

# Communication

## Question paper 4

<b>Level</b>	International A Level
<b>Subject</b>	Physics
<b>Exam Board</b>	CIE
<b>Topic</b>	Communication
<b>Sub Topic</b>	
<b>Paper Type</b>	Theory
<b>Booklet</b>	Question paper 4

**Time Allowed:** 63 minutes

**Score:** /52

**Percentage:** /100

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

1 An incomplete simplified block diagram of the circuitry for a mobile-phone handset is shown in Fig. 12.1.

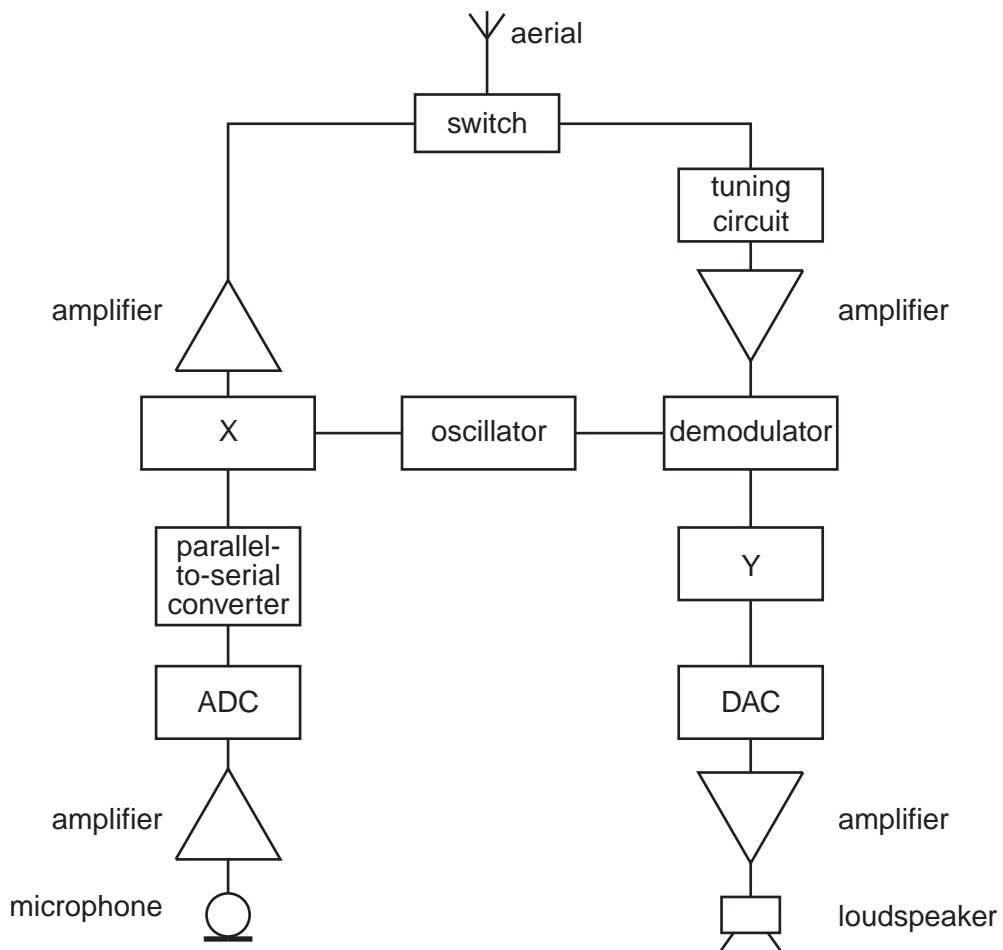


Fig. 12.1

(a) State the name of the block labelled

(i) X,

.....[1]

(ii) Y.

.....[1]

**(b)** Explain the purpose of

**(i)** the switch,

.....  
..... [1]

**(ii)** the parallel-to-serial converter.

.....  
.....  
..... [2]

2 (a) Cable television uses optic fibres for the transmission of signals.  
Suggest four advantages of optic fibres over coaxial cables for the transmission of data.

