AQA GCSE Physics | 8463

SPECIFICATION POINT 4.6.2.6

# Visible light (physics only)

## Past-paper questions

| | |
|---|---|
| Tier | **Foundation** |
| Question groups | **60** |
| Available paper years | **2006–2025** |

## Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

**Name:** _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.6.2.6 Visible light (physics only)

Question 01

November 2006 | PHY1B | Original Q1 | Legacy

**QUESTION ONE**

Electromagnetic radiation has many uses.

Match types of electromagnetic radiation, **A**, **B**, **C** and **D**, with the drawings labelled **1–4**.

**A** infra red rays

**B** ultraviolet waves

**C** visible light

**D** X-rays

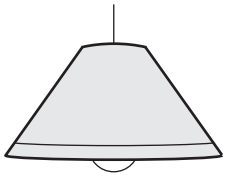
**1**

Toaster



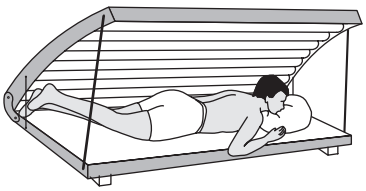
**2**

Room lamp



**3**

Sunbed



**4**

Hospital scanner



4.6.2.6 Visible light (physics only)

Question 02

November 2006 | PHY1B | Original Q2 | Legacy

## QUESTION TWO

Electromagnetic radiation can be grouped into types, each with a different range of wavelengths.

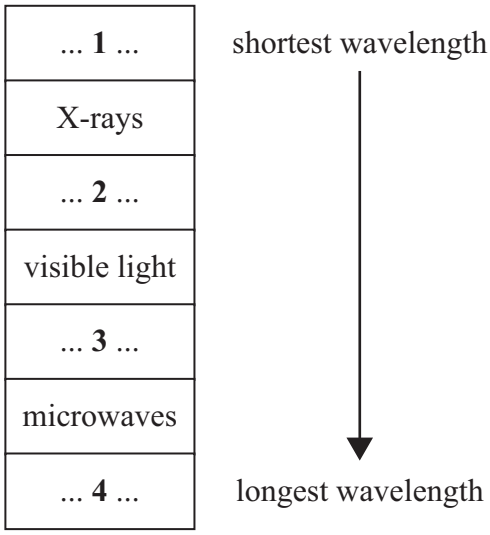
Match types of electromagnetic radiation, **A**, **B**, **C** and **D**, with the numbers **1–4** in the list.

**A** gamma rays

**B** infra red rays

**C** radio waves

**D** ultraviolet waves



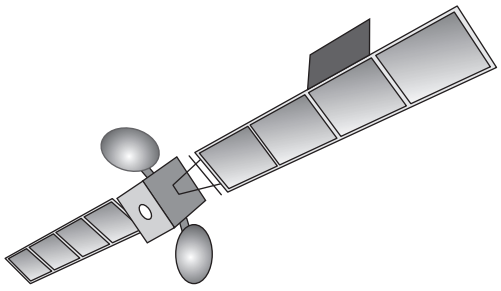
**4.6.2.6 Visible light (physics only)**

**Question 03**

November 2006 | PHY1B | Original Q5 | Legacy

**QUESTION FIVE**

The drawing shows a satellite which carries a telescope used to observe space.



Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** a distant galaxy

**B** a satellite

**C** the Earth

**D** the Universe

Observations of space using visible light are better from . . . **1** . . . because clouds may block observations taken from . . . **2** . . . .

The red-shift in light from . . . **3** . . . provides evidence of the 'big bang' theory of the start of . . . **4** . . . .

4.6.2.6 Visible light (physics only)

Question 04

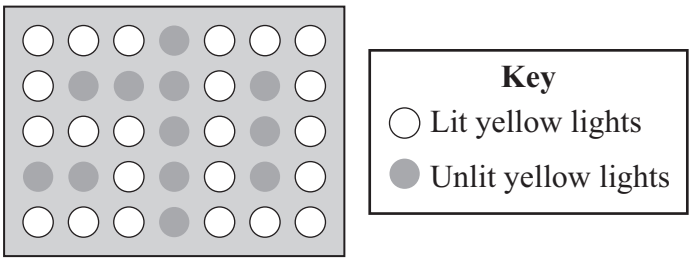
November 2006 | PHY1B | Original Q8 | Legacy

## QUESTION EIGHT

Vehicles on motorways often travel at high speeds. It is important that clear warning signs are used.

Tests were carried out to find the most suitable colour for the lights in the warning sign.

The drawing shows a sign which has yellow lights.




**8A** Suggest why yellow light is used for the sign.

**1** It has a higher frequency than all other colours.

**2** It has a longer wavelength than all other colours.

**3** It is easier to see than all other colours.

**4** It travels faster than all other colours.

**8B** What determines the colour of the light from the display?

**1** its brightness

**2** its frequency

**3** its power

**4** its speed in a vacuum

**8C** The wavelength of red light is 700 nm and the wavelength of violet light is 300 nm.

What is the likely value of the wavelength of the yellow light from the sign?

**1** 250 nm

**2** 350 nm

**3** 600 nm

**4** 750 nm

4.6.2.6 Visible light (physics only)



**8D** The warning sign is switched on by sending a radio signal. The frequency of the signal is 2 000 000 hertz and its wavelength is 150 metres.

Calculate the wave speed of the signal in metres/second.

| **wave speed** = **frequency** × **wavelength** |
|---|

**1** 13 333 m/s

**2** 1 333 333 m/s

**3** 300 000 000 m/s

**4** 3 000 000 000 m/s

**Turn over for the next question**

**4.6.2.6 Visible light (physics only)**

**Question 05**

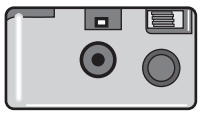
March 2007 | PHY1B | Original Q1 | Legacy

**QUESTION ONE**

Each of these devices uses electromagnetic radiation.

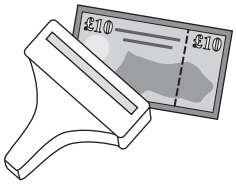
**1**

Camera



**2**

Forgery detector



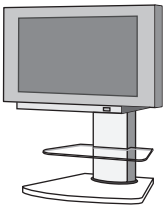

**3**

Toaster



**4**

Television



Match the parts of the electromagnetic spectrum, **A**, **B**, **C** and **D**, with the drawings labelled **1–4**.

**A** infra red

**B** radio waves

**C** ultraviolet

**D** visible light

4.6.2.6 Visible light (physics only)

Question 06

June 2007 | PHY1B | Original Q7 | Legacy

## QUESTION SEVEN

The solar system is part of the Milky Way galaxy.

**7A** Astronomers measure the wavelengths of light from distant galaxies.

The unit for wavelength is . . .

**1** Hz

**2** m/s

**3** m

**4** °C

**7B** Visible light from distant galaxies shows an increase in . . .

**1** frequency.

**2** intensity.

**3** speed.

**4** wavelength.

**7C** There is a red-shift in light observed from most distant galaxies.

This has led scientists to the belief that . . .

**1** galaxies are moving away from each other.

**2** galaxies are moving towards each other.

**3** galaxies are moving towards the Milky Way.

**4** galaxies are moving towards each other, but some are moving apart.

4.6.2.6 Visible light (physics only)



**7D** Scientists who have studied electromagnetic radiation from distant galaxies support the 'big bang' theory, which states that the Universe began . . .

**1** in many places at the same time.

**2** from a very small point.

**3** as one very big galaxy.

**4** as one very big solar system.

**Turn over for the next question**

**4.6.2.6 Visible light (physics only)**

**Question 07**

June 2007 | PHY1F | Original Q4 | Legacy

**4** (a) Ultraviolet and visible light are both electromagnetic waves.

(i) Name **one** other type of electromagnetic wave.

.....

*(1 mark)*

(ii) Which **one** of the following statements is true for electromagnetic waves travelling through a vacuum?

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

All the waves have the same frequency. ☐

All the waves have the same wavelength. ☐

All the waves travel at the same speed. ☐

*(1mark)*

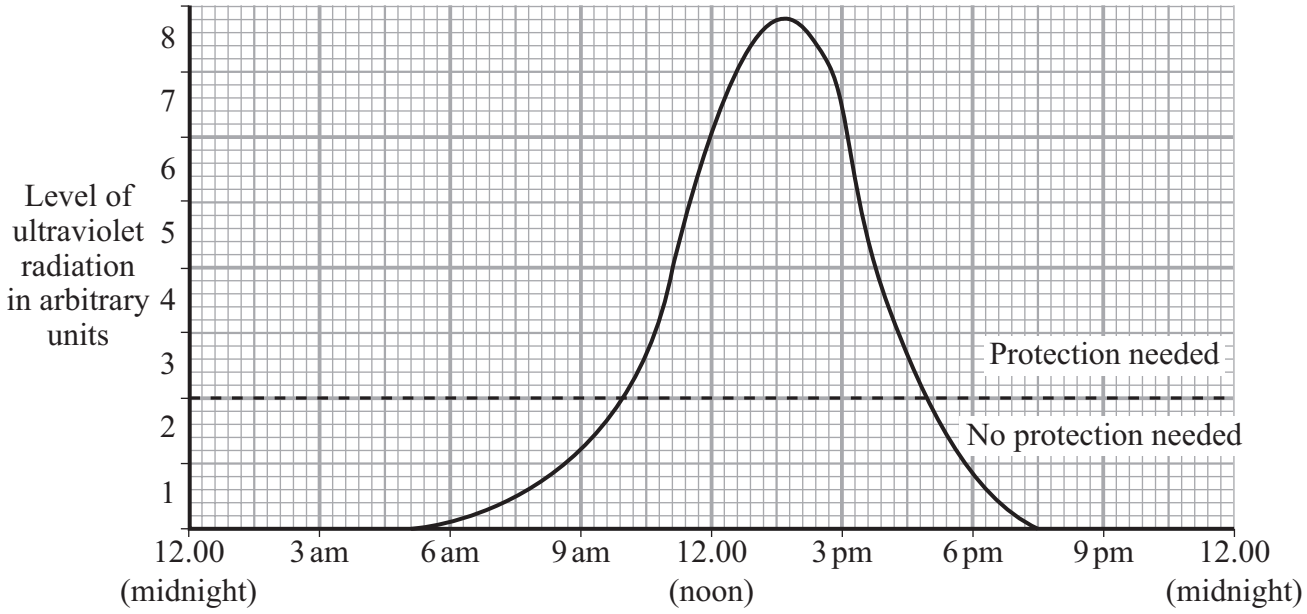
**4.6.2.6 Visible light (physics only)**

**Question 07 · continued**



*BLANK*

(b) The graph shows how the level of ultraviolet radiation changed during a summer day in England.




(i) What serious health problem can be caused by exposure to the ultraviolet radiation from the Sun?

.....

*(1 mark)*

(ii) Explain why it would be sensible to stay out of the Sun between 10 am and 4 pm in the summer.

.....

.....

.....

.....

*(2 marks)*

5

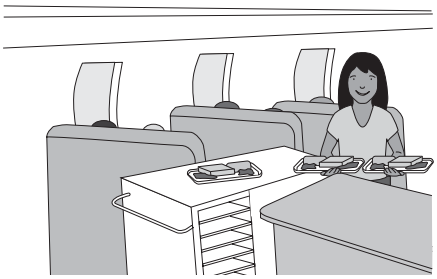
**4.6.2.6 Visible light (physics only)**

**Question 08**

November 2007 | PHY1B | Original Q1 | Legacy

## QUESTION ONE

The drawing shows meals being served on an aircraft.



Match types of electromagnetic waves, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** gamma rays

**B** infra red rays

**C** radio waves

**D** visible light

The food was heated in ovens by . . . **1** . . . .

The fruit in the meal pack does not go mouldy because it has been treated with . . . **2** . . . .

The lamps in the cabin are designed to give off . . . **3** . . . .

The pilot keeps in touch with air traffic control by using . . . **4** . . . .

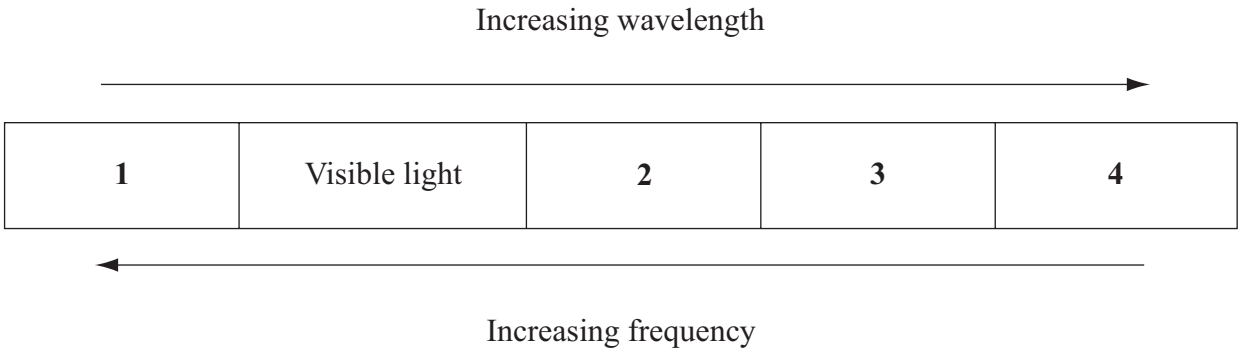
4.6.2.6 Visible light (physics only)

Question 09

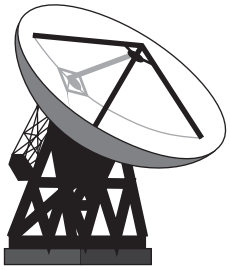
November 2007 | PHY1B | Original Q3 | Legacy

## QUESTION THREE

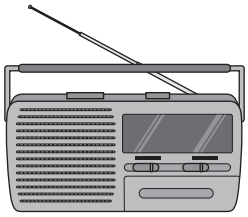
The diagram shows part of the electromagnetic spectrum.



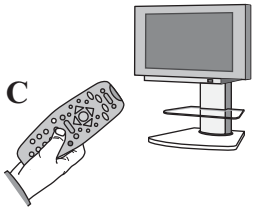

Match devices, **A**, **B**, **C** and **D**, with the types of electromagnetic radiation **1–4** in the spectrum.



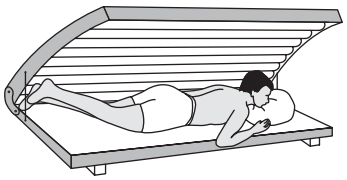
**A**



**B**



**C**



**D**

**4.6.2.6 Visible light (physics only)**

**Question 10**

March 2008 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

We use electromagnetic radiation in many different ways.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

**A** infra red radiation

**B** gamma radiation

**C** visible light

**D** ultraviolet radiation

| | |
|---|---|
| **1** | is used to send messages using a torch |
| **2** | is used in sunbeds |
| **3** | is used in heaters |
| **4** | is used to treat cancer |

**4.6.2.6 Visible light (physics only)**

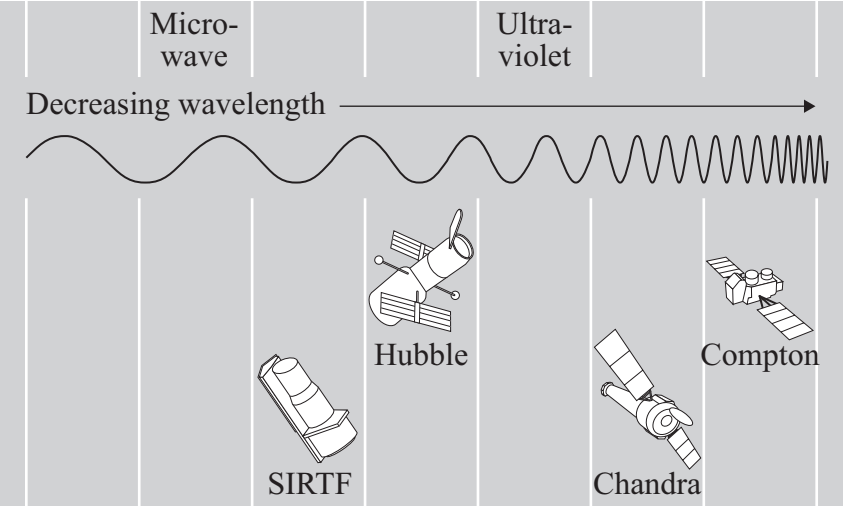
**Question 11**

March 2008 | PHY1BP | Original Q3 | Legacy

## QUESTION THREE

Space telescopes are designed to detect different types of electromagnetic radiation.

