Electromagnetic Spectrum

Question Paper

Course	CIE IGCSE Physics
Section	3. Waves
Topic	Electromagnetic Spectrum
Difficulty	Medium

Time Allowed 50

Score /39

Percentage /100

Question 1a

Fig. 7.1 shows the electromagnetic spectrum. One type of radiation is not labelled.

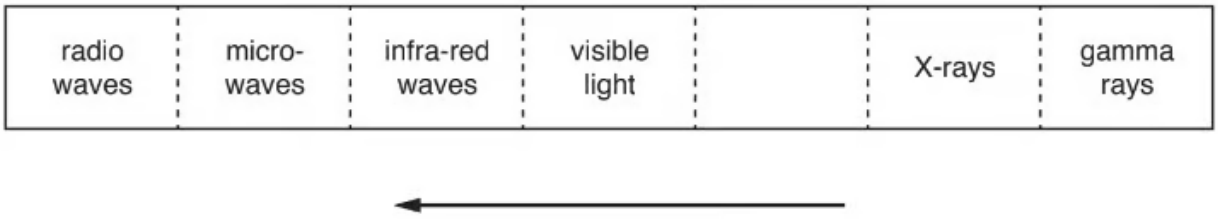

Fig. 7.1

(i) On Fig. 7.1, add the label for the missing type of radiation.

[1]

(ii) The arrow in Fig. 7.1 indicates a property that is increasing.

State the name of the property that is increasing in the direction of the arrow.

[1]

(iii) Compare the speeds of radio waves and visible light in a vacuum.

[1]

[3 marks]

Question 1b

(i) Describe how X-rays are used for security in airports.

[2]

(ii) Explain the properties of X-rays that make them useful in airport security.

[2]

[4 marks]

Question 2a

Fig. 7.1 shows an incomplete diagram of the electromagnetic spectrum.

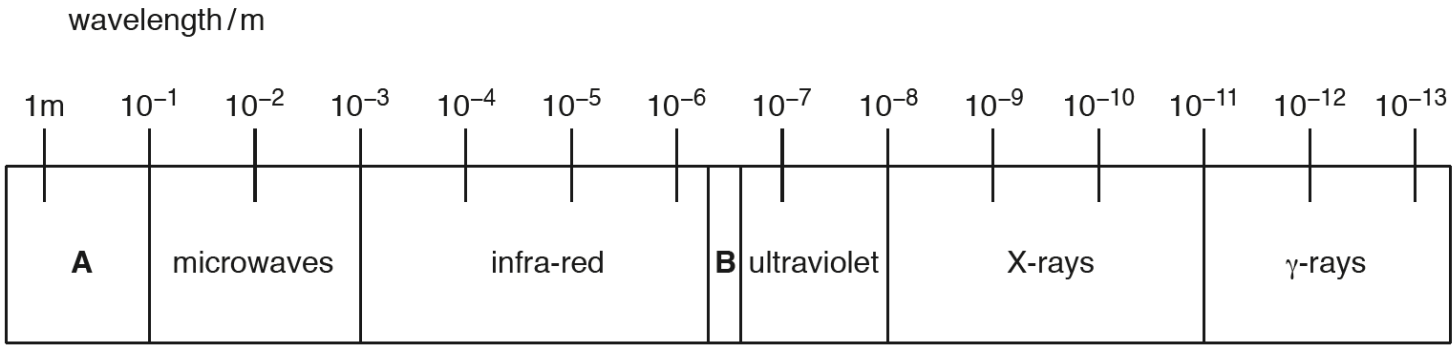

Fig. 7.1

(i) In Fig. 7.1, section A and section B of the electromagnetic spectrum are not labelled.

State the names of parts A and B.

[2]

(ii) An electromagnetic wave has a wavelength of 1.0×10^{-9} m. Use Fig. 7.1 to identify the type of electromagnetic wave.

[1]

[3 marks]

Question 2b

All electromagnetic waves travel at the same speed in a vacuum.

State one other property that is the same for all electromagnetic waves

[1 mark]

Question 2c

For each purpose, state one type of electromagnetic radiation that can be used.

(i) Remote controllers for televisions

[1]

(ii) Killing bacterial cells

[1]

[2 marks]

Question 3a

Fig. 7.1 shows some parts of the electromagnetic spectrum.

radio waves		infra-red waves	visible light	ultraviolet waves	X-rays	γ-rays

Fig. 7.1

(i) In Fig. 7.1, one part of the electromagnetic spectrum is not labelled.
State the name of this part.

[1]

(ii) The speed of visible light waves in a vacuum is 3.0×10^8 m / s.
Suggest a value for the speed of infra-red waves in a vacuum.

speed = ... m / s
[1]

(iii) Some parts of the electromagnetic spectrum have a wavelength shorter than that of visible light.
State one example.

[1]
[3 marks]

Question 3b

(i) X-rays and γ-rays are used in hospitals.

Describe one medical use for X-rays and one use for γ-rays.

[1]

(ii) Explain why γ-rays are dangerous to living things.

[1]

[4 marks]

Question 4a

Fig. 7.1 shows a diagram of the main regions of the electromagnetic spectrum. Two labels are missing.

