Q1. The figure below shows an incomplete electromagnetic spectrum.

A	**microwaves**	**B**	**C**	**ultraviolet**	**D**	**gamma**

(a) What name is given to the group of waves at the position labelled **A** in the figure above?

Tick **one** box.

infrared ☐

radio ☐

visible light ☐

X-ray ☐

(1)

(b) Electromagnetic waves have many practical uses.

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

Electromagnetic wave	**Use**
Gamma rays	For fibre optic communications
Microwaves	For communicating with a satellite

Ultraviolet	To see security markings
	To sterilise surgical instruments

(3)

(c) Complete the sentence.

Use an answer from the box.

black body	**ionising**	**nuclear**

X-rays can be dangerous to people because X-rays are

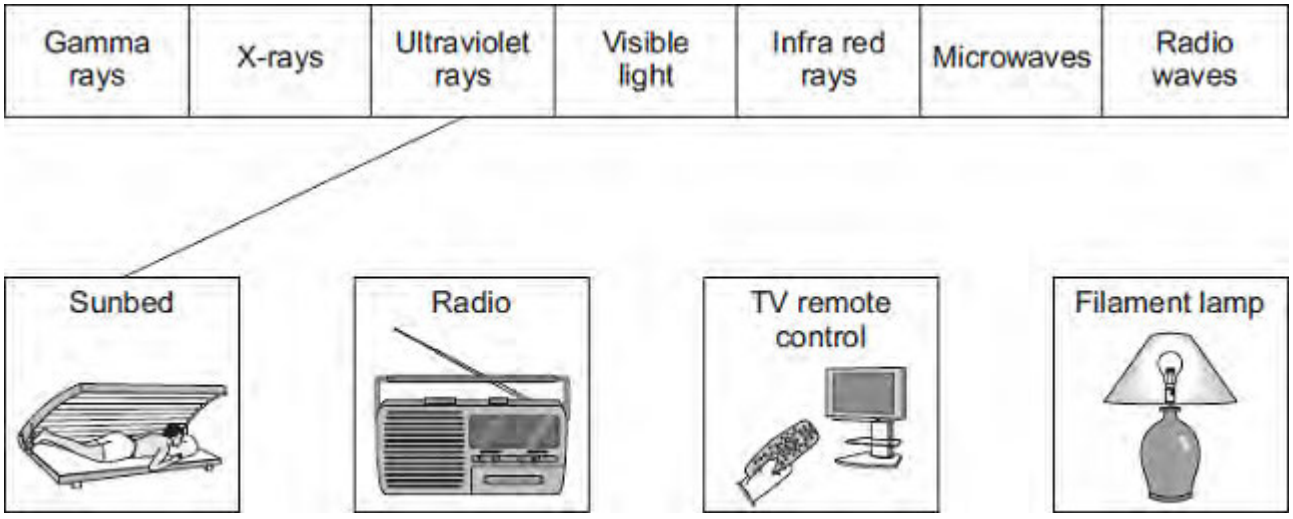
..... radiation.

(1)
(Total 5 marks)

Q2.(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)

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

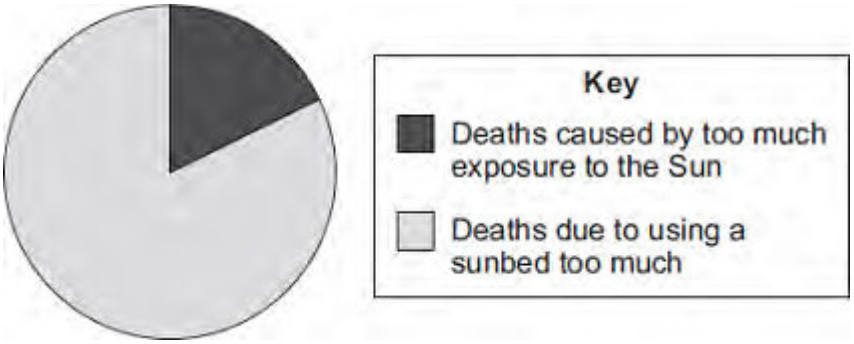


(i) What serious health problem may be caused by using a sunbed too much?