The diagram shows part of the electromagnetic spectrum and four different telescopes.




Match telescopes, **A**, **B**, **C** and **D**, with the types of electromagnetic radiation **1–4** in the table that each is designed to detect.

**A** SIRTF

**B** Hubble

**C** Chandra

**D** Compton

| | **Type of electromagnetic radiation** |
|---|---|
| **1** | gamma radiation |
| **2** | infra red radiation |
| **3** | X-rays |
| **4** | visible light |

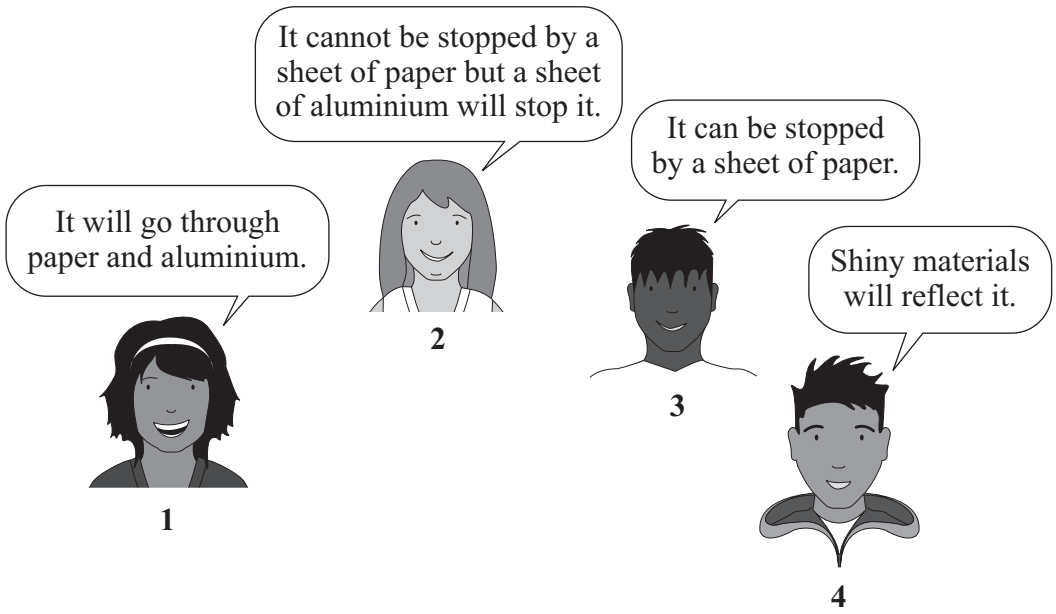
**4.6.2.6 Visible light (physics only)**

**Question 12**

March 2008 | PHY1BP | Original Q4 | Legacy

## QUESTION FOUR

Some students are talking about radiation.




Match words, **A**, **B**, **C** and **D**, with the students' statements **1–4**.

**A** alpha

**B** beta

**C** gamma

**D** visible light

**4.6.2.6 Visible light (physics only)**

**Question 13**

June 2008 | PHY1BP | Original Q1 | Legacy

## QUESTION ONE

This question is about electromagnetic radiation.

Match types of electromagnetic radiation, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

**A** infra red

**B** ultraviolet

**C** visible light

**D** gamma

| | |
|---|---|
| can be used to send messages using a torch | **1** |
| can cause a suntan | **2** |
| can be used in a television remote control | **3** |
| can travel through a person's body | **4** |

**4.6.2.6 Visible light (physics only)**

**Question 14**

November 2008 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

Electromagnetic waves have many uses.

Match the types of waves, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** infra red rays

**B** visible light

**C** ultraviolet rays

**D** X-rays

Luggage at airports is examined using . . . **1** . . . .

Mobile phone screens give off . . . **2** . . . .

Sunbeds use . . . **3** . . . .

When cooking bacon, a grill uses . . . **4** . . . .

**4.6.2.6 Visible light (physics only)**

**Question 15**

November 2008 | PHY1BP | Original Q2 | Legacy

## QUESTION TWO

The diagram shows parts of the electromagnetic spectrum.

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | X-rays | **2** | **3** | Infra red rays | Microwaves | **4** |

Match types of radiation, **A**, **B**, **C** and **D**, with the numbers **1–4** in the diagram.

**A** gamma rays

**B** radio waves

**C** ultraviolet rays

**D** visible light

**4.6.2.6 Visible light (physics only)**

**Question 16**

November 2008 | PHY1BP | Original Q4 | Legacy

## QUESTION FOUR

The Earth's atmosphere absorbs all electromagnetic waves except those with wavelengths longer than ultraviolet radiation.

Match the electromagnetic radiations, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** microwaves

**B** radio waves

**C** visible light

**D** X-rays

Three hundred years ago, many objects in the night sky were discovered by looking through hand-held telescopes. These telescopes detect . . . **1** . . . .

In the last century, distant galaxies were discovered by using large dishes and aerials on Earth which detect . . . **2** . . . .

In recent years, many discoveries have been made using telescopes mounted on satellites in space. Unlike telescopes on Earth, these telescopes can detect . . . **3** . . . .

The satellites send images back to Earth using . . . **4** . . . .

**4.6.2.6 Visible light (physics only)**

**Question 17**

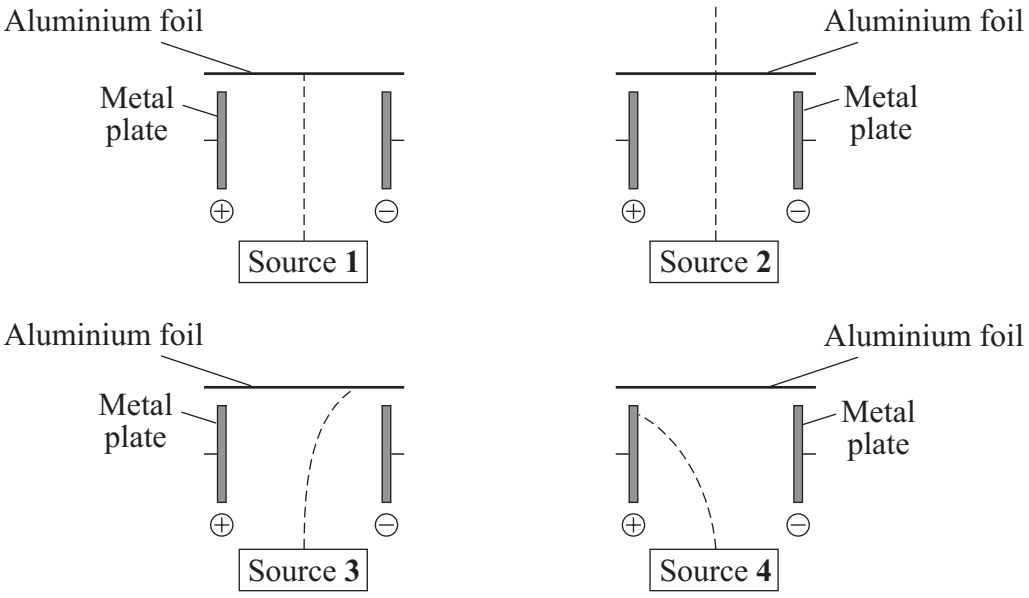
November 2008 | PHY1BP | Original Q5 | Legacy

## QUESTION FIVE

Radiation from four sources, **1**, **2**, **3** and **4**, is directed into an electric field between two metal plates.

There is a sheet of aluminium foil after the gap between the metal plates.

Light waves are not deflected in electric fields.




In each diagram, the dashed line (----------) shows the path of the radiation.

Match the types of radiation, **A**, **B**, **C** and **D**, with the sources **1–4**.

**A** alpha radiation

**B** beta radiation

**C** gamma radiation

**D** visible light

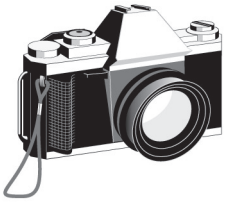
**4.6.2.6 Visible light (physics only)**

**Question 18**

March 2009 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

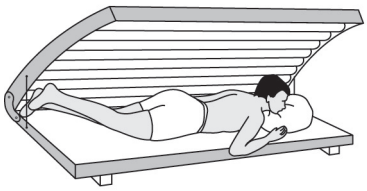
Different devices use different types of electromagnetic waves.



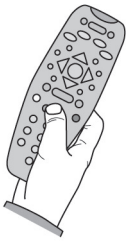
**1**
Camera



**2**
Hospital scanner



**3**
Sunbed



**4**
TV remote control

Match types of electromagnetic waves, **A**, **B**, **C** and **D**, with the diagrams **1–4**.

**A** infra red

**B** visible light

**C** ultraviolet

**D** X-rays

**4.6.2.6 Visible light (physics only)**

**Question 19**

March 2009 | PHY1BP | Original Q6 | Legacy

## QUESTION SIX

The table shows part of the electromagnetic spectrum.

| | | | | | |
|---|---|---|---|---|---|
| gamma rays | X-rays | ultraviolet | visible light | infra red | microwaves |

**6A** Which one of the following parts of the electromagnetic spectrum has the longest wavelength?

**1** gamma rays

**2** microwaves

**3** ultraviolet

**4** visible light

**6B** Which one of the following parts of the electromagnetic spectrum has the highest frequency?

**1** gamma rays

**2** microwaves

**3** ultraviolet

**4** visible light

**6C** Which part of the electromagnetic spectrum is used to show up invisible security marking on valuable equipment?

**1** microwaves

**2** ultraviolet

**3** visible light

**4** X-rays

**4.6.2.6 Visible light (physics only)**

**Question 19 · continued**



**6D** Which part of the electromagnetic spectrum is emitted by mobile phone transmitters?

**1** microwaves

**2** ultraviolet

**3** visible light

**4** X-rays

**Turn over for the next question**

### 4.6.2.6 Visible light (physics only)

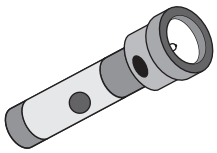
**Question 20**

June 2009 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

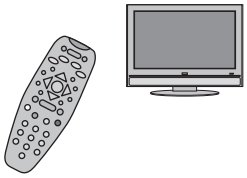
Many everyday devices use electromagnetic waves.

Torch



**1**

Remote control



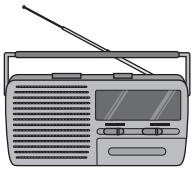
**2**

Mobile phone



**3**

Radio



**4**

Match types of electromagnetic waves, **A**, **B**, **C** and **D**, with the devices **1**–**4**.

**A** infra red

**B** microwaves

**C** radio waves

**D** visible light

**4.6.2.6 Visible light (physics only)**

**Question 21**

June 2009 | PHY1BP | Original Q5 | Legacy

## QUESTION FIVE

Electromagnetic radiation can be grouped into types. Each type has a different range of wavelengths.

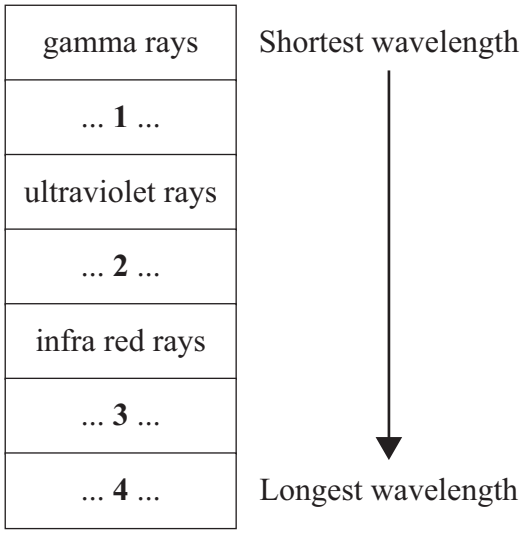
Match types of radiation, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

**A** microwaves

**B** X-rays

**C** visible light

**D** radio waves



**4.6.2.6 Visible light (physics only)**

**Question 22**

June 2009 | PHY1F | Original Q6 | Legacy

**6** (a) The table lists the names of seven telescopes. Each one of the telescopes is designed to detect a different one of the seven types of electromagnetic wave.
The table is incomplete.

| Name of telescope | Type of wave detected |
|---|---|
| HESS | Gamma |
| XMM Newton | X-ray |
| FUSE | Ultraviolet |
| William Herschel | Visible light |
| Spitzer | |
| SPT | Microwave |
| Lovell | Radio |

**6** (a) (i) Which **one** of the telescopes is designed to detect the type of wave with the shortest wavelength?

.....

*(1 mark)*

**6** (a) (ii) What type of wave is the Spitzer telescope designed to detect?

.....

*(1 mark)*

**6** (b) The William Herschel telescope is on the Earth's surface. Another telescope, the Hubble telescope, which also detects visible light, orbits the Earth.

How is the image produced by the Hubble telescope better than the image produced by the William Herschel telescope?

.....

Give a reason for your answer.

.....

.....

*(2 marks)*

*for mark*

**6** (c) Some types of electromagnetic wave are absorbed by water.
The SPT telescope is located in the Antarctic, which is a dry environment.

Explain why it is better to have this type of telescope in a dry environment rather than in a wet, humid environment.

.....

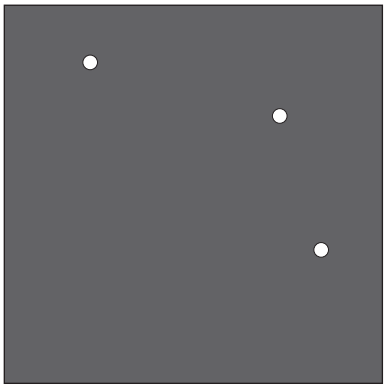
.....

.....

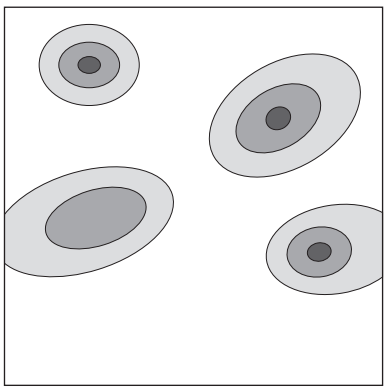
.....

*(2 marks)*

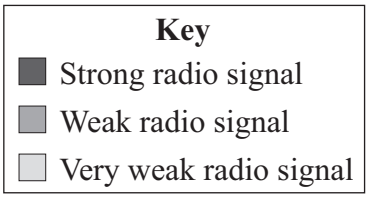
**6** (d) The pictures represent the images produced using a visible light telescope and a radio telescope. Both images are of the same part of the sky. The shading on the radio telescope image represents the strength of the radio signals.



Visible light image



Radio telescope image




Suggest what extra information can be gained from the radio telescope image compared with the visible light image.

.....

.....

*(1 mark)*

7

**4.6.2.6 Visible light (physics only)**

**Question 23**

November 2009 | PHY1BP | Original Q2 | Legacy

## QUESTION TWO

This question is about four types of electromagnetic radiation.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** gamma

**B** infra red

**C** radio

**D** visible light

The type of electromagnetic radiation with the longest wavelength is . . . **1** . . . .

The type of electromagnetic radiation with the highest frequency is . . . **2** . . . .