- 1. ....  
.....
- 2. ....  
.....
- 3. ....  
.....
- 4. ....  
.....

[4]

(b) Electromagnetic radiation of wavelength 1310nm is frequently used for optic fibre communication, rather than visible light.

(i) State the region of the electromagnetic spectrum in which radiation of wavelength 1310nm is found.

.....[1]

(ii) Suggest why this radiation is used, rather than visible light.

.....  
.....[1]

- (c) An optic fibre has an attenuation per unit length of  $0.2 \text{ dB km}^{-1}$ .  
A signal is transmitted along the optic fibre of length 30 km to a receiver. The noise power at the receiver is  $9.3 \mu\text{W}$ .  
The minimum acceptable signal-to-noise ratio at the receiver is 26 dB.

Calculate

- (i) the minimum signal power at the receiver,

power = ..... W [2]

- (ii) the minimum input signal power to the optic fibre.

power = .....W [2]

3 A simplified block diagram of a mobile phone handset is shown in Fig. 11.1.

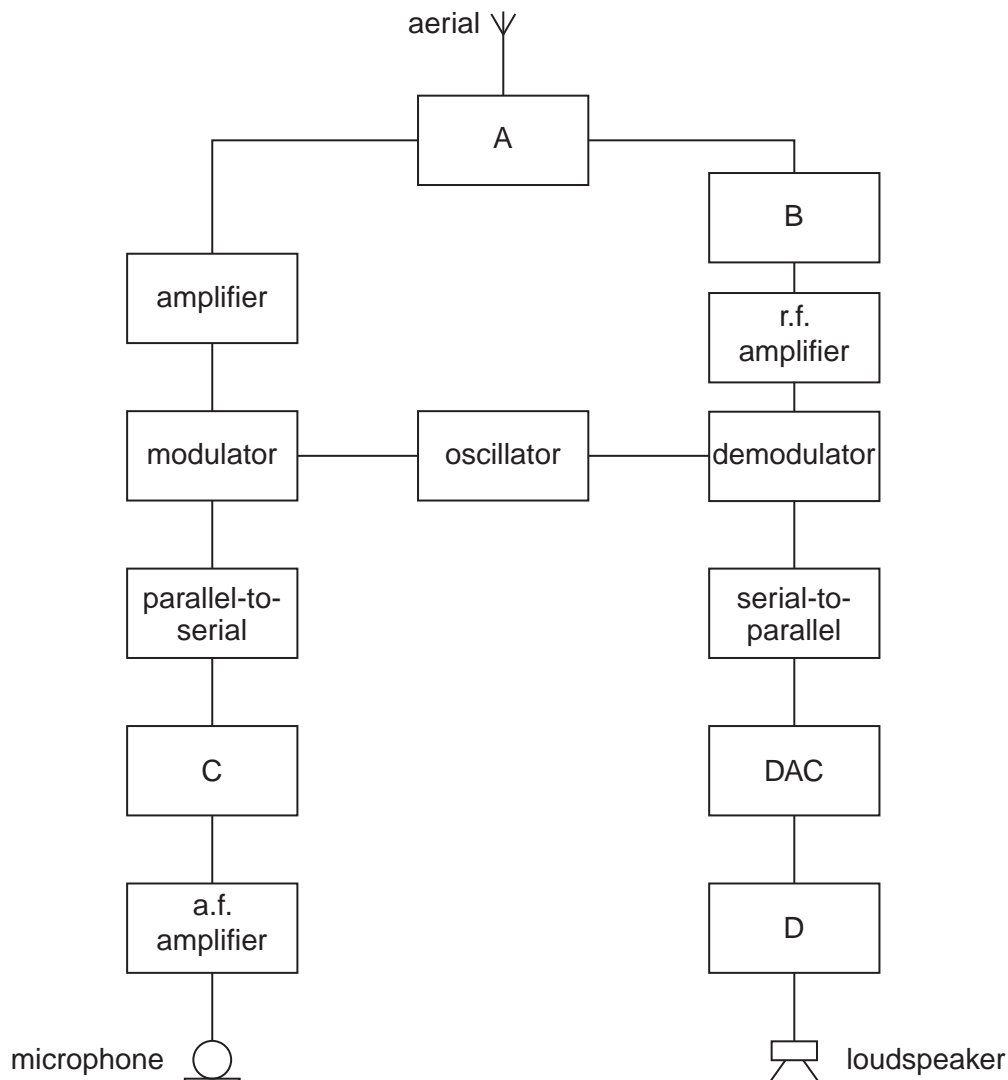


Fig. 11.1

(a) Name and state the function of

(i) block A,

.....  
 .....  
 ..... [2]

(ii) block B,

.....  
 .....  
 ..... [2]

**(iii)** block C,

.....  
.....  
..... [2]

**(iv)** block D.

.....  
.....  
..... [2]

**(b)** Give two reasons why communication between a mobile phone handset and the base station is conducted using UHF.

1. ....  
.....  
2. ....  
..... [2]

4 In a cellular phone network, a region is divided into a number of cells, each with its own base station.

