

Name of the Student: _____

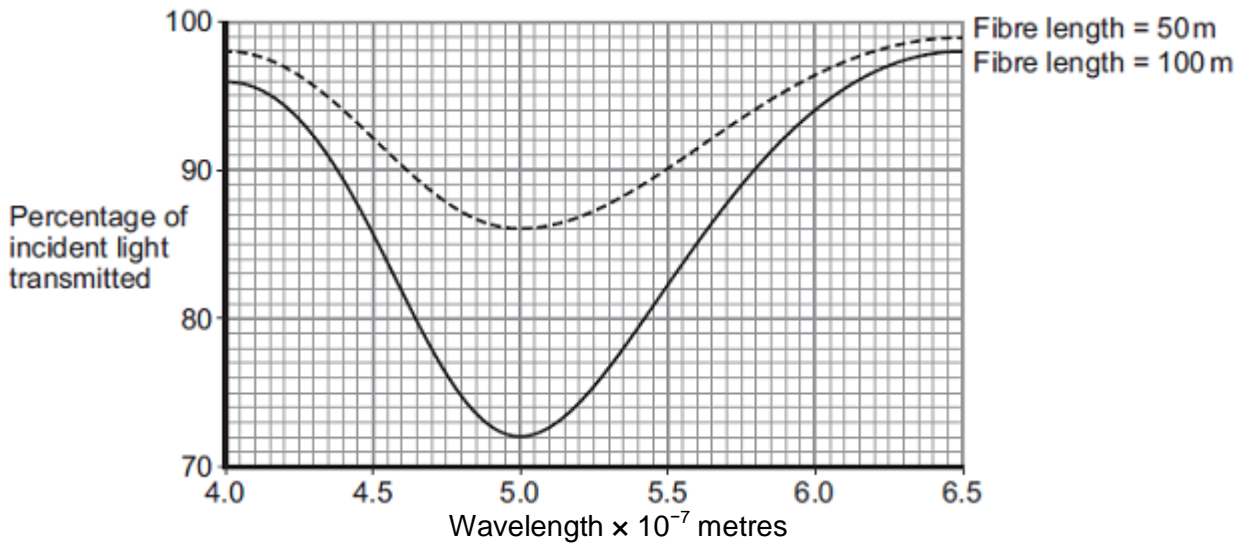
Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

Different wavelengths of light can be used to transmit information along optical fibres.

The graph below shows how the percentage of incident light transmitted through a fibre varies with the wavelength of light and the length of the fibre.



Compare the percentages of incident light transmitted through the two different fibres over the range of wavelengths shown.

(Total 3 marks)

Q2.

- (a) Electromagnetic waves form a continuous spectrum with a range of wavelengths.

What is the approximate range of wavelengths of electromagnetic waves?

Tick (✓) **one** box.

10^{-15} metres to 10^4 metres

10^{-4} metres to 10^{15} metres

10^{-6} metres to 10^6 metres

(1)

- (b) Infrared waves and microwaves are used for communications.

- (i) Give **one** example of infrared waves being used for communication.

(1)

- (ii) A mobile phone network uses microwaves to transmit signals through the air. The microwaves have a frequency of 1.8×10^9 Hz and travel at a speed of 3.0×10^8 m/s.

Calculate the wavelength of the microwaves.

Give your answer to **two** significant figures.

Wavelength = _____ m

(3)

- (c) Some scientists suggest there is a possible link between using a mobile phone and male fertility.

The results of their study are given in the table.

Mobile phone use in hours per day	Sperm count in millions of sperm cells per cm^3 of semen
0	86
less than 2	69

2 – 4	59
more than 4	50

The results show a negative correlation: the more hours a mobile phone is used each day, the lower the sperm count. However, the results do **not** necessarily mean using a mobile phone causes the reduced sperm count.

Suggest **one** reason why.

(1)
(Total 6 marks)

Q3.

Galaxies emit all types of electromagnetic wave.

- (a) (i) Which type of electromagnetic wave has the shortest wavelength?

(1)

- (ii) State **one** difference between an ultraviolet wave and a visible light wave.

(1)

- (b) Electromagnetic waves travel through space at a speed of 3.0×10^8 m/s.

The radio waves emitted from a distant galaxy have a wavelength of 25 metres.

Calculate the frequency of the radio waves emitted from the galaxy and give the unit.

Frequency = _____

(3)

- (c) Scientists use a radio telescope to measure the wavelength of the radio waves emitted from the galaxy in part (b) as the waves reach the Earth. The scientists measure the wavelength as 25.2 metres. The effect causing this observed increase in wavelength is called red-shift.

- (i) The waves emitted from most galaxies show red-shift.

What does red-shift tell scientists about the direction most galaxies are moving?

(1)

(ii) The size of the red-shift is **not** the same for all galaxies.

What information can scientists find out about a galaxy when they measure the size of the red-shift the galaxy produces?

(2)

(iii) What does the observation of red-shift suggest is happening to the Universe?

(1)

(Total 9 marks)