.....

(1)

(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)

(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)
(Total 6 marks)

Q3. A lorry has an air horn. The air horn produces sound waves in the air.

(a) Use **one** word to complete the following sentence.

Sound waves cause air particles to ..... .

(1)

(b) The air horn produces sound waves at a constant frequency of 420 Hz.

The wavelength of the sound waves is 0.80 m.

Calculate the speed of the sound waves.

.....

.....

.....

Speed = ... m/s

(2)

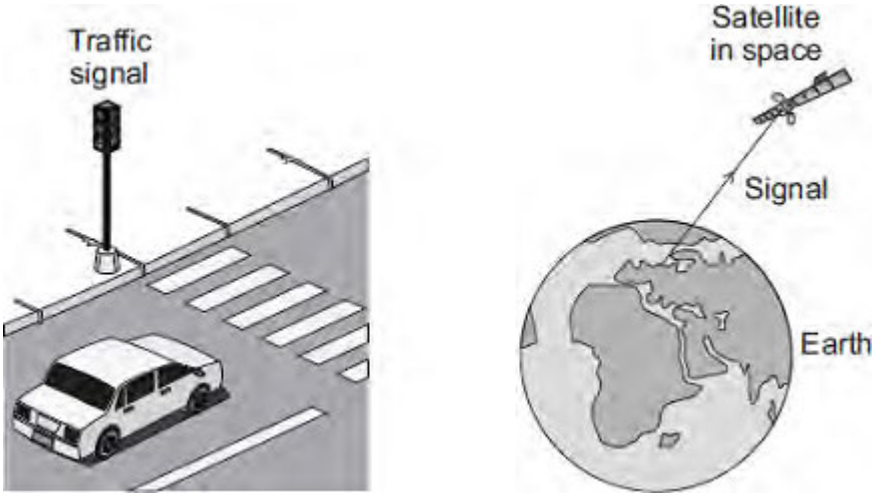
(Total 3 marks)

Q4.Diagram 1 shows four of the seven types of wave in the electromagnetic spectrum.

Diagram 1

J	**K**	**L**	Visible light	Infrared	Microwaves	Radio waves

(a) The **four** types of electromagnetic wave named in **Diagram 1** above are used for communication.



(i) Which type of electromagnetic wave is used when a traffic signal communicates with a car driver?

.....

(1)

(ii) Which type of electromagnetic wave is used to communicate with a satellite in space?

.....

(1)

(b) Gamma rays are part of the electromagnetic spectrum.

Which letter, **J**, **K** or **L**, shows the position of gamma rays in the electromagnetic spectrum?

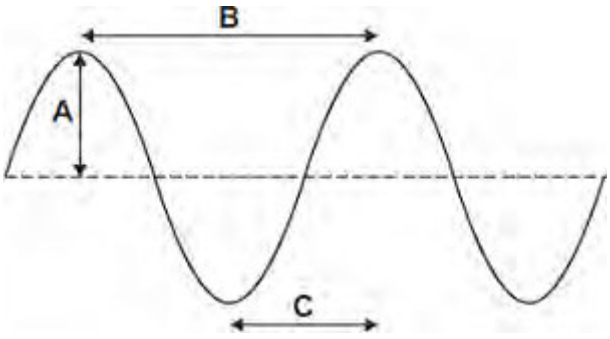
Draw a ring around the correct answer.

J **K** **L**

(1)

(c) **Diagram 2** shows an infrared wave.

Diagram 2



(i) Which **one** of the arrows, labelled **A**, **B** or **C**, shows the wavelength of the wave?

Write the correct answer, **A**, **B** or **C**, in the box. ☐

(1)

(ii) Draw a ring around the correct answer to complete the sentence.