The type of electromagnetic radiation that is used to cook food is . . . **3** . . . .

The type of electromagnetic radiation that allows us to see is . . . **4** . . . .

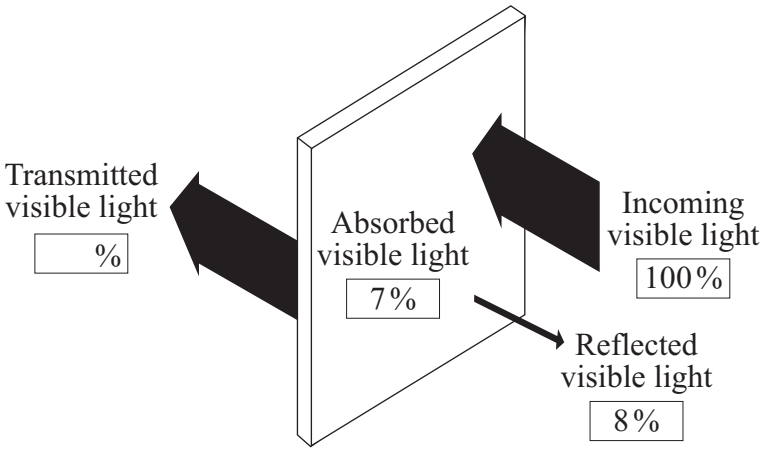
**4.6.2.6 Visible light (physics only)**

**Question 24**



**3** Glass reflects, absorbs and transmits both infra red radiation and visible light.

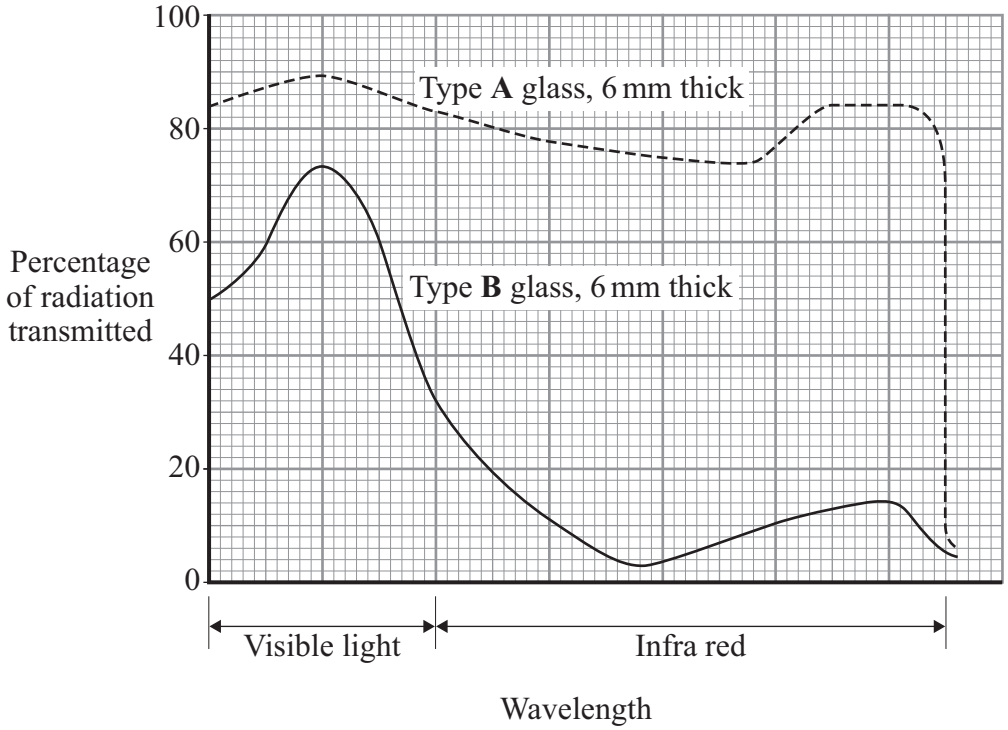
**3** (a) The diagram shows the percentages of visible light that are reflected and absorbed by one type of glass.




What percentage of visible light is transmitted by this type of glass?

..... %
*(1 mark)*

**3** (b) The amounts of infra red radiation and visible light transmitted by glass depend on the type and thickness of glass. The data obtained from tests on two different types of glass is displayed in the graph below.



**4.6.2.6 Visible light (physics only)**

**Question 24 · continued**



*for mark*

**3** (b) (i) To be able to compare the two types of glass, it was important to control one variable.

What variable was controlled in the tests?

.....

*(1 mark)*

**3** (b) (ii) A homeowner has a glass conservatory built on the back of the house. The homeowner tells the builder that the inside of the conservatory should stay as cool as possible throughout the summer.

Explain why the builder uses 'type **B**' glass for the conservatory.

.....

.....

.....

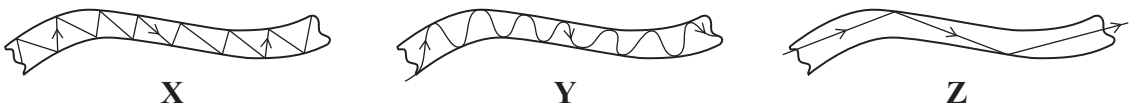
.....

*(2 marks)*

**3** (c) Infra red and visible light can be used to send signals along an optical fibre.

Which **one** of the following diagrams, **X**, **Y** or **Z**, shows the path taken by a signal as it travels along an optical fibre?

Draw a ring around the correct diagram.



**X** **Y** **Z**

*(1 mark)*

**5**

**4.6.2.6 Visible light (physics only)**

**Question 25**

March 2010 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

Different types of electromagnetic radiation have different hazards.

Match words, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

**A** microwaves

**B** ultraviolet rays

**C** visible light

**D** X-rays

| | **Possible hazard** |
|---|---|
| **1** | could cause skin cancer during sunbathing |
| **2** | could cause blindness if you look directly at the Sun |
| **3** | could kill cells deep inside your body |
| **4** | could damage your brain while using a mobile phone |

**4.6.2.6 Visible light (physics only)**

**Question 26**



## QUESTION TWO

The table shows part of the electromagnetic spectrum.

| | | | | | | |
|---|---|---|---|---|---|---|
| Gamma | | Ultraviolet | | Infra red | | Radio |

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

**A** gamma

**B** infra red

**C** radio

**D** ultraviolet

The part of the electromagnetic spectrum with the longest wavelengths is . . . **1** . . . .

Between X-rays and visible light in the electromagnetic spectrum is . . . **2** . . . radiation.

Some radioactive isotopes emit . . . **3** . . . radiation.

Signals can be sent from remote controls to a television by . . . **4** . . . radiation.

### 4.6.2.6 Visible light (physics only)

**Question 27**

June 2010 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

Electromagnetic radiation can be grouped into types. Each type has a different range of wavelengths.

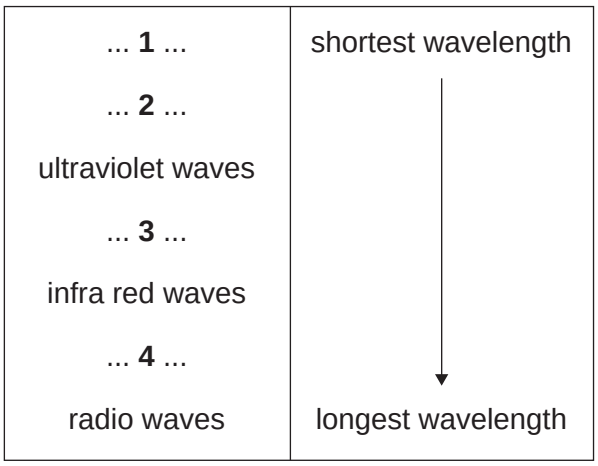
Match types of radiation, **A**, **B**, **C** and **D**, with the numbers **1–4** in the diagram.

**A** gamma rays

**B** microwaves

**C** visible light

**D** X-rays



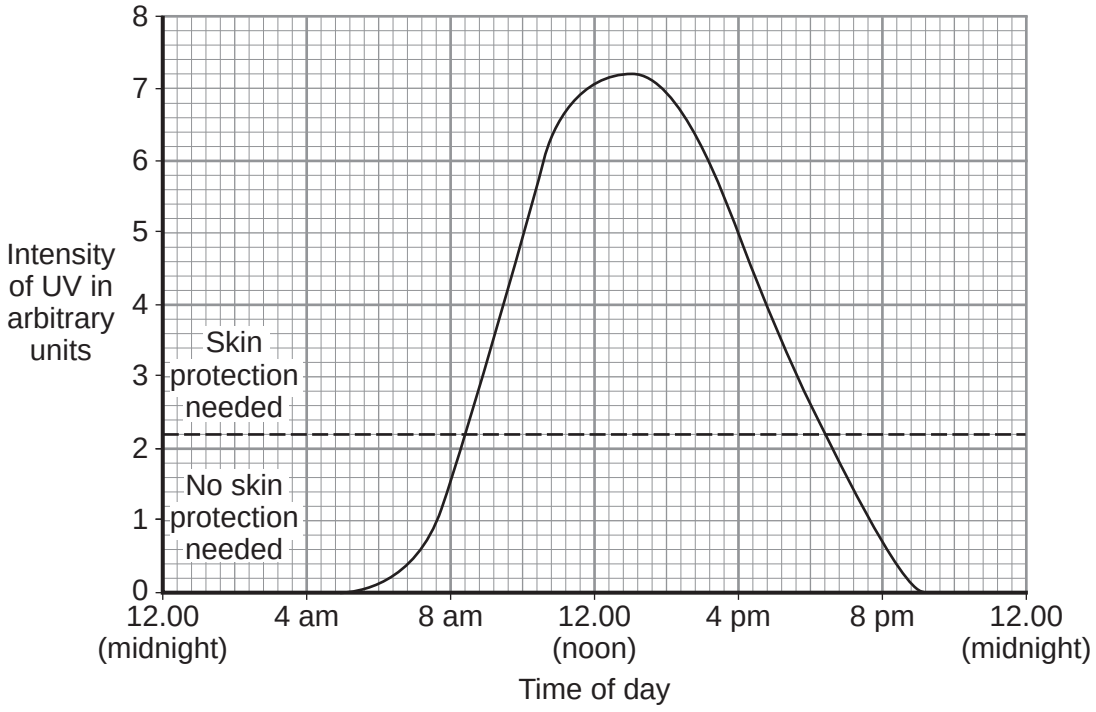
4.6.2.6 Visible light (physics only)

Question 28

June 2010 | PHY1BP | Original Q8 | Legacy

## QUESTION EIGHT

The graph shows how the intensity of ultraviolet (UV) radiation changes during a typical day in June in the UK.




**8A** The intensity of UV radiation reaches a maximum at . . .

**1** 9.30 am

**2** 12.00 noon

**3** 1.00 pm

**4** 5.00 pm

**8B** The dashed line (– – – –) on the graph shows the intensity above which you should protect your skin from UV radiation by using sunscreen cream.

For approximately how long is the intensity of UV radiation high enough to suggest that protection is needed?

**1** 0 hours

**2** 7 hours

**3** 10 hours

**4** 16 hours

4.6.2.6 Visible light (physics only)

Question 28 · continued



**8C** For a typical day in December in the UK, how would you expect the graph to be different?

| | Peak | Area under the graph |
|---|---|---|
| **1** | higher | the same |
| **2** | lower | the same |
| **3** | higher | bigger |
| **4** | lower | smaller |

**8D** UV radiation travels as an electromagnetic wave.

Which row in the table below correctly shows the speed and frequency of UV compared with the speed and frequency of visible light?

| | Speed of UV compared with visible light | Frequency of UV compared with visible light |
|---|---|---|
| **1** | slower | lower |
| **2** | same | higher |
| **3** | faster | higher |
| **4** | same | lower |

**4.6.2.6 Visible light (physics only)**

**Question 29**

June 2010 | PHY1F | Original Q2 | Legacy

**2** The diagram shows the seven types of wave that make up the electromagnetic spectrum.

| | | | | | | |
|---|---|---|---|---|---|---|
| Gamma rays | X-rays | Ultraviolet rays | Visible light | Infra red rays | Micro-waves | Radio waves |

**2 (a) (i)** Microwaves and visible light can be used for communications.

Name **one** more type of electromagnetic wave that can be used for communications.

.....

*(1 mark)*

**2 (a) (ii)** Name **one** type of electromagnetic wave that has a longer wavelength than microwaves.

.....

*(1 mark)*

**2 (b)** Wi-Fi is a system that joins a laptop computer to the internet without using wires. A 2400 megahertz microwave signal is used to link a computer to a device called a router.

What quantity is measured in hertz?

Draw a ring around your answer.

**frequency** **wavelength** **wave speed**

*(1 mark)*

**2 (c)** A politician commented on the increasing use of Wi-Fi. He said: 'I believe that these systems may be harmful to children.'

**2 (c) (i)** Suggest **one** reason why more scientific research into the safety of Wi-Fi systems is needed.

.....

.....

*(1 mark)*

4.6.2.6 Visible light (physics only)

Question 29 · continued



**2 (c) (ii)** Complete the following sentence by drawing a ring around the correct line in the box.

What the politician said was

| |
|---|
| a fact. |
| an opinion. |
| a prediction. |

*(1 mark)*

5

**Turn over for the next question**

### 4.6.2.6 Visible light (physics only)

**Question 30**

November 2010 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

Different types of electromagnetic radiation affect living tissue and cells in different ways.

Match types of radiation, **A**, **B**, **C** and **D**, with the descriptions **1**–**4** in the table.

**A** infra red

**B** ultraviolet

**C** visible light

**D** X-rays

| | **The radiation . . .** |
|---|---|
| **1** | can be felt by the skin as heat. |
| **2** | can pass through fleshy tissue but is absorbed by bone. |
| **3** | can be detected by special cells in the eye. |
| **4** | can be absorbed by the skin and cause a suntan. |

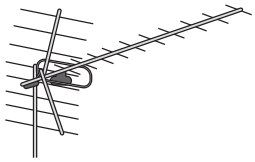
### 4.6.2.6 Visible light (physics only)

**Question 31**

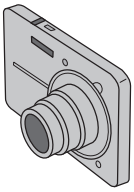
November 2010 | PHY1BP | Original Q3 | Legacy

**QUESTION THREE**

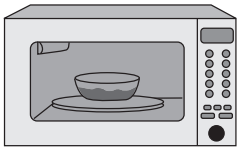
The drawings show devices that use electromagnetic waves.



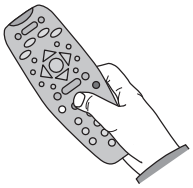
1



2



3



4

Match types of electromagnetic wave, **A**, **B**, **C** and **D**, with the devices **1**–**4**.

**A** infra red

**B** microwaves

**C** radio waves

**D** visible light

### 4.6.2.6 Visible light (physics only)

**Question 32**

November 2010 | PHY1BP | Original Q4 | Legacy

**QUESTION FOUR**

The diagram shows part of the electromagnetic spectrum.

| | | | | | | |
|---|---|---|---|---|---|---|
| **1** | X-rays | **2** | Visible light | **3** | Microwaves | **4** |

Match types of radiation, **A**, **B**, **C** and **D**, with the numbers **1**–**4** on the diagram.

**A** gamma

**B** infra red

**C** radio

**D** ultraviolet

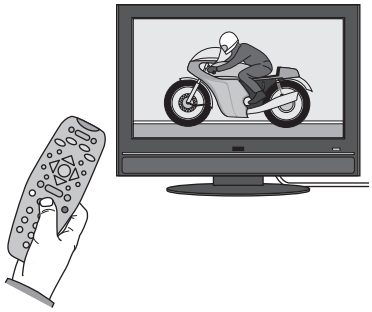
### 4.6.2.6 Visible light (physics only)

**Question 33**

March 2011 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

This question is about electromagnetic radiation and television.



