Communication

Question paper 6

Level	International A Level
Subject	Physics
Exam Board	CIE
Topic	Communication
Sub Topic	
Paper Type	Theory
Booklet	Question paper 6

Time Allowed: 59 minutes

Score: /49

Percentage: /100

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

1 (a) State and explain two advantages of the transmission of information in digital, rather than analogue, form.

1. ....

....

....

2. ....

....

....
[4]

(b) Convert

(i) the decimal number 13 to a four-bit digital number,

.... [1]

(ii) the digital number 0101 to a decimal number.

.... [1]

(c) An analogue signal is to be transmitted digitally. A block diagram for part of the transmission system is shown in Fig. 12.1.

Fig. 12.1

(i) Complete Fig. 12.1 by labelling block X and block Y. [2]

(ii) State the purpose of the parallel-to-serial converter.

....

....

.... [2]

(d) The original analogue signal is shown in Fig. 12.2. The recovered signal after transmission is shown in Fig. 12.3.
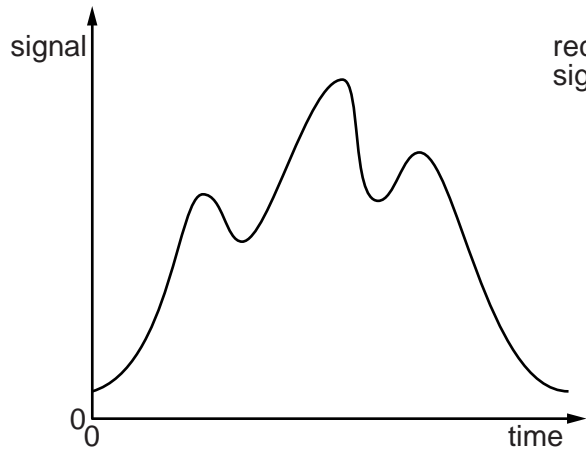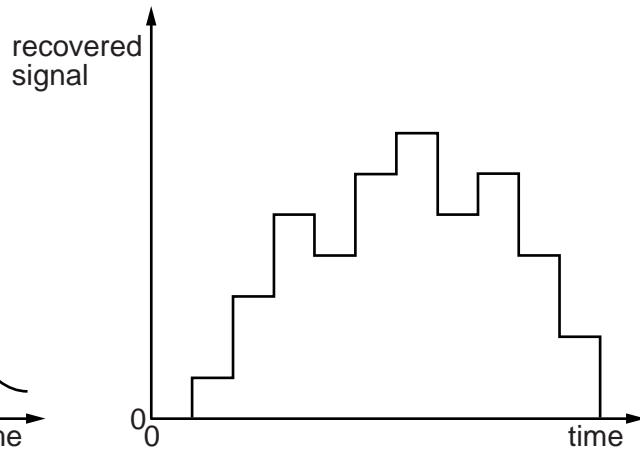

Fig. 12.2

Fig. 12.3

Suggest and explain two ways in which the reproduction of the input signal may be improved.

1. ....

....

....

2. ....

....

....

[4]