The wavelength of infrared waves is

shorter than	
the same as	the wavelength of radio waves.
longer than	

(1)

(d) Mobile phone networks send signals using microwaves. Some people think the energy a person's head absorbs when using a mobile phone may be harmful to health.

(i) Scientists have compared the health of people who use mobile phones with the health of people who do not use mobile phones.

Which **one** of the following statements gives a reason why scientists have done this?

Tick (✓) **one** box.

To find out if using a mobile phone is harmful to health. ☐

To find out if mobile phones give out radiation. ☐

To find out why some people are healthy. ☐

(1)

(ii) The table gives the specific absorption rate (SAR) value for two different mobile phones.

The SAR value is a measure of the maximum energy a person's head absorbs when a mobile phone is used.

Mobile Phone	SAR value in W/kg
X	0.28
Y	1.35

A parent buys mobile phone **X** for her daughter.

Using the information in the table, suggest why buying mobile phone **X** was the best choice.

.....

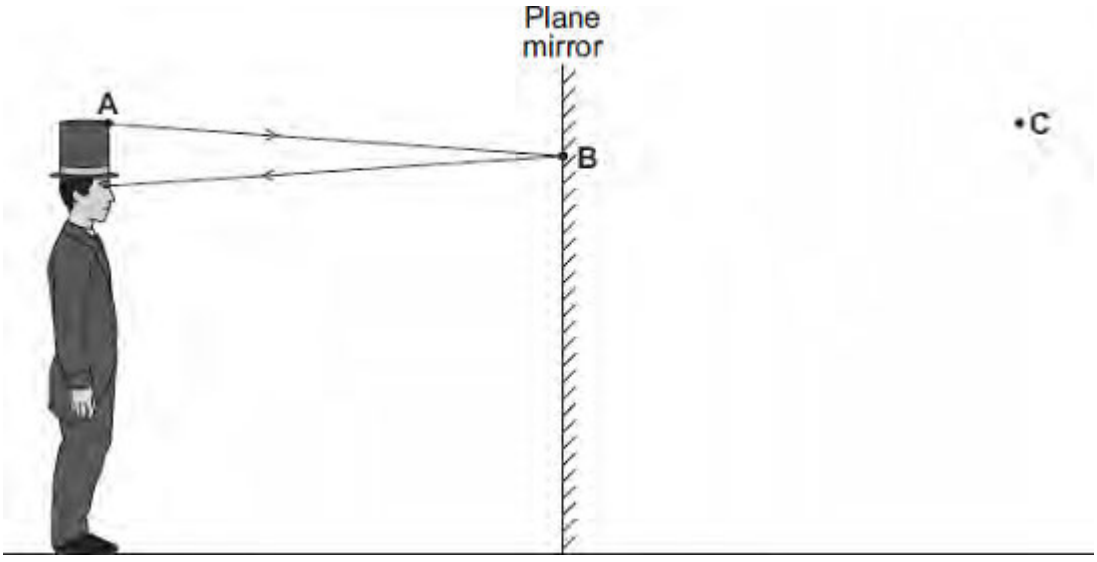
.....

.....

.....

(2)
(Total 8 marks)

Q5.A person can see an image of himself in a tall plane mirror.



The diagram shows how the person can see his hat.

(a) Which point, **A**, **B** or **C**, shows the position of the image of his hat?

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

(1)

(b) On the diagram, use a ruler to draw a light ray to show how the person can see his shoe.

(3)

(c) Which **one** of the words in the box is used to describe the image formed by a plane mirror?

Draw a ring around the correct answer.

imaginary	**real**	**virtual**

(1)
(Total 5 marks)

Q6.(a) Some humans are short-sighted.

Complete the following sentence.

Short sight can be caused by the eyeball being too ..... .

(1)

(b) Spectacles can be worn to correct short sight.

The table below gives information about three different lenses that can be used in spectacles.