Match types of electromagnetic radiation, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

**A** infra red

**B** microwaves

**C** radio waves

**D** visible light

Television signals from a transmitter on Earth are carried by . . . **1** . . . .

Television signals from a satellite are carried by . . . **2** . . . .

A television remote control uses . . . **3** . . . .

A television screen is designed to produce . . . **4** . . . .

### 4.6.2.6 Visible light (physics only)

**Question 34**

March 2011 | PHY1BP | Original Q2 | Legacy

**QUESTION TWO**

Electromagnetic radiation can be absorbed, reflected and transmitted.

Match words, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

**A** infra red

**B** microwaves

**C** visible light

**D** X-rays

A mirror is designed to reflect . . . **1** . . . .

Mobile phone masts are designed to transmit . . . **2** . . . .

The metal surface inside an oven is designed to reflect . . . **3** . . . .

Lead-lined aprons used in hospitals are designed to absorb . . . **4** . . . .

### 4.6.2.6 Visible light (physics only)

**Question 35**

March 2011 | PHY1BP | Original Q4 | Legacy

**QUESTION FOUR**

The waves in the electromagnetic spectrum can be grouped in order of wavelength.

Match types, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the table.

**A** gamma rays

**B** infra red rays

**C** radio waves

**D** ultraviolet rays

| |
|---|
| . . . **1** . . . |
| X-rays |
| . . . **2** . . . |
| visible light |
| . . . **3** . . . |
| microwaves |
| . . . **4** . . . |

### 4.6.2.6 Visible light (physics only)

**Question 36**



**QUESTION ONE**

Electromagnetic radiation has many uses.

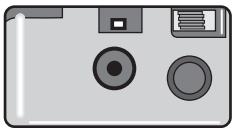
**1**

Toaster



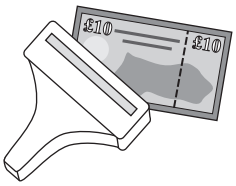
**2**

Camera



**3**

Forgery detector




**4**

Hospital scanner



Match useful types of electromagnetic radiation, **A**, **B**, **C** and **D**, with the drawings labelled **1**–**4**.

**A** infra red

**B** ultraviolet

**C** visible light

**D** X-rays

4.6.2.6 Visible light (physics only)

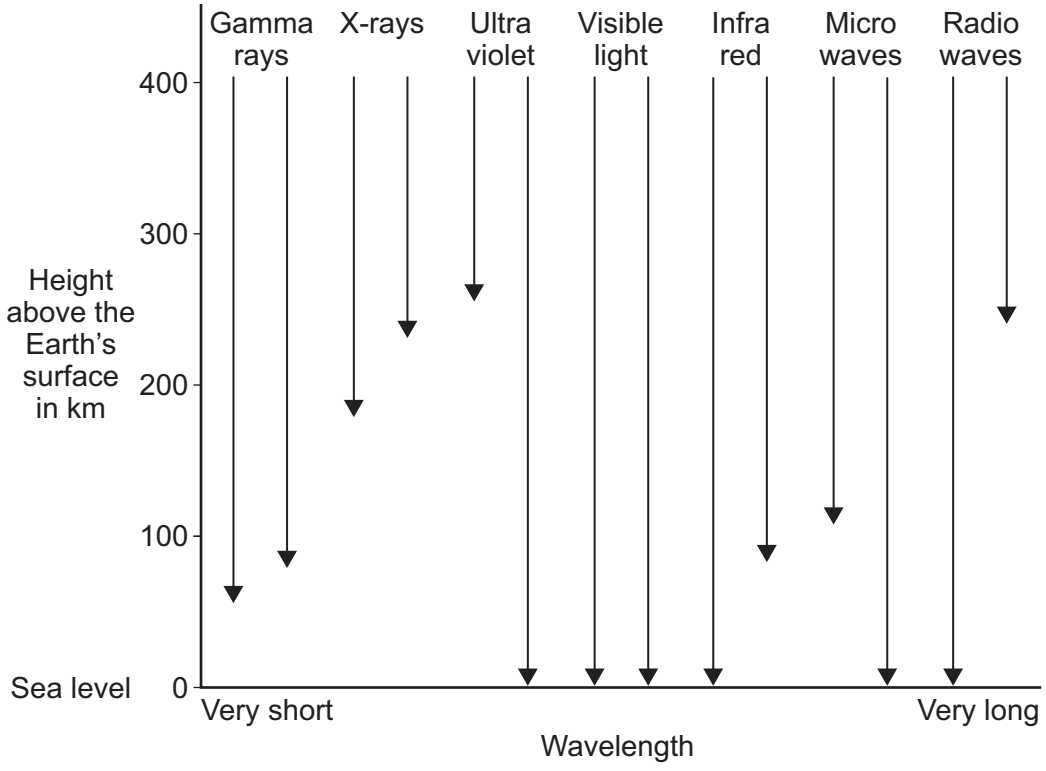
Question 37

June 2011 | PHY1BP | Original Q9 | Legacy

**QUESTION NINE**

Telescopes can be based on the Earth's surface or put into orbit in space.

The diagram shows how far electromagnetic waves penetrate the Earth's atmosphere. For some types of electromagnetic radiation, longer and shorter waves penetrate the atmosphere to different depths.




**9A** Telescopes on Earth detect **all** wavelengths of . . .

**1** radio waves only.

**2** visible light only.

**3** radio waves and visible light.

**4** visible light and X-rays.

**9B** Which of the following statements about the use of telescopes in space is true?

**1** The atmosphere distorts the image produced by the telescope.

**2** The telescopes are affected by light pollution from the Earth.

**3** The telescopes can detect electromagnetic waves that cannot reach the Earth's surface.

**4** The telescopes are easy to repair and maintain.

4.6.2.6 Visible light (physics only)

Question 37 · continued



The table gives information about some space telescopes. Each telescope detects a different type of electromagnetic radiation.

| Telescope | Wavelength detected in nanometres |
|---|---|
| INTEGRAL | less than 0.01 |
| Chandra | 0.01 – 20 |
| FUSE | 20 – 400 |
| Hubble | 400 – 700 |
| Spitzer | 1000 – 1 000 000 |

**9C** The Hubble telescope detects visible light.

Which telescope detects infra red radiation?

**1** Chandra

**2** FUSE

**3** INTEGRAL

**4** Spitzer

**9D** Which telescope detects X-rays?

**1** Chandra

**2** FUSE

**3** INTEGRAL

**4** Spitzer

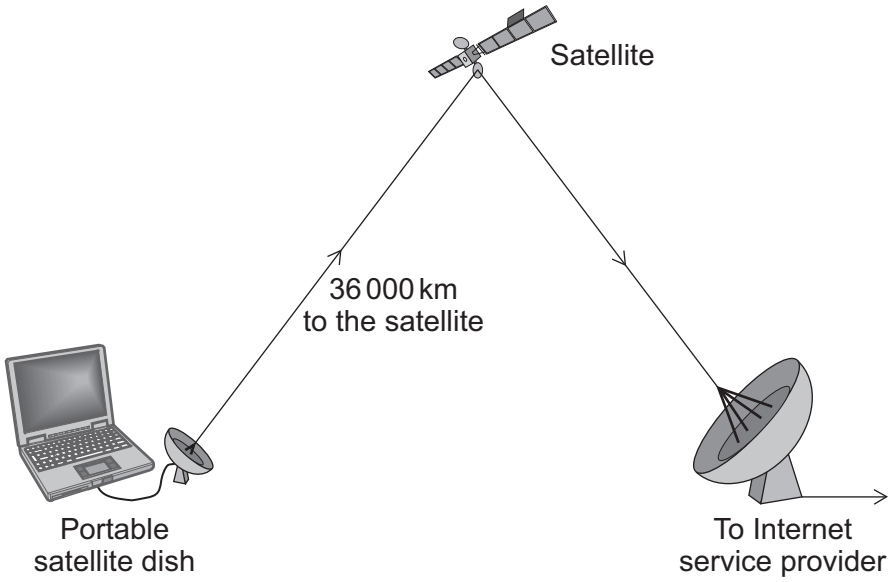
**END OF TEST**

### 4.6.2.6 Visible light (physics only)

**Question 38**

June 2011 | PHY1F | Original Q2 | Legacy

**2 (a)** The diagram shows a computer connected to the Internet using a satellite link.




**2 (a) (i)** Which **one** of the following types of electromagnetic wave is used to send information to the satellite?

Draw a ring around your answer.

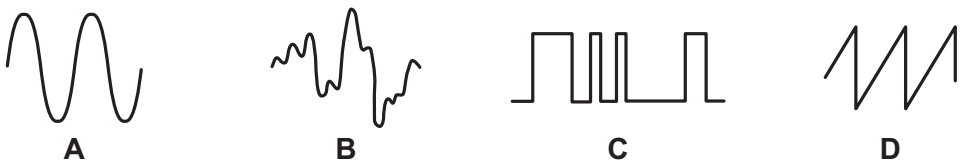
**microwave** **radio** **visible light**

*(1 mark)*

**2 (a) (ii)** The information is sent to the satellite using a digital signal.

Which **one** of the signals, **A**, **B**, **C** or **D**, is a digital signal?

Write your answer, **A**, **B**, **C** or **D**, in the box.




Signal ☐

*(1 mark)*

4.6.2.6 Visible light (physics only)

Question 38 · continued



**2 (a) (iii)** It is better to send information as a digital signal rather than as an analogue signal.

Which **one** of the following statements explains why?

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

Digital signals travel faster. ☐

Digital signals can be switched on and off. ☐

Digital signals are less affected by interference. ☐

*(1 mark)*

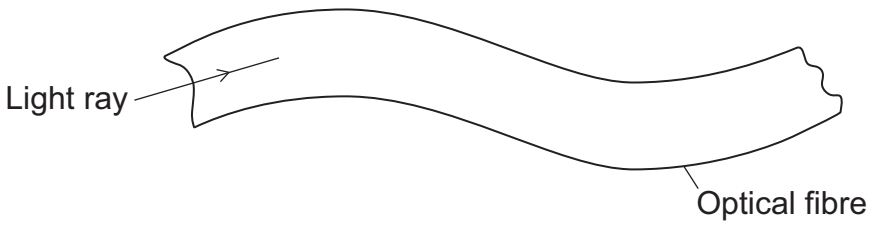
**2 (b)** Since 2009, people in some parts of Kenya have been able to connect to the Internet using signals sent through an optical fibre cable rather than via a satellite link.

**2 (b) (i)** Complete the following sentence by drawing a ring around the correct line in the box.

Visible light and [infra red / radio / ultraviolet] can be used to send signals along an optical fibre.

*(1 mark)*

**2 (b) (ii)** The diagram shows part of an optical fibre.




Complete the diagram to show how the light ray travels through the optical fibre.

*(2 marks)*

6

### 4.6.2.6 Visible light (physics only)

**Question 39**

November 2011 | PHY1BP | Original Q1 | Legacy

**QUESTION ONE**

Different types of electromagnetic waves are used in hospitals.

Match types of electromagnetic wave, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

**A** gamma rays

**B** infra red rays

**C** radio waves

**D** visible light

Surgical instruments are sterilised using . . . **1** . . . .

Laser eye surgery uses . . . **2** . . . .

Damaged muscles are given heat treatment using . . . **3** . . . .

A doctor can be contacted by a bleeper that uses . . . **4** . . . .

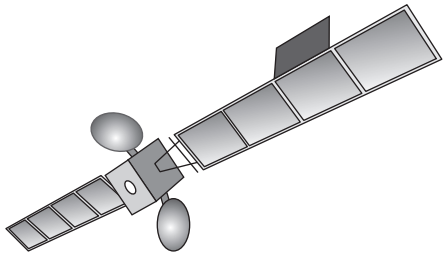
4.6.2.6 Visible light (physics only)

Question 40

November 2011 | PHY1BP | Original Q3 | Legacy

**QUESTION THREE**

The drawing shows a satellite that carries a telescope used to look at objects in space.



Match words, **A**, **B**, **C** and **D**, with the numbers **1**–**4** in the sentences.

**A** a distant galaxy

**B** a satellite

**C** the Earth

**D** the Universe

Observations of space using visible light are better made from . . . **1** . . . because clouds may block observations made from . . . **2** . . . .

The red-shift in light from . . . **3** . . . provides evidence of the ‘big bang’ theory of the start of . . . **4** . . . .

4.6.2.6 Visible light (physics only)

Question 41

November 2011 | PHY1BP | Original Q5 | Legacy

**QUESTION FIVE**

The frequencies of the waves in the electromagnetic spectrum can be grouped into types.

Match types, **A**, **B**, **C** and **D**, with the descriptions **1**–**4** in the table.

**A** gamma rays

**B** infra red rays

**C** radio waves

**D** ultraviolet rays

| | |
|---|---|
| **1** | They have a higher frequency than X-rays. |
| **2** | They have a lower frequency than microwaves. |
| **3** | They have a lower frequency than visible light but a higher frequency than microwaves. |
| **4** | They have a lower frequency than X-rays but a higher frequency than visible light. |

4.6.2.6 Visible light (physics only)

Question 42

November 2011 | PHY1BP | Original Q6 | Legacy

## QUESTION SIX

This question is about visible light and infra red rays.

**6A** Which statement is true for both visible light and infra red rays?

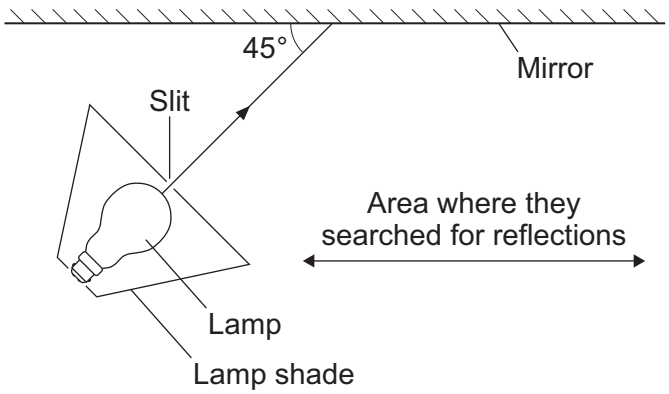
**1** They have the same wavelength.

**2** They have the same speed in a vacuum.

**3** Only visible light can travel along an optical fibre.

**4** Only infra red rays can be absorbed.

Some students wanted to see if visible light and infra red rays reflect at the same angle from a mirror. They set up a lamp pointing at 45° to a mirror. They then searched for reflections in the area shown in the diagram. Their investigation was carried out in a dark room.




**6B** The students carried out their investigation in a dark room because . . .

**1** visible light travels faster in the dark.

**2** it cuts out any other sources of visible light.

**3** it allows them to do their investigation safely.

**4** you can only see visible light in a dark room.

4.6.2.6 Visible light (physics only)

Question 42 · continued



**6C** To minimise random errors, the students should have . . .

**1** used a curved mirror.

**2** plotted a graph of the angles they measured.

**3** repeated the measurements several times and calculated the average.

**4** carried out the investigation in a room with the lights on.

**6D** When a household lamp was used, the students saw a reflection of the light at 45° to the mirror.

When an infra red source was used, they could not see the rays. Using an infra red detector, they did find a reflection at 45°.

This is because . . .

