultraviolet radiation and gamma radiation can damage the human body.

State **one** damaging effect for each.

ultraviolet .....

gamma .....

(2)

(Total 8 marks)

5. (a) The table shows some information about the electromagnetic spectrum.

low frequency ⟶ high frequency

radio waves	**A**	infra-red	visible light	**B**	X-rays	gamma rays

(i) Name the radiation at **A**.

.....

(1)

(ii) Name the radiation at **B**.

.....

(1)

(iii) State **one** use of X-rays.

.....

(1)

(iv) State **one** harmful effect of X-rays.

.....

(1)

(v) State **two** properties that all electromagnetic waves have in common.

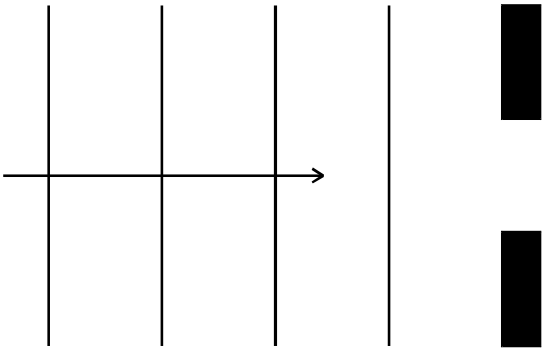
1 .....

2 .....

(2)

(b) The diagram shows water waves approaching a gap.

The wavelength of the waves is 1.5 cm. The gap is also 1.5 cm wide.



Complete the diagram to show the diffracted waves produced by the gap.

(3)

(c) In the 17th and !8th centuries, scientists debated whether light behaved as waves or particles.

Diffraction is a wave property.

When light is shone onto a 1.5 cm gap, no diffraction is observed.

Suggest **two** conclusions that could be drawn from this observation.

.....

.....

.....

.....

(3)
(Total 12 marks)

6. The boxes show the names of some of the waves in the electromagnetic spectrum and their uses.

Draw **one** straight line from each electromagnetic wave to its use.

infra-red	prolonging the shelf life of food
ultraviolet	electric toaster
gamma rays	mobile phones
microwaves	detecting forged five pound notes
	measuring the depth of the sea

(Total 4 marks)

7. (a) The diagram shows the various parts of the electromagnetic spectrum.

radio	microwave	infra-red	visible	ultraviolet	X-ray	gamma ray

long wavelength	←	short wavelength
low frequency	→	high frequency
low energy	→	high energy

(i) Describe the relationship shown between the energy carried by an electromagnetic wave and its frequency.

.....

.....

(1)

(ii) Explain why waves with high energy are more dangerous to humans than those with low energy.

.....

.....

.....

(2)

(iii) Describe the relationship shown between the wavelength and frequency of the waves.

.....

.....

(1)

(b) Ultrasounds are also waves.

State **two** differences between ultrasound waves and radio waves.

1 .....

.....

2 .....

.....

(2)
(Total 6 marks)

8. Part of the electromagnetic spectrum is shown below.

gamma rays	**X-rays**	**A**	**visible light**	**infra-red waves**	**micro-waves**	**radio waves**

(a) Name part **A** of the electromagnetic spectrum.

.....

(1)

(b) Which part of the electromagnetic spectrum has the shortest wavelength?

.....

(1)

(c) All electromagnetic waves travel at the same speed in a vacuum.
If the frequency decreases, what happens to the wavelength?

.....

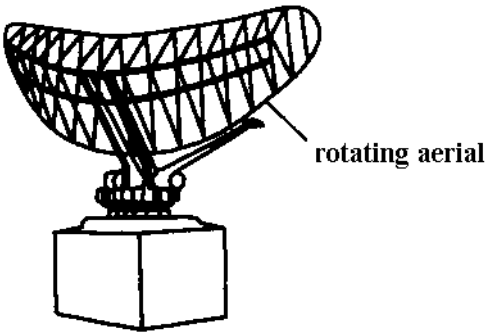
(1)

(d) Microwaves can be used to cook food.
Which other part of the electromagnetic spectrum can be used to cook food?