	Lens feature		
	Material	**Mass in grams**	**Type**
Lens A	Plastic	5.0	Concave (diverging)
Lens B	Glass	6.0	Convex (converging)
Lens C	Glass	5.5	Convex (converging)

Which lens from **Table 2** would be used to correct short sight?

Draw a ring around the correct answer.

Lens A **Lens B** **Lens C**

Give the reason for your answer.

.....

.....

(2)

(c) Every lens has a focal length.

Which factor affects the focal length of a lens?

Tick (✓) **one** box.

The colour of the lens ☐

The refractive index of the lens material ☐

The size of the object being viewed ☐

(1)

(d) A lens has a focal length of 0.25 metres.

Calculate the power of the lens.

.....

.....

.....

Power of lens = ... dioptres

(2)

(e) Laser eye surgery can correct some types of eye defect.

Which of the following is another medical use for a laser?

Tick (✓) **one** box.

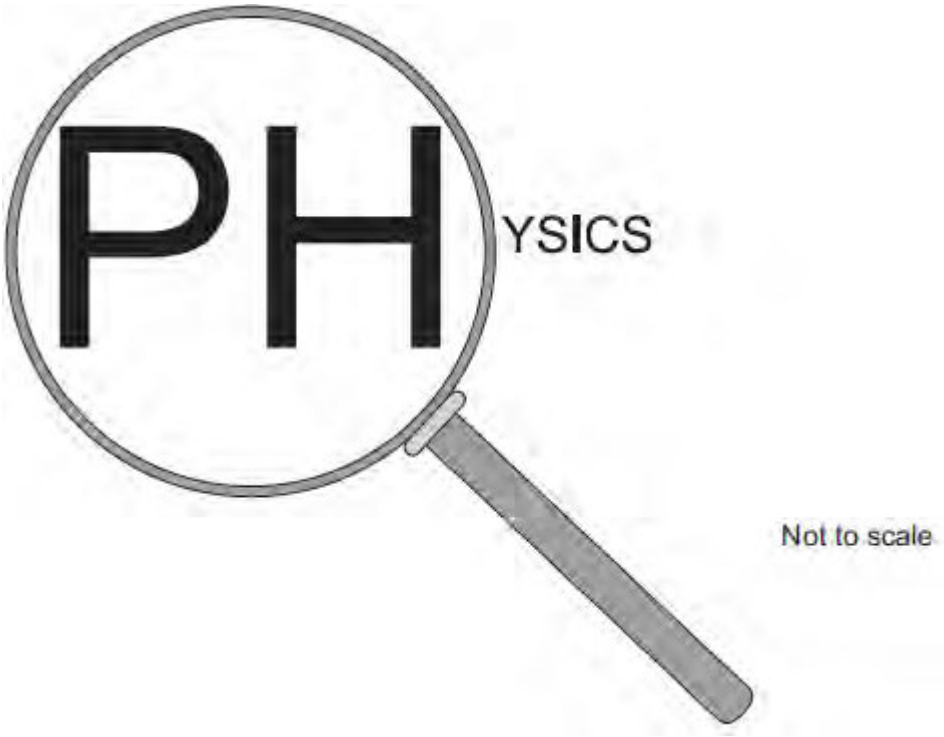
Cauterising open blood vessels ☐

Detecting broken bones ☐

Imaging the lungs ☐

(1)

(f) The figure shows a convex lens being used as a magnifying glass.



An object of height 14 mm is viewed through a magnifying glass.

The image height is 70 mm.

Calculate the magnification produced by the lens in the magnifying glass.

.....

.....

.....

Magnification = ...

(2)
(Total 9 marks)

Q7. The figure below shows an X-ray image of a human skull.



Stockdevil/iStock/Thinkstock

(a) Use the correct answers from the box to complete the sentence.

absorbs	**ionises**	**reflects**	**transmits**

When X-rays enter the human body, soft tissue ..... X-rays

and bone ..... X-rays.