**1** infra red rays are not reflected by a mirror.

**2** infra red rays are absorbed by the mirror.

**3** human eyes are not sensitive to infra red rays.

**4** visible light and infra red rays reflect in different ways.

### 4.6.2.6 Visible light (physics only)

**Question 43**

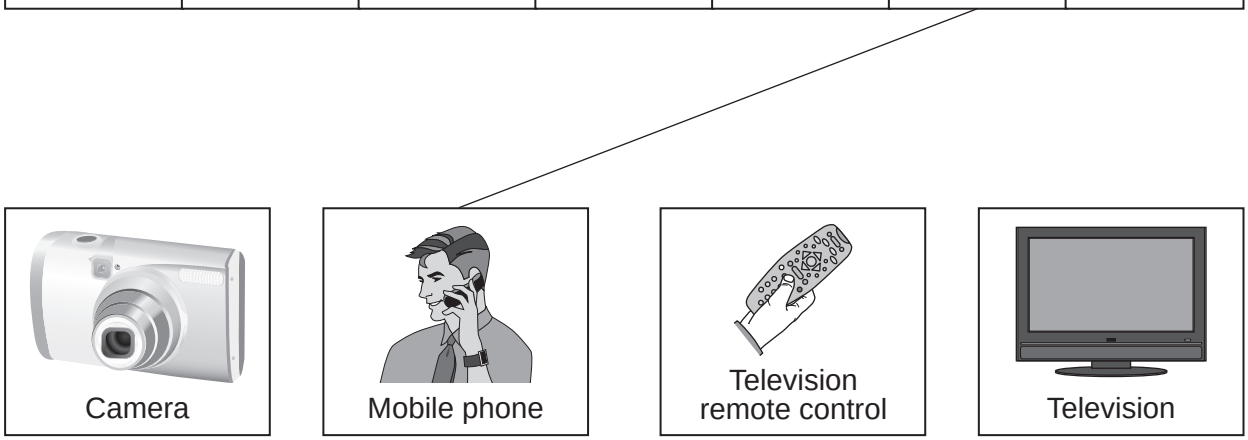
June 2012 | PH1FP | Original Q2 | Legacy

**2 (a)** The diagram shows the electromagnetic spectrum.

The pictures show four devices. Each device uses a different type of electromagnetic wave.

Draw **one** line from each device to the type of electromagnetic wave the device uses. One line has been drawn for you.

| Gamma rays | X-rays | Ultraviolet waves | Visible light waves | Infrared waves | Microwaves | Radio waves |
|---|---|---|---|---|---|---|




*(3 marks)*

**2 (b)** Visible light waves travel through space at a speed of 300 000 km/s.

How fast do infrared waves travel through space?

.....

*(1 mark)*

**2 (c)** Draw a ring around the correct answer in the box to complete the sentence.

Infrared waves have

| a longer wavelength than |
|---|
| the same wavelength as |
| a shorter wavelength than |

visible light waves.

*(1 mark)*

4.6.2.6 Visible light (physics only)

Question 43 · continued



**2 (d)** The two diagrams, **A** and **B**, show a light ray travelling into a glass block.

**Diagram A**

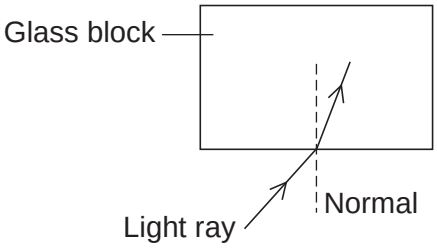
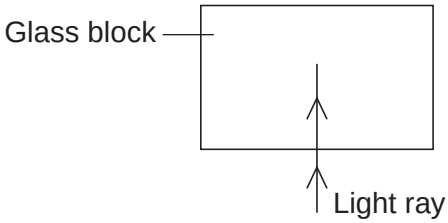



**Diagram B**




**2 (d) (i)** Look at **Diagram A**.

What name is given to the process that happens as the light enters the glass block?

.....

*(1 mark)*

**2 (d) (ii)** Look at **Diagram B**.

The light enters the glass block without changing direction.

Why?

.....

.....

*(1 mark)*

7

### 4.6.2.6 Visible light (physics only)

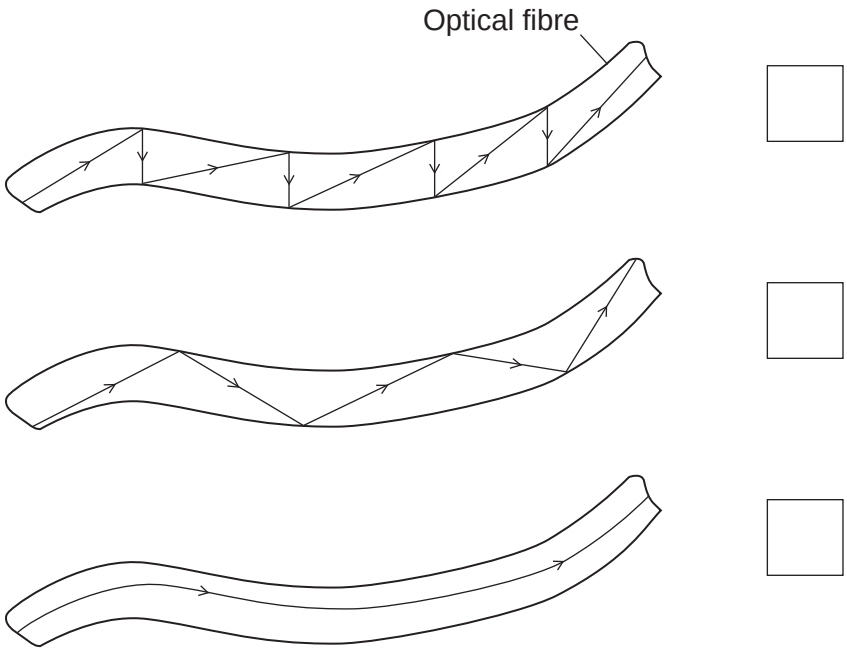
**Question 44**

June 2013 | PH3FP | Original Q1 | Legacy

**1 (a)** Visible light can be sent along optical fibres.

Which diagram correctly shows the path of light along an optical fibre?

Tick (✓) **one** box.




*(1 mark)*

**1 (b)** Complete the sentence to describe what happens to light as it travels through an optical fibre.

At the walls of the optical fibre, light undergoes total internal ..... .

*(1 mark)*

4.6.2.6 Visible light (physics only)

Question 44 · continued



**1 (c)** Which device passes light through optical fibres to produce images of the inside of the body?

Draw a ring around the correct answer.

**endoscope** **stethoscope** **X-ray machine**

*(1 mark)*

**1 (d)** Lasers are an energy source.

Which **one** of the following is a use for a laser?

Draw a ring around the correct answer.

**CT scanning** **digital camera** **eye surgery**

*(1 mark)*

4

**Turn over for the next question**

4.6.2.6 Visible light (physics only)

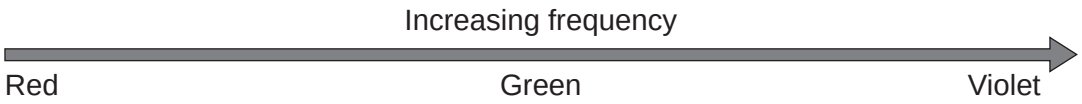
Question 45

June 2014 | PH1FP | Original Q6 | Legacy

**6 (a)** The visible light spectrum has a range of frequencies.

**Figure 8** shows that the frequency increases from red light to violet light.

**Figure 8**




Use the correct answers from the box to complete the sentence.

| | | |
|---|---|---|
| **decreases** | **stays the same** | **increases** |

**[2 marks]**

As the frequency of the light waves increases, the wavelength

of the light waves ..... and

the energy of the light waves ..... .

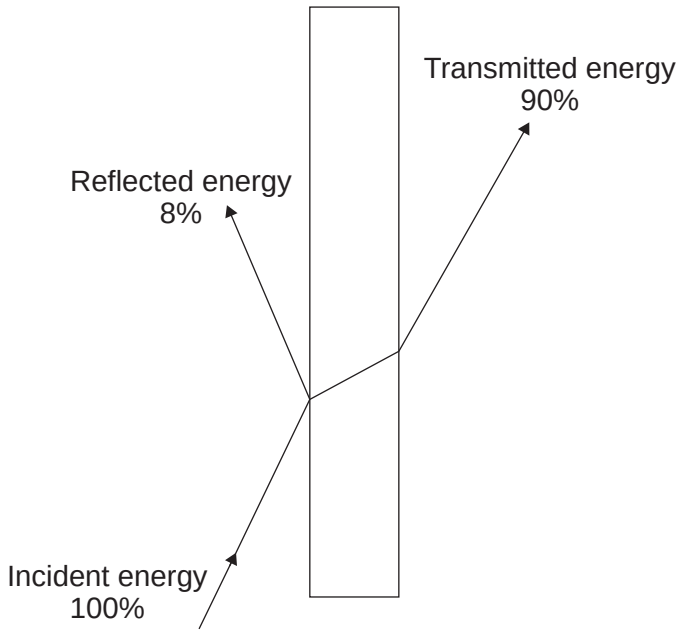
4.6.2.6 Visible light (physics only)

Question 45 · continued



**6 (b)** **Figure 9** shows what happens to the light energy when a ray of light hits a glass block.

**Figure 9**




98% of the incident energy is either reflected or transmitted by the glass block.

What happens to the other 2% of the incident energy?

**[1 mark]**

.....

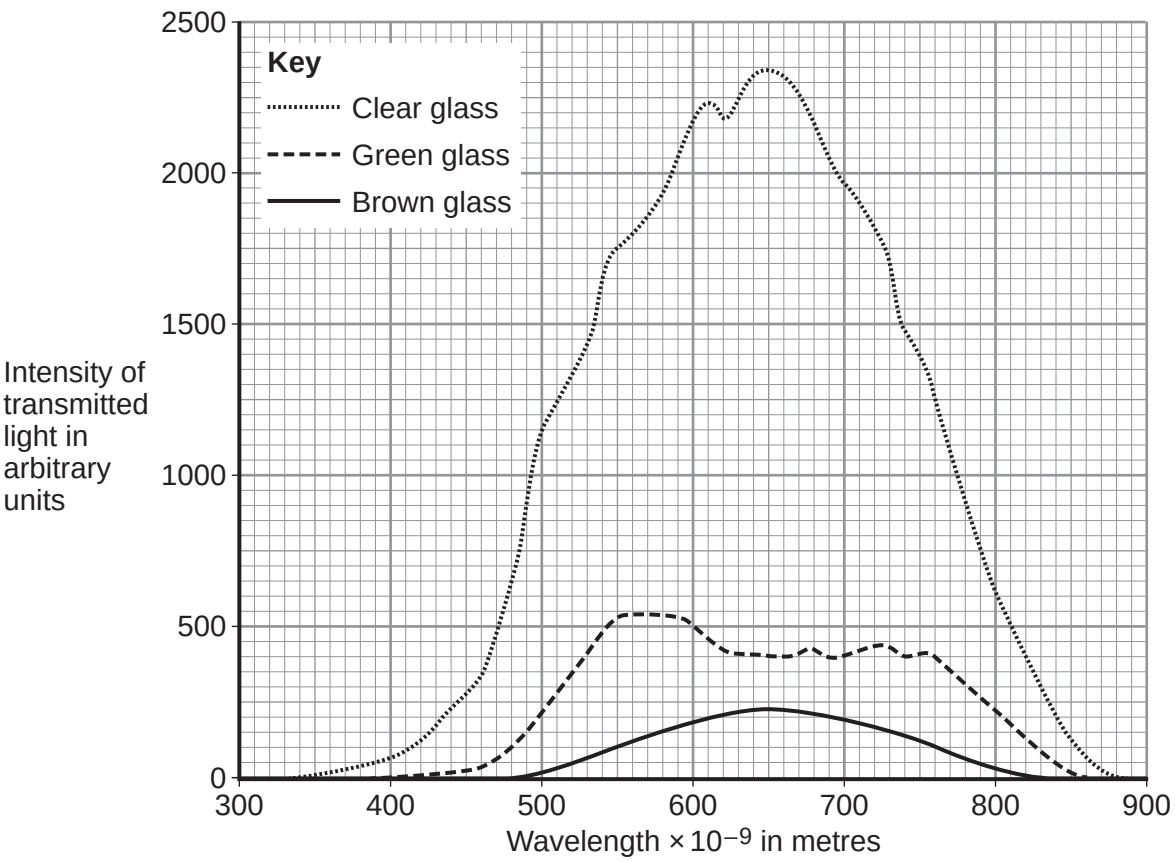
.....

**Question 6 continues on the next page**

**6 (c)** Bottled beer will spoil if the intensity of the light passing through the glass bottle into the beer is too high.

**Figure 10** shows the intensity of the light that is transmitted through three different pieces of glass.

**Figure 10**




**6 (c) (i)** The pieces of glass all had the same thickness.

Suggest why.

**[1 mark]**

.....

.....

**6 (c) (ii)** Bottles made of brown glass are suitable for storing beer.

Suggest why.

**[1 mark]**

.....

.....

5

4.6.2.6 Visible light (physics only)

Question 46

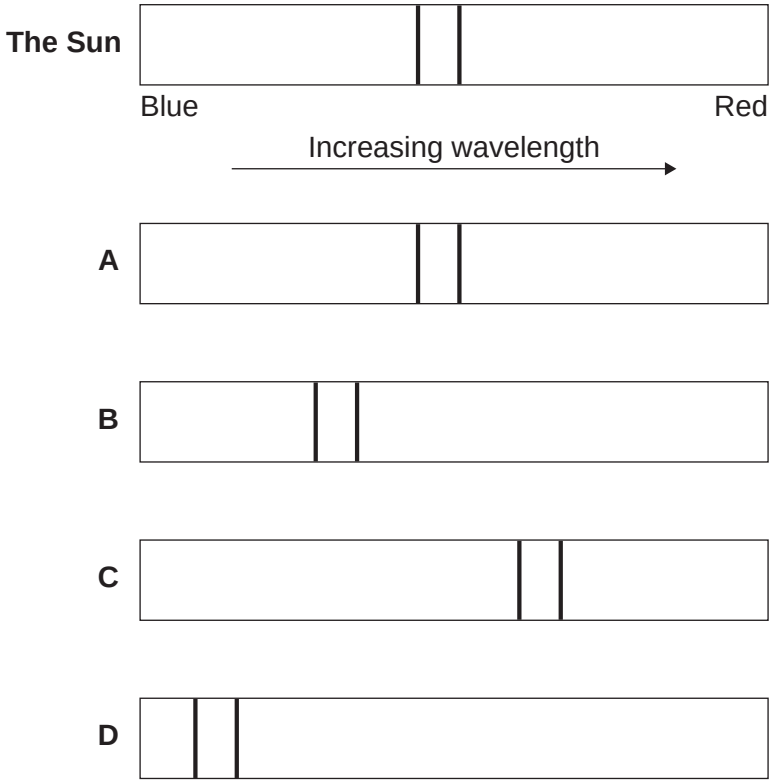


**6** Scientists can use the visible light spectrum from distant stars to determine whether the stars are moving.

The visible light spectrum from stars includes dark lines at specific wavelengths.

**6 (a)** **Figure 9** shows the visible light spectrum from the Sun and from four other stars, **A**, **B**, **C** and **D**.

**Figure 9**




**6 (a) (i)** Which star, **A**, **B**, **C** or **D**, is moving away from the Earth?

**[1 mark]**

4.6.2.6 Visible light (physics only)

Question 46 · continued



**6 (a) (ii)** How does the speed of star **B** compare with the speed of star **D**?

**[1 mark]**

Tick (✓) **one** box.

| | **Tick** (✓) |
|---|---|
| The speed of star **B** is greater than the speed of star **D**. | |
| The speed of star **B** is less than the speed of star **D**. | |
| The speed of star **B** is the same as the speed of star **D**. | |

**6 (b)** A radio wave is emitted by a star.
The radio wave has a wavelength of 1500 m and a frequency of 200 000 Hz.

Calculate the speed of this radio wave.

Use the correct equation from the Physics Equations Sheet.

**[3 marks]**

Choose the correct unit from the list below.

**m** **m/s** **m/s$^2$**

.....

.....

.....

Speed = ..... unit .....