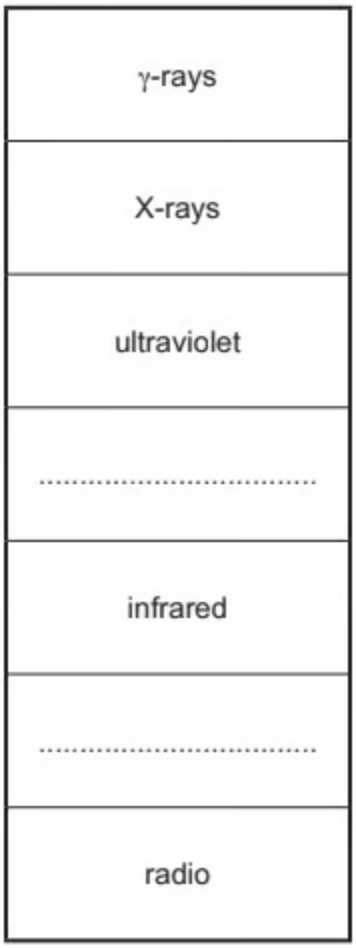

Fig. 7.1

(i) Complete the labels on Fig. 7.1.

[2]

(ii) State two properties that are the same for all waves in the electromagnetic spectrum.

[2]

[4 marks]

Question 4b

State which region of the electromagnetic spectrum is used in each situation.

(i) Detecting objects without opening baggage at a security check

[1]

(ii) Television remote control

[1]

(iii) Satellite television transmissions

[1]

[2 marks]

Question 5a

Extended tier only

Optical fibres are used for high speed broadband.

Short wavelength visible light and infrared radiation are used to achieve this fast broadband. Explain why.

[2 marks]

Question 5b

An optical fibre is inserted into a patient's body to examine the liver during a keyhole surgery.

Explain why visible light is more useful and safer than X-rays during this surgery.

[3 marks]

Question 5c

Extended

Fig. 1.1 shows the optical fibre used. The arrow shows the initial direction of the ray of visible light.

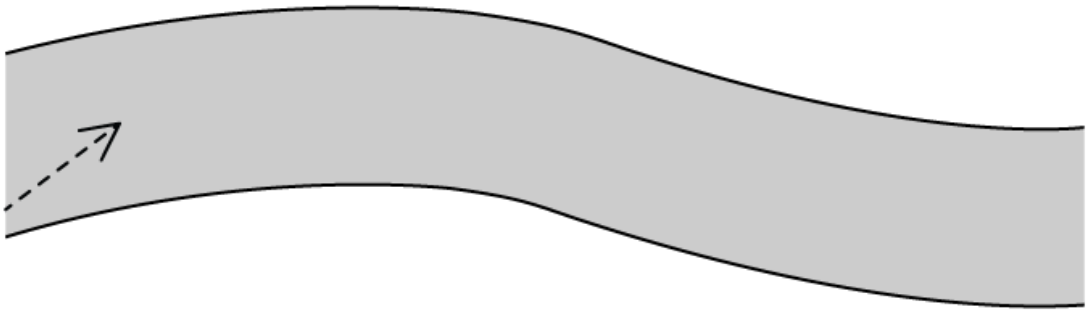

Fig. 1.1

Draw the path of visible light along the fibre from one end to the other.

[2 marks]

Question 5d

Extended

A technician uses an optical fibre in a factory to view a pipe blockage. The blockage is round a bend, shown in Fig. 1.2.

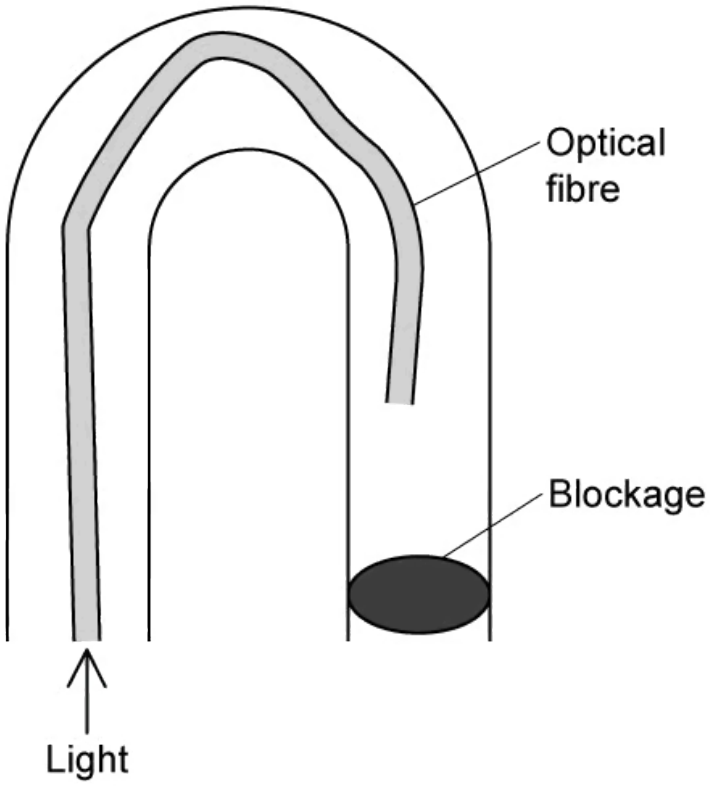

Fig. 1.2

The glass from which the optical fibre is made has a refractive index of 1.3.

(i) Calculate the critical angle of the glass.

[3]

(ii) The light does not reach the blockage. Suggest why.

[3]

[6 marks]