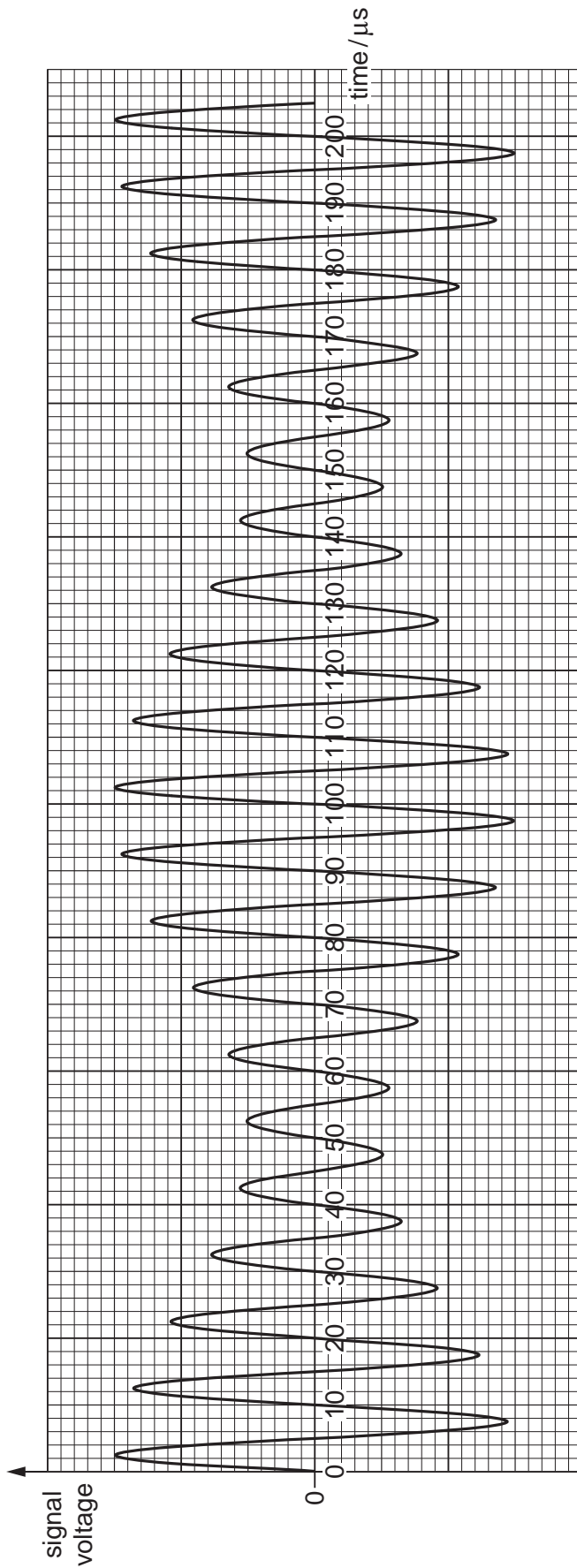**2** The variation with time of the signal transmitted from an aerial is shown in Fig. 11.1.

Fig. 11.1

(a) State the name of this type of modulated transmission.

.... [1]

(b) Use Fig. 11.1 to determine the frequency of

(i) the carrier wave,

frequency = ... Hz [2]

(ii) the information signal.

frequency = ... Hz [1]

(c) **(i)** On the axes of Fig. 11.2, draw the frequency spectrum (the variation with frequency of the signal voltage) of the signal from the aerial. Mark relevant values on the frequency axis.
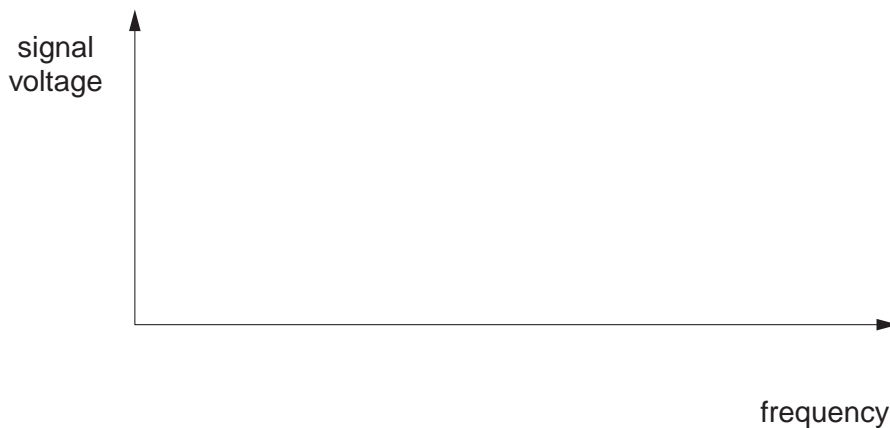
signal
voltage

frequency

Fig. 11.2

[3]

(ii) Determine the bandwidth of the signal.

bandwidth = ... Hz [1]