5

4.6.2.6 Visible light (physics only)

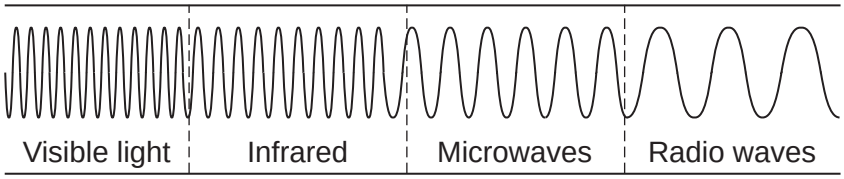
Question 47

June 2016 | PH1FP | Original Q3 | Legacy

**3** Infrared and microwaves are two types of electromagnetic radiation.

**Figure 4** shows the positions of the two types of radiation within part of the electromagnetic spectrum.

**Figure 4**




**3 (a) (i)** Name **one** type of electromagnetic radiation which has more energy than infrared.

**[1 mark]**

_____

**3 (a) (ii)** Use the correct answer from the box to complete each sentence.

Each answer may be used once, more than once or not at all.

**[3 marks]**

| | | |
|---|---|---|
| **greater than** | **less than** | **the same as** |

The wavelength of infrared is _____ the wavelength of microwaves.

The frequency of microwaves is _____ the frequency of infrared.

The speed of microwaves in a vacuum is _____ the speed of infrared in a vacuum.

4.6.2.6 Visible light (physics only)

Question 47 · continued



**3 (b)** Cosmic Microwave Background Radiation (CMBR) is electromagnetic radiation that fills the universe.

Only one theory about the origin of the universe can explain the presence of CMBR.

**3 (b) (i)** Give the name of this theory.

**[1 mark]**

_____

**3 (b) (ii)** Which other piece of evidence supports this theory?

**[1 mark]**

Tick (✓) **one** box.

| | **Tick (✓)** |
|---|---|
| the diffraction of sound waves | |
| the electromagnetic spectrum | |
| the red-shift of light from distant galaxies | |

6

4.6.2.6 Visible light (physics only)

Question 48

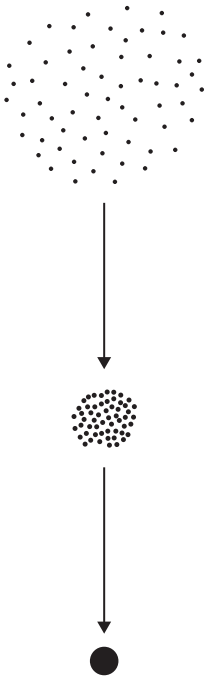


**1 (a)** **Figure 1** shows how a star is formed.

Use **one** answer from each box to complete the sentences in **Figure 1**.

**[3 marks]**

**Figure 1**



| | | |
|---|---|---|
| **gas** | **rock** | **water** |

A star starts as a huge cloud of dust and _____ particles in space.

| | | |
|---|---|---|
| **friction** | **fusion** | **gravity** |

The force of _____ pulls the particles in the cloud closer together.

| | | |
|---|---|---|
| **protostar** | **red giant** | **white dwarf** |

The compressed mass of particles

forms a _____ .

4.6.2.6 Visible light (physics only)

Question 48 · continued



**1 (b)** Elements heavier than iron are formed in a supernova.
What is a supernova?

**[1 mark]**

Tick (✓) **one** box.

the explosion of a massive star ☐

a very bright, hot young star ☐

a very cool super giant star ☐

**1 (c)** Brown dwarf stars are small stars too cool to give out visible light. They were first discovered in 1995. Scientists think that there are millions of these stars spread throughout the Universe.

Which **one** of the following is the most likely reason why brown dwarf stars were not discovered before 1995?

**[1 mark]**

Tick (✓) **one** box.

Brown dwarf stars did not exist before 1995. ☐

Scientists were looking in the wrong part of the Universe. ☐

The telescopes and measuring instruments were not sensitive enough. ☐

5

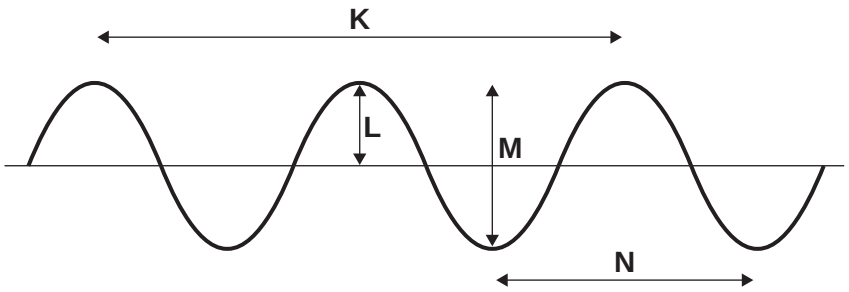
4.6.2.6 Visible light (physics only)

Question 49

June 2017 | PH1FP | Original Q3 | Legacy

**3 (a)** **Figure 4** shows an electromagnetic wave.

**Figure 4**




**3 (a) (i)** Which arrow, **K**, **L**, **M** or **N**, shows the wavelength of the wave?

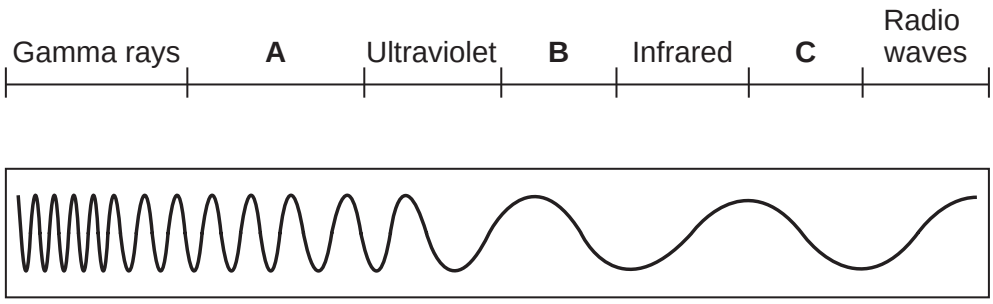
**[1 mark]**

**3 (a) (ii)** Which arrow, **K**, **L**, **M** or **N**, shows the amplitude of the wave?

**[1 mark]**

**3 (b)** **Figure 5** shows the electromagnetic spectrum.

**Figure 5**




A laser emits visible light.

Which letter, **A**, **B** or **C**, on **Figure 5** shows the position of visible light?

**[1 mark]**

4.6.2.6 Visible light (physics only)

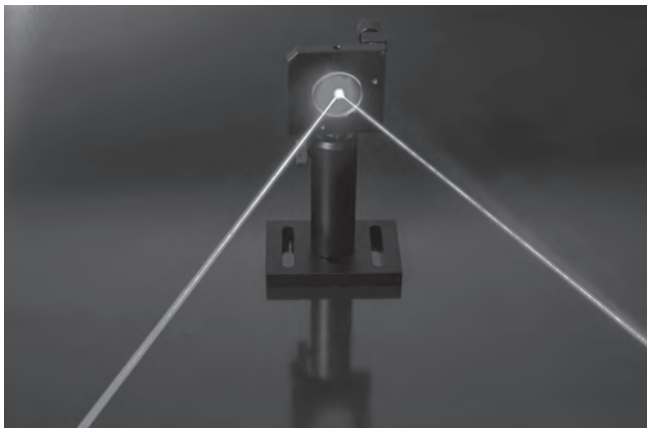
Question 49 · continued



**3 (c)** Laser light is used in some burglar alarms.

**Figure 6** shows laser light being reflected by a mirror. The light then reaches a detector.

**Figure 6**



**3 (c) (i)** How does the size of the angle of incidence compare with the size of the angle of reflection?

**[1 mark]**

_____

_____

**3 (c) (ii)** When a burglar gets in the way of the laser light, the light no longer reaches the detector.

Suggest **one** reason why.

**[1 mark]**

_____

_____

5

4.6.2.6 Visible light (physics only)

Question 50

June 2018 | 8463/2F | Original Q5

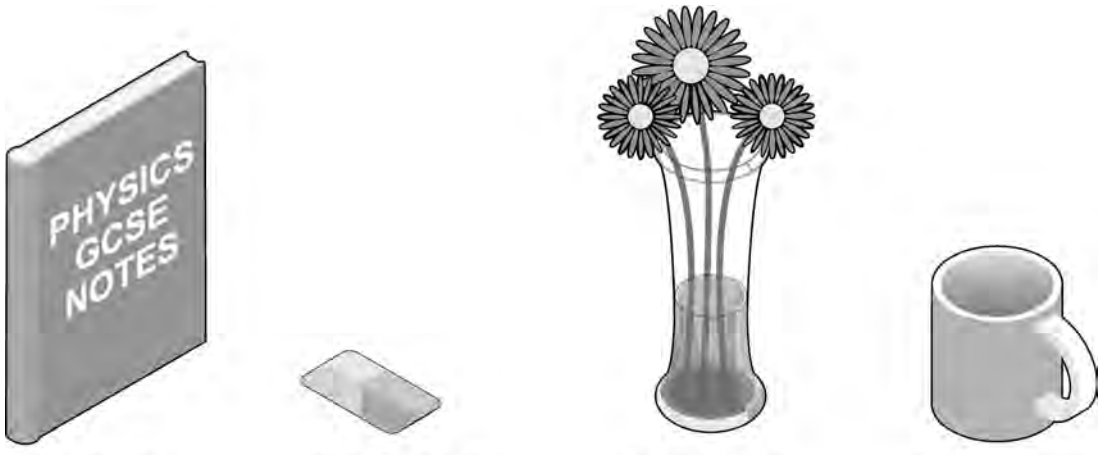
**0 5** Some objects are transparent and some objects are opaque.

**0 5 . 1** Which **one** of the objects in **Figure 5** is transparent?

Tick **one** box.

**[1 mark]**

**Figure 5**




Book ☐ Pencil rubber ☐ Glass vase ☐ Ceramic mug ☐

**0 5 . 2** Complete the sentence.

Choose an answer from the box.

**[1 mark]**

| | | |
|---|---|---|
| **absorb** | **reflect** | **transmit** |

An opaque object does not _____ light.

4.6.2.6 Visible light (physics only)

Question 50 · continued



A student wears a white T-shirt and a red baseball cap to a party.

**0 5 . 3** Why does the T-shirt look white in white light?

**[1 mark]**

**0 5 . 4** Explain how the colour of the baseball cap appears to change when the room lights at the party change from white to blue.

**[2 marks]**

**Question 5 continues on the next page**

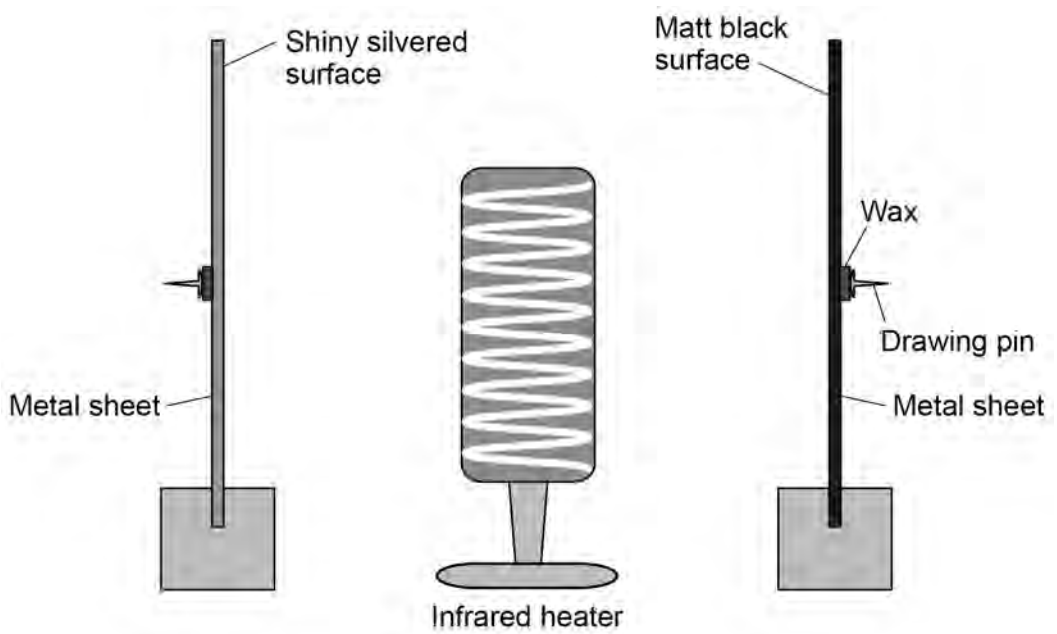
Question 50 · continued



A student investigated how the type of surface affects the amount of infrared radiation the surface absorbs.

**Figure 6** shows the equipment that the student used.

**Figure 6**




The metal sheets absorb infrared radiation. The wax melts and the drawing pins fall off the surfaces.

**0 5 . 5** In the investigation there are several variables.

Draw **one** line from each variable to the correct description of that variable.

**[2 marks]**

| Variable | Description |
|---|---|
| Control | Distance from the metal sheets to the infrared heater. |
| Dependent | The surface colour of the metal sheets. |
| Independent | Time taken for the drawing pins to fall off. |

4.6.2.6 Visible light (physics only)

Question 50 · continued



**0 5 . 6** What is the main hazard in this investigation?

**[1 mark]**

**0 5 . 7** The drawing pin attached to the matt black metal sheet fell off first.

What can be concluded from this result?

**[1 mark]**

9

**Turn over for the next question**

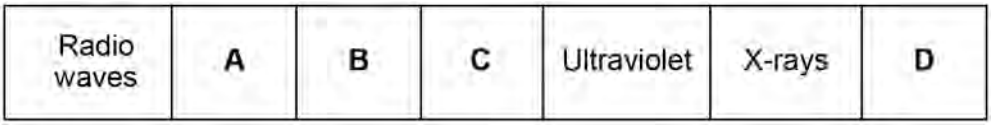
4.6.2.6 Visible light (physics only)

Question 51

June 2018 | 8463/2F | Original Q8

**0 8** **Figure 10** shows the position of three types of wave in the electromagnetic spectrum.

**Figure 10**




**0 8 . 1** Which position shows where visible light is in the spectrum?

Tick **one** box.

**[1 mark]**

**A** ☐ **B** ☐ **C** ☐ **D** ☐

**0 8 . 2** Which **one** of the statements about electromagnetic waves is correct?

Tick **one** box.

**[1 mark]**

Radio waves have a higher frequency than X-rays. ☐

Radio waves have a longer wavelength than ultraviolet. ☐

X-rays have a longer wavelength than radio waves. ☐

X-rays travel faster through the air than ultraviolet. ☐

**0 8 . 3** Give **one** possible danger of exposing your skin to ultraviolet radiation.

**[1 mark]**

4.6.2.6 Visible light (physics only)

Question 51 · continued



**0 8 . 4** Having an X-ray taken exposes a person to ionising radiation.

**Table 3** gives the average radiation dose for an X-ray of the chest and an X-ray of the upper digestive system.

**Table 3**

| Part of the body | Radiation dose in millisieverts (mSv) |
|---|---|
| Upper digestive system | 5.0 |
| Chest | 0.1 |

The risk of an X-ray causing cancer is about 1 in 20 000 for each mSv of radiation received.

Compare the risk of developing cancer from having an X-ray of the upper digestive system with the risk from having an X-ray of the chest.

Use the data in **Table 3**.

**[2 marks]**

5

4.6.2.6 Visible light (physics only)

Question 52

June 2019 | 8463/1F | Original Q9

**0 9** Light bulbs are labelled with a power input.

**0 9 . 1** What does power input mean?

**[1 mark]**

Tick (✓) **one** box.

- The charge transferred each second by the bulb. ☐
- The current through the bulb. ☐
- The energy transferred each second to the bulb. ☐
- The potential difference across the bulb. ☐

**0 9 . 2** Write down the equation which links current, potential difference and power.

**[1 mark]**

_____

**0 9 . 3** A light bulb has a power input of 40 W

The mains potential difference is 230 V

Calculate the current in the light bulb.