(2)

(b) Complete the following sentence.

The X-rays affect photographic film in the same way that ..... does.

(1)

(c) The table below shows the total dose of X-rays received by the human body when different parts are X-rayed.

Part of body X-rayed	**Dose of X-rays received by human body in arbitrary units**
Head	3

Chest	4
Pelvis	60

Calculate the number of head X-rays that are equal in dose to one pelvis X-ray.

.....

.....

.....

Number of head X-rays = ...

(2)

(d) Which **one** of the following is another use of X-rays?

Tick (✓) **one** box.

Cleaning stained teeth ☐

Killing cancer cells ☐

Scanning of unborn babies ☐

(1)
(Total 6 marks)

Q8. Light changes direction as it passes from one medium to another.

(a) Use the correct answer from the box to complete the sentence.

diffraction	**reflection**	**refraction**

The change of direction when light passes from one medium to another is called ..... .

(1)

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

When light passes from air into a glass block, it changes

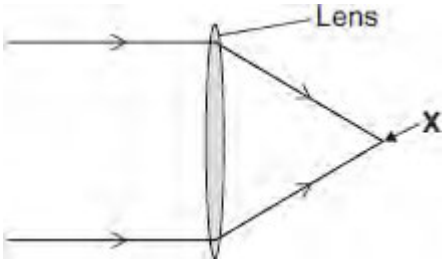
direction

away from the normal.
towards the normal.
to always travel along the normal.

(1)

(c) **Diagram 1** shows light rays entering and passing through a lens.

Diagram 1



(i) Which type of lens is shown in **Diagram 1**?

Draw a ring around the correct answer.

concave **convex** **diverging**

(1)

(ii) In **Diagram 1**, what is the point **X** called?

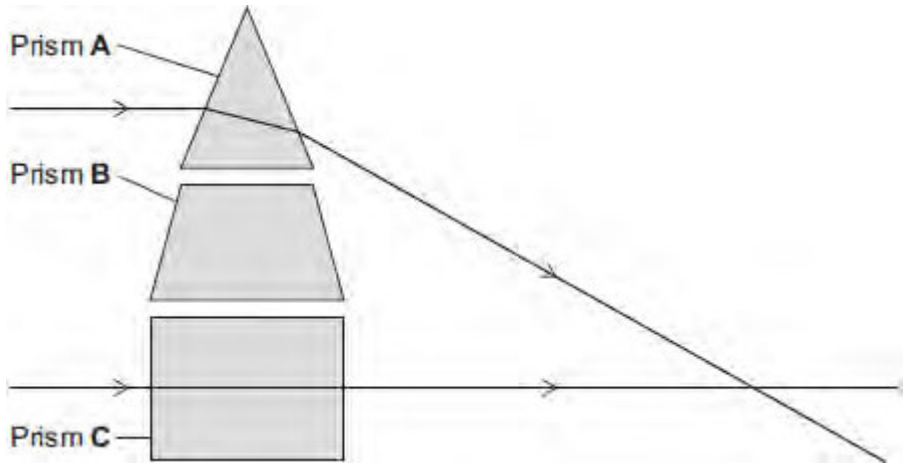
.....

(1)

(d) A lens acts like a number of prisms.

Diagram 2 shows two parallel rays of light entering and passing through prism **A** and prism **C**.

Diagram 2



Draw a third parallel ray entering and passing through prism **B**.

(4)

(e) What **two** factors determine the focal length of a lens?

1 .....

2 .....

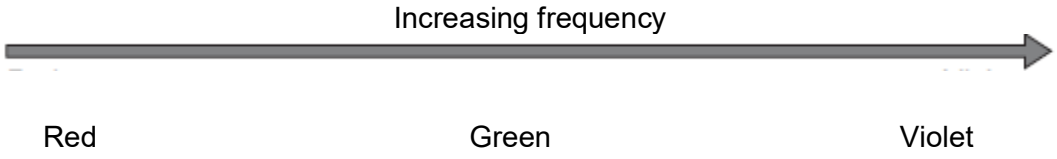
(2)

(Total 10 marks)

Q9.(a) The visible light spectrum has a range of frequencies.