3   A block diagram representing part of a mobile phone network is shown in Fig. 12.1.
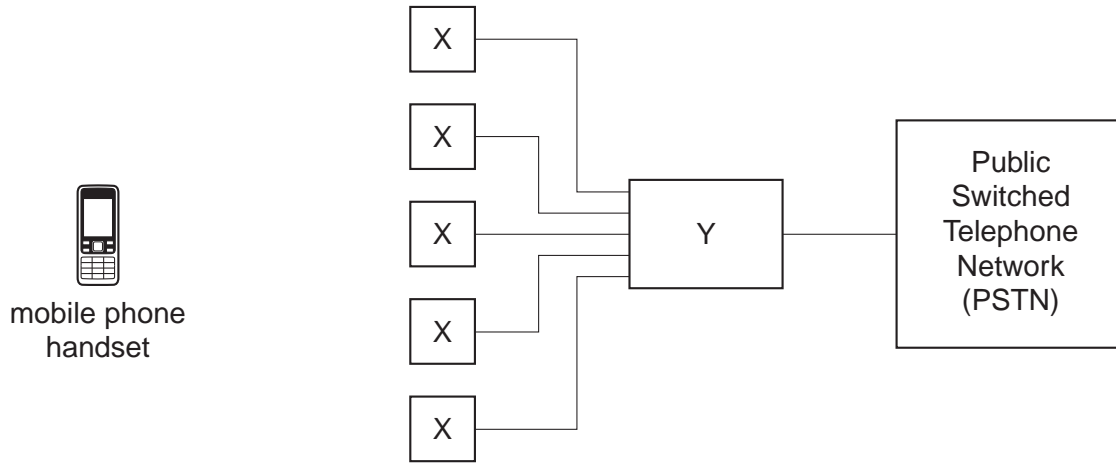
Fig. 12.1

(a) State what is represented by

    (i) the blocks labelled X,

    .... [1]

    (ii) the block labelled Y.

    .... [1]

(b) A user of a mobile phone is making a call.

    Explain the role of the components in the boxes labelled X and Y during the call.

    ....

    ....

    ....

    ....

    ....

    ....

    ....

    .... [5]

4 A signal is to be transmitted along a cable system of total length 125 km.
The cable has an attenuation of 7 dB km^{-1}. Amplifiers, each having a gain of 43 dB, are placed at 6 km intervals along the cable, as illustrated in Fig. 12.1.
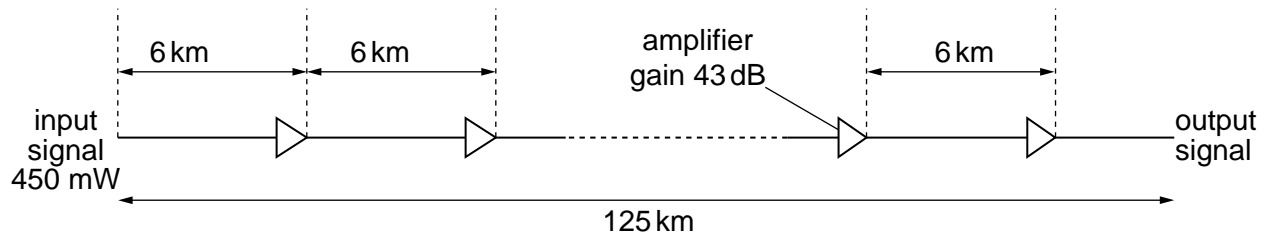
Fig. 12.1

(a) State what is meant by the *attenuation* of a signal.

....

.... [1]

(b) Calculate

(i) the total attenuation caused by the transmission of the signal along the cable,

attenuation = ... dB [1]

(ii) the total signal gain as a result of amplification by all of the amplifiers along the cable.

gain = ... dB [1]

(c) The input signal has a power of 450 mW. Use your answers in **(b)** to calculate the output power of the signal as it leaves the cable system.

power = ... mW [3]

5 (a) Fig. 13.1 is a block diagram illustrating part of a mobile phone handset used for receiving a signal from a base station.

Fig. 13.1

Complete Fig. 13.1 by labelling each of the blocks. [4]

(b) Explain the role of the base station and the cellular exchange when a mobile phone is switched on and before a call is made or received.

....

....

....

....

....

....

....

.... [4]

6 Different frequencies and wavelengths are used in different channels of communication. Suggest why

(a) infra-red radiation rather than visible light is usually used with optic fibres,

....

....

....[2]

(b) the base stations in mobile phone networks operate on UHF,

....

....

....[2]

(c) for satellite communication, frequencies of the order of GHz are used, with the uplink having a different frequency to the downlink.

....

....

....[2]