**[3 marks]**

_____

_____

_____

Current = _____ A

4.6.2.6 Visible light (physics only)

Question 52 · continued



**Table 3** shows information about three different light bulbs.

**Table 3**

| Light bulb | Total power input in watts | Useful power output in watts | Efficiency |
|---|---|---|---|
| P | 6.0 | 5.4 | 0.90 |
| Q | 40 | 2.0 | 0.05 |
| R | 9.0 | **X** | 0.30 |

**0 9 . 4** Write down the equation which links efficiency, total power input and useful power output.

**[1 mark]**

**0 9 . 5** Calculate the value of **X** in **Table 3**.

**[3 marks]**

**X** = _____ W

**0 9 . 6** In addition to power input, light bulbs should also be labelled with the rate at which they emit visible light.

Suggest why.

**[2 marks]**

11

4.6.2.6 Visible light (physics only)

Question 53

November 2020 | 8463/2F | Original Q4

**0 4 . 1** Visible light is used for communications.

Which other parts of the electromagnetic spectrum are used for communications?

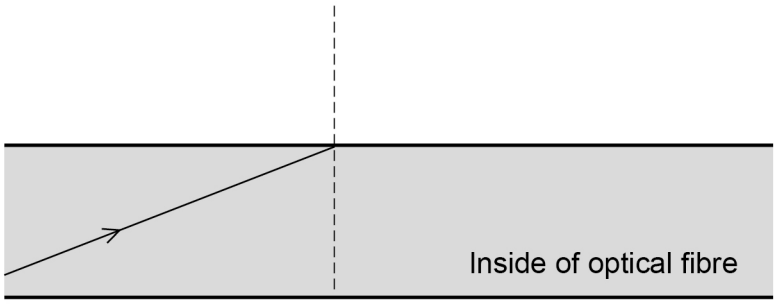
**[2 marks]**

Tick (✓) **two** boxes.

- Gamma rays ☐
- Microwaves ☐
- Radio waves ☐
- Ultraviolet ☐
- X-rays ☐

**Figure 5** shows a ray of light in an optical fibre.

**Figure 5**




**0 4 . 2** What is the name given to the dotted line on **Figure 5**?

**[1 mark]**

**0 4 . 3** Where the ray of light touches the edge of the optical fibre it is reflected.

Draw the reflected ray on **Figure 5**.

**[2 marks]**

**Question 4 continues on the next page**

4.6.2.6 Visible light (physics only)

Question 53 · continued



**0 4 . 4** Optical fibres need to be able to bend around corners without breaking.

Suggest the property that optical fibres must have to allow them to bend around corners.

**[1 mark]**

_____

_____

**0 4 . 5** The appearance of visible light can change when it interacts with different objects.

Complete the sentences.

Choose the answers from the box.

Each answer may be used once, more than once or not at all.

**[3 marks]**

| | | | |
|---|---|---|---|
| **absorbed** | **reflected** | **refracted** | **transmitted** |

When white light is incident on a green filter, only green light passes through the filter.

This is because green light is _____ by the filter.

All other colours of light are _____ by the filter.

When red light shines on a blue object the red light is _____.

9

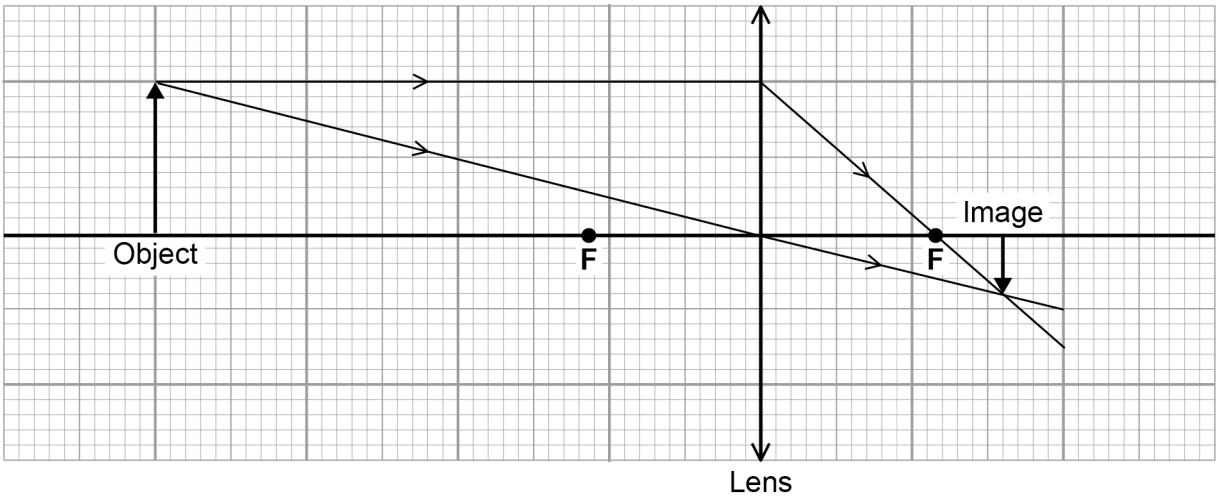
4.6.2.6 Visible light (physics only)

Question 54

November 2021 | 8463/2F | Original Q5

**0 5** **Figure 14** shows how a lens forms an image of an object.

**Figure 14**




**0 5 . 1** What type of lens is represented in **Figure 14**?

**[1 mark]**

Tick (✓) **one** box.

Concave ☐

Convex ☐

Diverging ☐

**0 5 . 2** Measure the image height and the object height in **Figure 14**.

**[1 mark]**

Image height = _____ cm

Object height = _____ cm

4.6.2.6 Visible light (physics only)

Question 54 · continued



**0 5 . 3** Calculate the magnification produced by the lens.

Use the equation:

$$\text{magnification} = \frac{\text{image height}}{\text{object height}}$$

**[2 marks]**

Magnification = _____

**0 5 . 4** Which **two** words describe the image in **Figure 14**?

**[2 marks]**

Tick (✓) **two** boxes.

- Enlarged ☐
- Inverted ☐
- Real ☐
- Upright ☐
- Virtual ☐

**Question 5 continues on the next page**

4.6.2.6 Visible light (physics only)

Question 54 · continued



**0 5 . 5** The object was blue.

A student looked at the blue object through a green filter.

Complete the sentences.

Choose answers from the box.

**[2 marks]**

| | | | | |
|---|---|---|---|---|
| **black** | **blue** | **green** | **red** | **white** |

Looking at the blue object through a green filter makes the object appear _____ .

This is because the green filter only transmits the light that is _____ .

8

4.6.2.6 Visible light (physics only)

Question 55

June 2022 | 8463/2F | Original Q5

**0 5** Ultraviolet and visible light are both parts of the electromagnetic spectrum.

**0 5 . 1** How does the speed of ultraviolet in a vacuum compare to the speed of visible light in a vacuum?

**[1 mark]**

Tick (✓) **one** box.

Ultraviolet travels at a faster speed than visible light. ☐

Ultraviolet travels at a slower speed than visible light. ☐

Ultraviolet travels at the same speed as visible light. ☐

**0 5 . 2** **Figure 9** shows parts of the electromagnetic spectrum.

**Figure 9**

| Radio waves | A | B | C | D | X-rays | Gamma rays |
|---|---|---|---|---|---|---|

Which letters represent the positions of ultraviolet and visible light in the electromagnetic spectrum?

**[2 marks]**

Ultraviolet _____

Visible light _____

4.6.2.6 Visible light (physics only)



**0 5 . 3** **Table 3** shows the range of wavelengths for different types of ultraviolet.

**Table 3**

| Type | Range of wavelength in nanometres |
|---|---|
| Ultraviolet **A** (UVA) | 315–400 |
| Ultraviolet **B** (UVB) | 280–315 |
| Ultraviolet **C** (UVC) | 100–280 |

Determine which type of ultraviolet shown in **Table 3** has the largest range of wavelengths.

To gain full marks you must calculate the range of wavelengths for each type of ultraviolet.

**[3 marks]**

Type of ultraviolet with the largest range of wavelengths _____

**Question 5 continues on the next page**

Question 55 · continued



**Figure 10** shows how different types of ultraviolet are absorbed by the ozone layer in the Earth's atmosphere.

**Table 4** shows the relative ionising power from each type of ultraviolet.

**Figure 10**

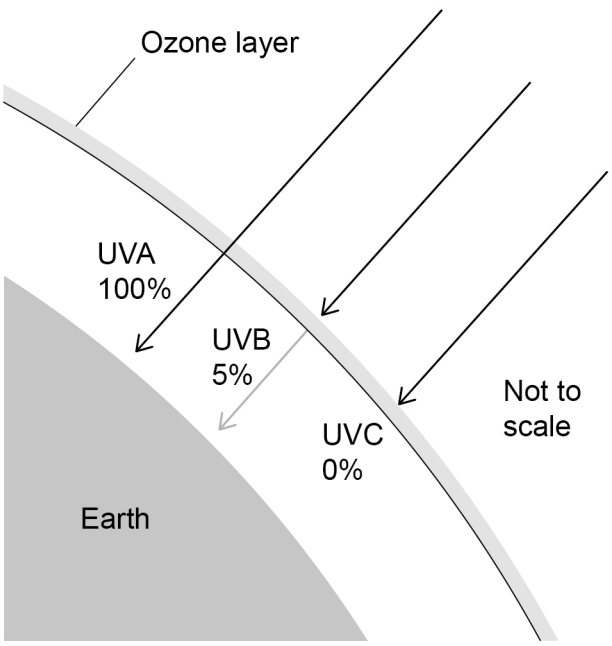



**Table 4**

| Type | Relative ionising power |
|---|---|
| UVA | Low |
| UVB | Medium |
| UVC | High |

**0 5 . 4** Explain the importance of the ozone layer in reducing the risk to people from all types of ultraviolet.

Use **Figure 10** and **Table 4**.

**[4 marks]**

**0 5 . 5** The Sun emits visible light.

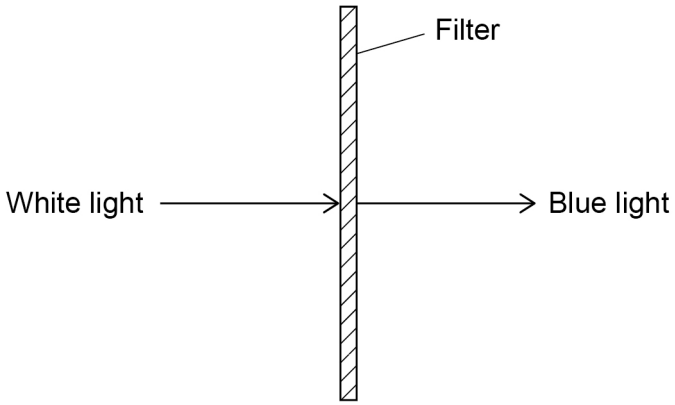
A student concludes that visible light is **not** absorbed by the ozone layer.

Give **one** piece of evidence that shows the student's conclusion is correct.

**[1 mark]**

**0 5 . 6** **Figure 11** shows white light incident on a colour filter.

**Figure 11**




Complete the sentence.

Choose the answers from the box.

**[2 marks]**

| | | | | |
|---|---|---|---|---|
| **absorbed** | **radiated** | **reflected** | **refracted** | **transmitted** |

When white light is incident on the filter, only blue light is _____

and all other colours of light are _____ .

13

4.6.2.6 Visible light (physics only)

Question 56

June 2023 | 8463/2F | Original Q6

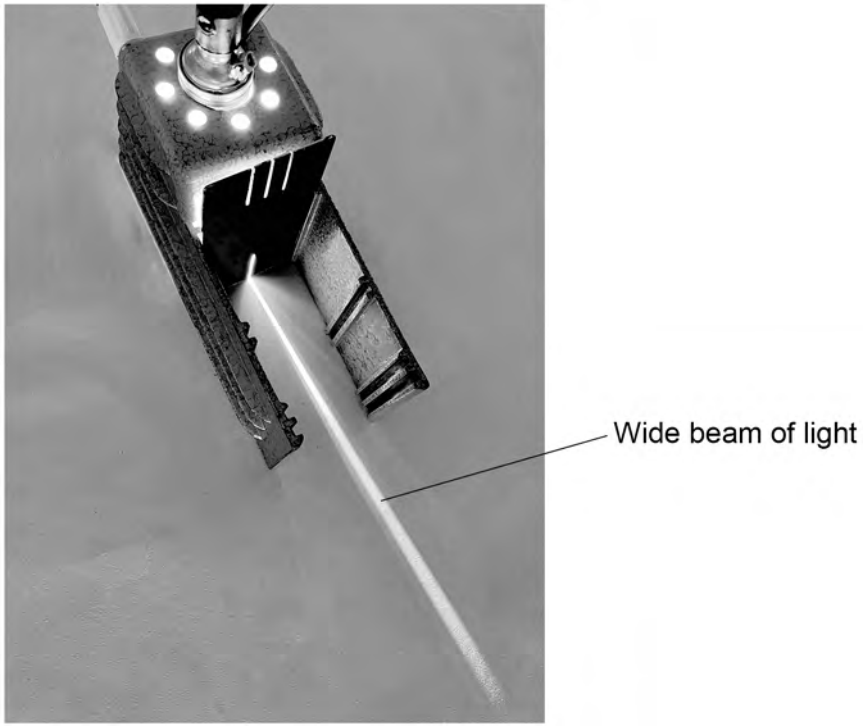
**0 6** A student investigated the refraction of light through a glass block.

**Figure 14** shows the ray box used.

The student aimed the beam of light from the ray box towards a glass block.

The student measured the angle of incidence at the point where the light entered the glass block.

**Figure 14**




**0 6 . 1** Why is using a wide beam of light less likely to give accurate results than using a narrow beam?

**[1 mark]**

Tick (✓) **one** box.

- It will be harder to judge where the centre of the beam is. ☐
- It will cause a smaller uncertainty in the measurements. ☐
- The angle of refraction will be larger than it should be. ☐

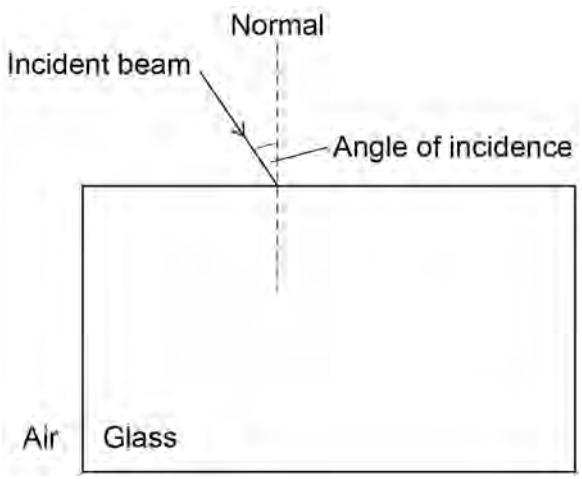
4.6.2.6 Visible light (physics only)

Question 56 · continued



**0 6 . 2** **Figure 15** shows the beam of light incident on the glass block.

**Figure 15**




Complete **Figure 15** to show the path taken by the beam of light through the glass block and back into the air.