Figure 1 shows that the frequency increases from red light to violet light.

Figure 1



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

decreases	**stays the same**	**increases**

As the frequency of the light waves increases, the wavelength

of the light waves ..... and

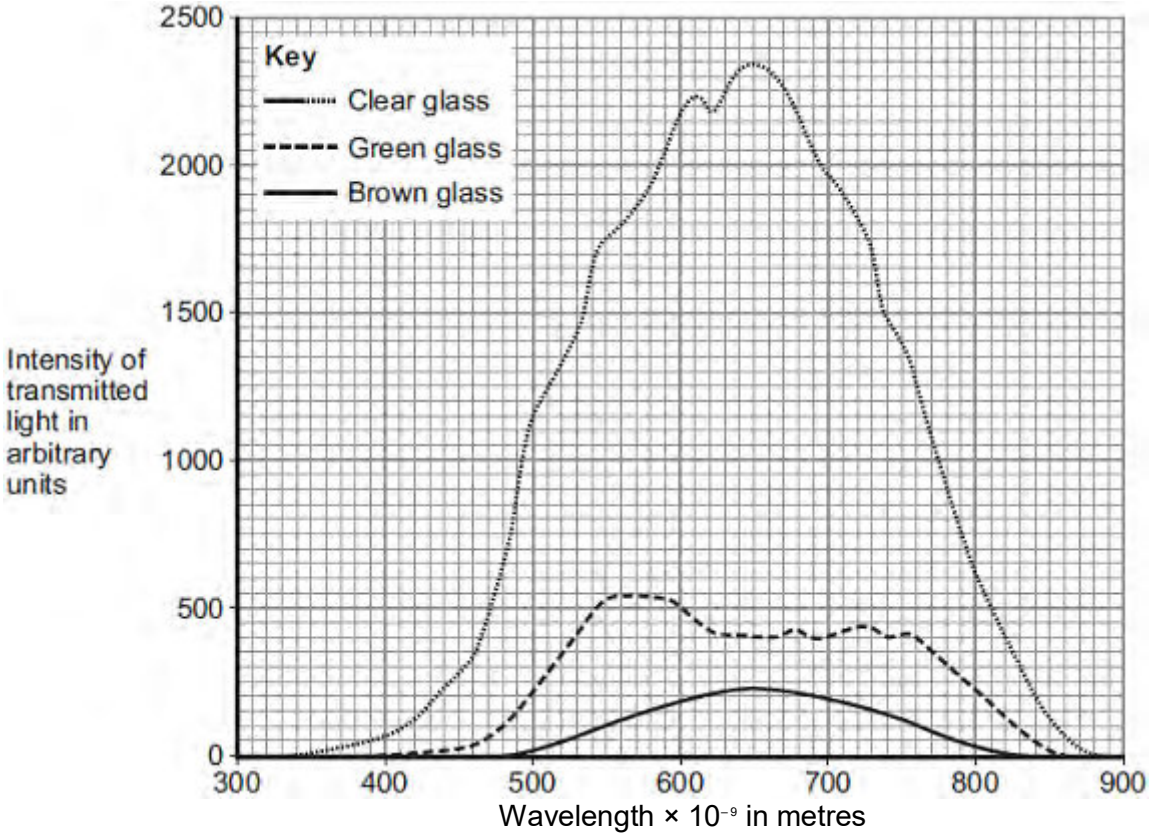
the energy of the light waves ..... .

(2)

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

Figure 3 shows the intensity of the light that is transmitted through three different pieces of glass.

Figure 3



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

Suggest why.

.....

.....

(1)

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

Suggest why.

.....

.....

(1)

(Total 4 marks)