.....

(1)

(e) Radar uses pulses of microwaves to detect aeroplanes.



Explain how microwaves can be used to find the position of an aeroplane in the sky.

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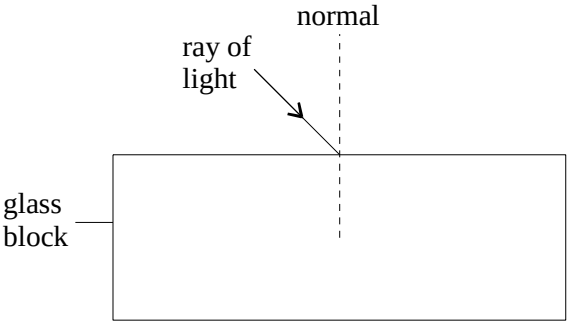
(3)
(Total 7 marks)

9. (a) A light ray travels through air and strikes a glass block.



Use a ruler to draw the paths of the refracted ray as it passes through and out of the block.

(2)

(b) This is part of a newspaper article

> **Ditch those glasses - in 15 minutes**
>
> Using computer technology and a thin invisible beam of ultraviolet radiation, microscopic amounts of eye tissue can be removed to correct visual impairment.

(i) Suggest another use for ultraviolet radiation.

.....

.....

(1)

(ii) Visible light and ultraviolet light are parts of the electromagnetic spectrum.
Two features of an electromagnetic wave are its wavelength and frequency.
Use these features to compare ultraviolet radiation and visible radiation.

.....

.....

.....

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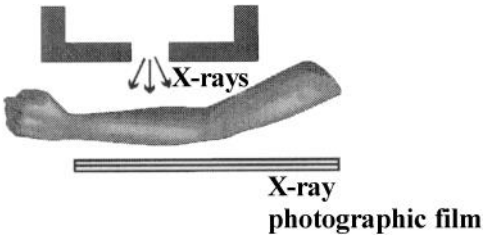
(2)

(c) Nicola has a suspected broken arm.
She is taken to hospital for an arm X-ray.



(i) Explain how the properties of X-rays make them suitable for making an X-ray photograph of the suspected broken arm.

.....

.....

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.....

.....

.....

(3)

(ii) Why can exposure to X-rays be harmful to the body?