**[3 marks]**

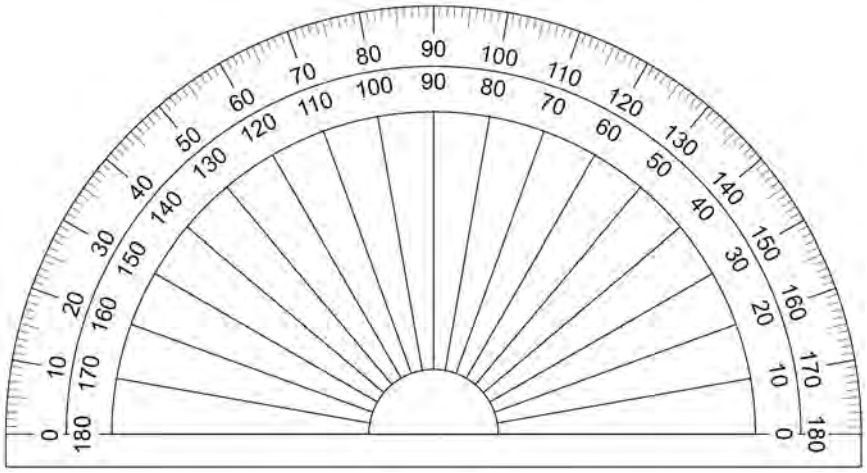
4.6.2.6 Visible light (physics only)

Question 56 · continued



**Figure 16** shows the protractor used by the student.

**Figure 16**



**0 6 . 3** What is the resolution of the protractor?

**[1 mark]**

Tick (✓) **one** box.

1 degree ☐

10 degrees ☐

180 degrees ☐

**0 6 . 4** For one angle of incidence the student measured the angle of refraction three times.

The three measurements were:

35° 31° 33°

Calculate the mean angle of refraction.

**[1 mark]**

Mean angle of refraction = _____ °

Question 56 · continued



The student placed a red filter in front of the white beam of light.

Only red light passes through the filter.

**0 6 . 5** Complete the sentence.

**[1 mark]**

When white light is incident on the red filter, all colours except for red are

_____ by the filter.

Use the Physics Equations Sheet to answer questions **06.6** and **06.7**.

**0 6 . 6** Write down the equation which links frequency ($f$), wave speed ($v$) and wavelength ($\lambda$).

**[1 mark]**

_____

**0 6 . 7** Light has a wave speed of $3.0 \times 10^8$ m/s in air.

The frequency of the red light is $4.0 \times 10^{14}$ Hz.

Calculate the wavelength of the red light in air.

**[3 marks]**

_____

_____

_____

_____

_____

Wavelength = _____ m

11

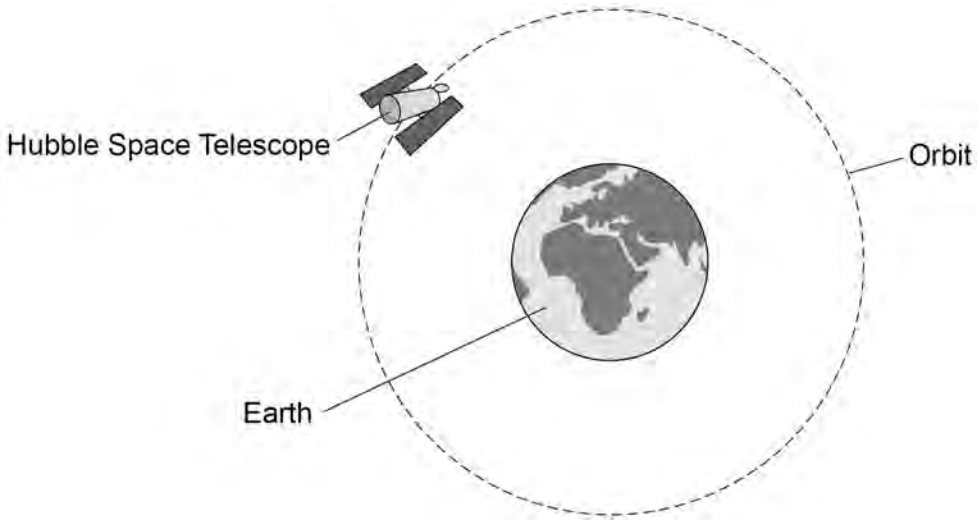
4.6.2.6 Visible light (physics only)

Question 57

June 2023 | 8463/2F | Original Q7

**0 7** **Figure 17** shows the Hubble Space Telescope orbiting the Earth.

**Figure 17**




**0 7 . 1** What name is given to an object that orbits a planet?

**[1 mark]**

Tick (✓) **one** box.

A comet ☐

A satellite ☐

A star ☐

**0 7 . 2** The Earth exerts a gravitational force on the Hubble Space Telescope.

Draw an arrow on **Figure 17** to show the gravitational force.

**[1 mark]**

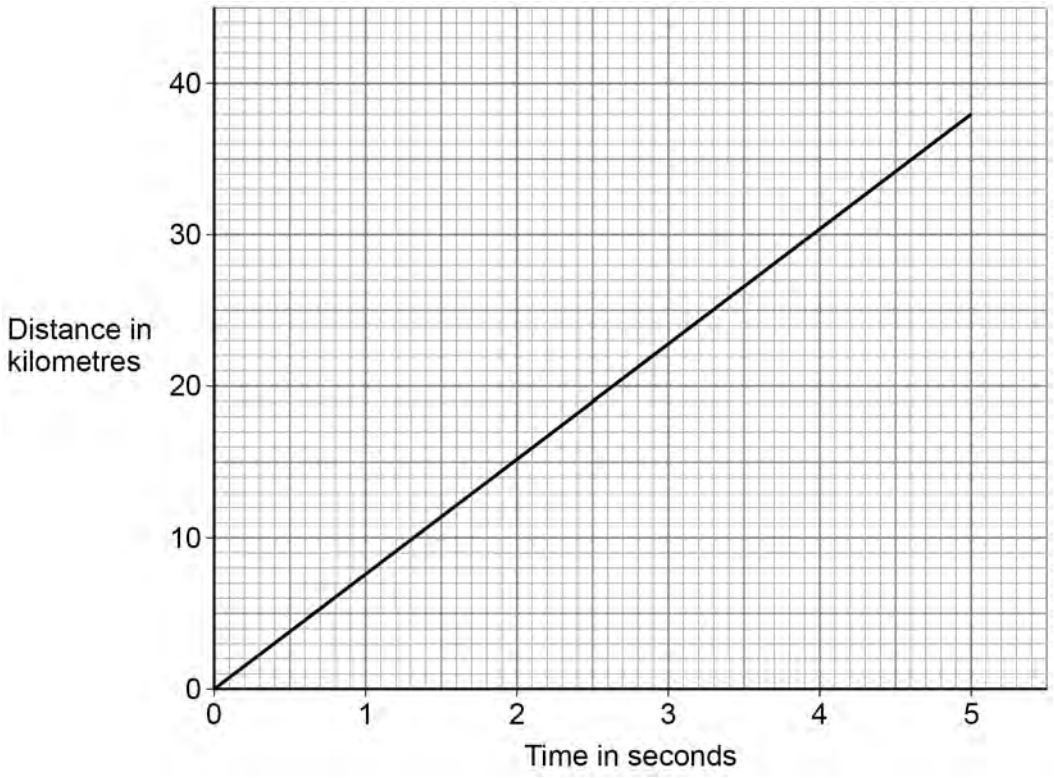
4.6.2.6 Visible light (physics only)

Question 57 · continued



**0 7 . 3** **Figure 18** shows how the distance travelled by the Hubble Space Telescope during its orbit changes with time.

**Figure 18**




The gradient of the line in **Figure 18** gives the speed of the Hubble Space Telescope.

Determine the speed of the Hubble Space Telescope.

Give your answer in km/s.

**[3 marks]**

Speed = _____ km/s

4.6.2.6 Visible light (physics only)

Question 57 · continued

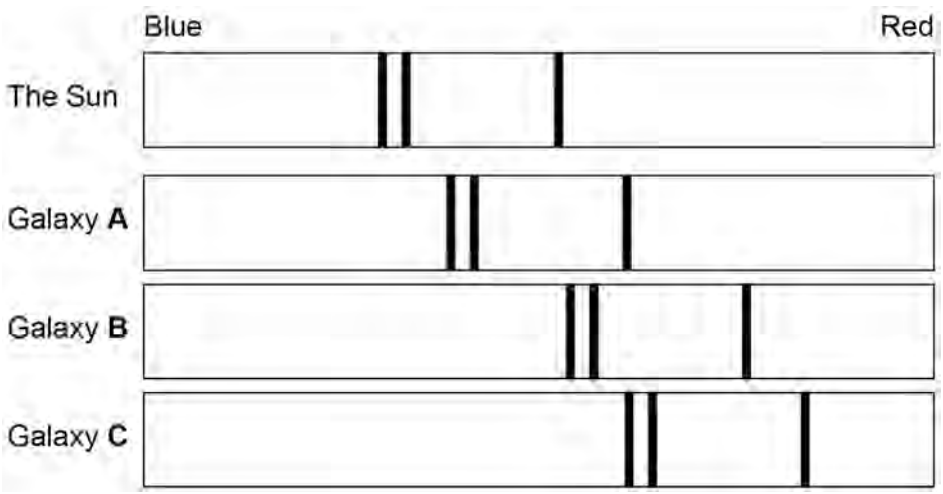


The Hubble Space Telescope can detect the visible light spectra from distant galaxies.

The visible light spectra from stars and galaxies include dark lines at specific wavelengths.

**Figure 19** shows the visible light spectra from the Sun and three galaxies.

**Figure 19**




**0 7 . 4** Which galaxy is moving away from the Earth the fastest?

**[1 mark]**

Tick (✓) **one** box.

Galaxy **A** ☐

Galaxy **B** ☐

Galaxy **C** ☐

4.6.2.6 Visible light (physics only)

Question 57 · continued

June 2023 | 8463/2F | Original Q7

**0 7 . 5** Which galaxy is the furthest away from the Earth?

**[1 mark]**

Tick (✓) **one** box.

Galaxy **A** ☐

Galaxy **B** ☐

Galaxy **C** ☐

**0 7 . 6** New scientific observations indicate that many galaxies rotate too quickly for the known mass of the stars they contain.

Why is it important that new scientific observations are peer reviewed?

**[1 mark]**

Tick (✓) **one** box.

To check the observations are correct ☐

To identify control variables ☐

To provide more proof ☐

8

4.6.2.6 Visible light (physics only)

**Question 58**

June 2024 | 8463/2F | Original Q1

**0 1** A group of stars is called a galaxy.

**0 1 . 1** What is the name of our galaxy?

**[1 mark]**

Tick (✓) **one** box.

- Black Eye ☐
- Hockey Stick ☐
- Milky Way ☐
- Sculptor Dwarf ☐

**0 1 . 2** The Sun is one of the stars in our galaxy.

What was the Sun originally formed from?

**[1 mark]**

Tick (✓) **one** box.

- Dust and gas ☐
- Heavy elements ☐
- Oxygen ☐

4.6.2.6 Visible light (physics only)

Question 58 · continued



**0 1 . 3** Which of the following forces was involved in the formation of the Sun?

**[1 mark]**

Tick (✓) **one** box.

- Electrostatic force ☐
- Gravitational force ☐
- Magnetic force ☐

**0 1 . 4** Stars produce light because they release energy.

Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| combustion | conduction | fusion |
|---|---|---|

The process which releases energy inside stars is _____.

**0 1 . 5** Visible light and infrared radiation travel from the Sun to the Earth.

Which statement describes the time taken for visible light and infrared radiation to travel from the Sun to the Earth?

**[1 mark]**

Tick (✓) **one** box.

- Visible light takes less time than infrared radiation ☐
- Visible light takes the same time as infrared radiation ☐
- Visible light takes more time than infrared radiation ☐

4.6.2.6 Visible light (physics only)

Question 58 · continued



**0 1 . 6** Infrared radiation has a longer wavelength than visible light.

Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| | | |
|---|---|---|
| **smaller** | **the same** | **greater** |

Compared with the frequency of infrared radiation, the frequency of visible light is _____.

**0 1 . 7** The Sun and the Earth both emit infrared radiation.

How does the rate of infrared radiation emitted by the Sun compare with the rate of infrared radiation emitted by the Earth?

Give a reason for your answer.

**[2 marks]**

Tick (✓) **one** box.

Lower rate than the Earth ☐

Same rate as the Earth ☐

Greater rate than the Earth ☐

Reason _____

_____

8

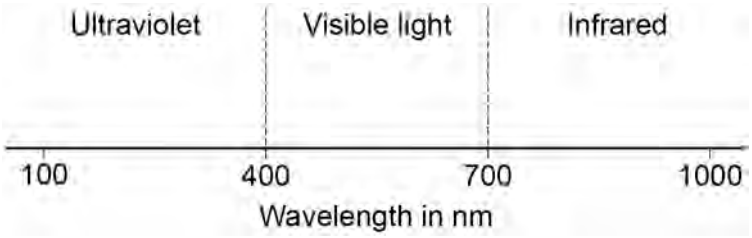
4.6.2.6 Visible light (physics only)

Question 59

June 2024 | 8463/2F | Original Q6

**0 6** **Figure 10** shows the wavelengths of some types of electromagnetic radiation.

**Figure 10**




**0 6 . 1** Suggest **one** piece of equipment that can be used to detect infrared radiation.

**[1 mark]**

**0 6 . 2** Which of the following values is a wavelength of red light?

**[1 mark]**

Tick (✓) **one** box.

320 nm ☐

410 nm ☐

690 nm ☐

750 nm ☐

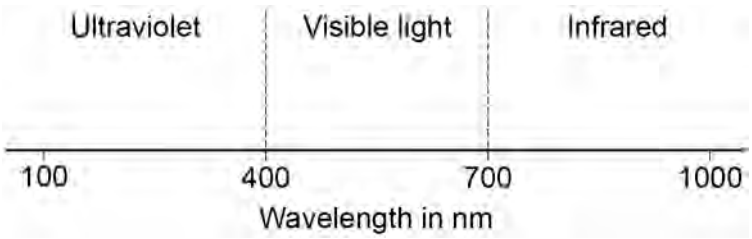
**Question 6 continues on the next page**

Question 59 · continued



**Figure 10** is repeated below.

**Figure 10**




**0 6 . 3** The eyes of a bee can detect electromagnetic radiation with wavelengths between 300 nm and 600 nm.

Give **two** ways the radiation detected by the eyes of a bee is different from the radiation detected by human eyes.

**[2 marks]**

1 _____

_____

2 _____

_____

**0 6 . 4** Complete the sentences.

Choose the answers from the box.

**[2 marks]**

| | | | |
|---|---|---|---|
| **absorbed** | **emitted** | **reflected** | **refracted** |

When sunlight shines on a red flower, the red light

is _____.

All other colours of light shining on the red flower

are _____.

4.6.2.6 Visible light (physics only)

Question 59 · continued

June 2024 | 8463/2F | Original Q6

**0 6 . 5** A gardener looks at a red flower through a green filter.

How does the flower appear to the gardener?

**[1 mark]**

Tick (✓) **one** box.

Black ☐

Green ☐

Red ☐

White ☐

**0 6 . 6** The leaves of the plant reflect light.

The leaves have a rough surface.

What type of reflection happens at the leaf surface?

**[1 mark]**

8

**4.6.2.6 Visible light (physics only)**

**Question 60**

June 2025 | 8463/2F | Original Q8

**0 8** In a thunderstorm, lightning produces visible light waves and sound waves.

**0 8 . 1** Describe the similarities and differences between visible light waves and sound waves.

**[6 marks]**

4.6.2.6 Visible light (physics only)

Question 60 · continued



Use the Physics Equations Sheet to answer questions **08.2** and **08.3**.

**0 8 . 2** Which equation links distance (*s*), speed (*v*) and time (*t*)?

**[1 mark]**

Tick (✓) **one** box.

speed = distance × time ☐

speed = $\frac{\text{distance}}{\text{time}}$ ☐

speed = $\frac{\text{time}}{\text{distance}}$ ☐

**0 8 . 3** Lightning strikes the ground 13 200 m from a student.

The speed of sound in air is 330 m/s.

Calculate the time taken for the sound created by the lightning strike to reach the student.

**[3 marks]**

Time = _____ s

10