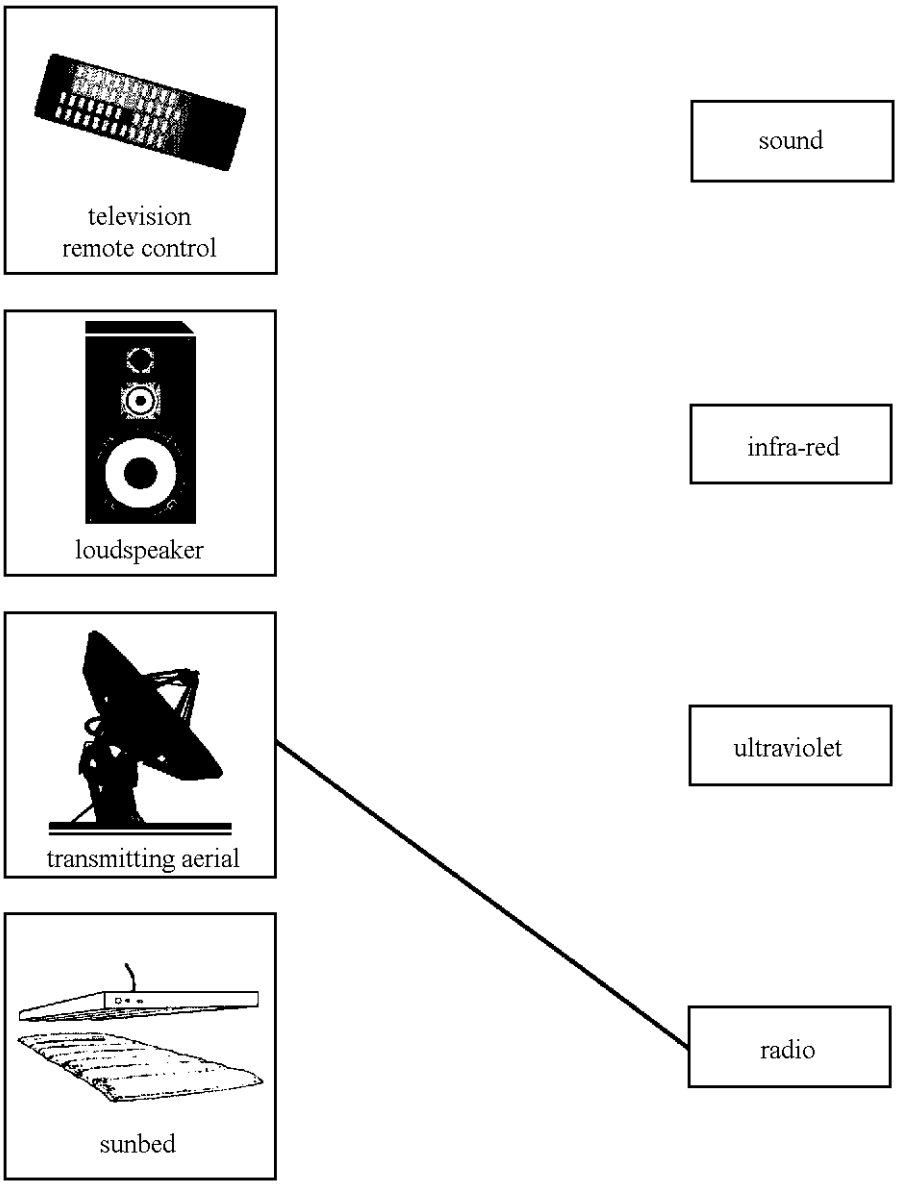
……

……

(1)
(Total 9 marks)

10. The diagrams show some everyday objects that produce waves.

(a) Draw a line from each diagram to the type of wave that the object produces.



(b) Which **one** of the waves is **not** in the electromagnetic spectrum?

……

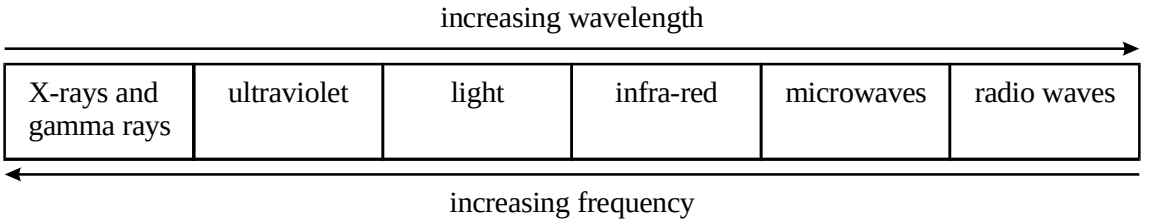
(1)

(c) Which **one** of the waves has a wavelength shorter than light?

.....

(1)
(Total 5 marks)

11. The diagram shows the different waves in the electromagnetic spectrum.



(a) Complete the sentence.

As the wavelength of the waves increases, their frequency .....

(1)

(b) Give one use of:

(i) microwaves

.....

(1)

(ii) ultraviolet waves

.....

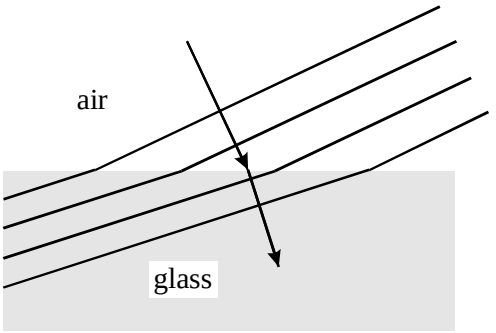
(1)

(iii) gamma rays

.....

(1)

(c) The diagram shows light waves passing from air into glass.



Describe **two** changes that take place to the waves as they pass into the glass.

.....

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(2)
(Total 6 marks)