(a) Suggest and explain two reasons why a region is divided into a number of cells.

1. ....  
.....  
.....

2. ....  
.....  
.....

[4]

(b) A passenger in a car is using a mobile phone as the car moves across several cells. Outline how it is ensured that the phone call is continuous.

.....  
.....  
.....  
.....  
.....

[4]



5 (a) Describe what is meant by *frequency modulation (FM)*.

.....  
.....  
..... [2]

(b) A sinusoidal carrier wave has a frequency of 600 kHz and an amplitude of 5.0 V.  
The carrier wave is frequency modulated by a sinusoidal wave of frequency 7.0 kHz and amplitude 2.0 V.  
The frequency deviation of the carrier wave is 20 kHz V<sup>-1</sup>.

Determine, for the modulated carrier wave,

(i) the amplitude,

amplitude = ..... V [1]

(ii) the maximum frequency,

maximum frequency = ..... Hz [1]

(iii) the minimum frequency,

minimum frequency = ..... Hz [1]

(iv) the number of times per second that the frequency changes from maximum to minimum and then back to maximum.

number = ..... [1]

- 6 Many television receivers are connected to an aerial using a coaxial cable. Such a cable is illustrated in Fig. 12.1.

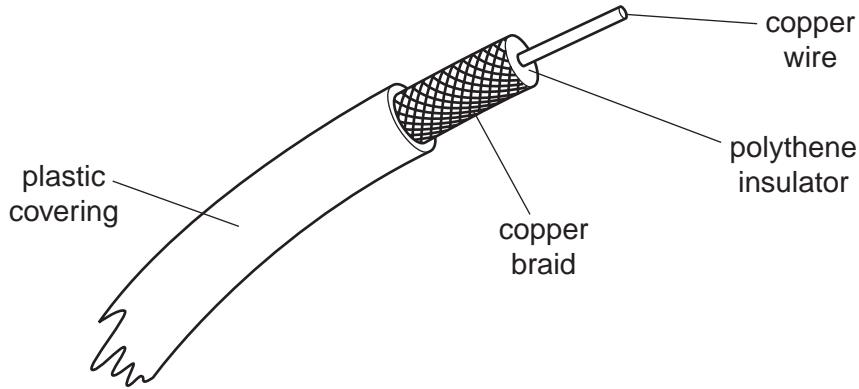


Fig. 12.1

- (a) State two functions of the copper braid.

1. ....  
 .....  
 2. ....  
 ..... [2]

- (b) Suggest two reasons why a coaxial cable is used, rather than a wire pair, to connect the aerial to the receiver.

1. ....  
 .....  
 2. ....  
 ..... [2]

- (c) A coaxial cable has an attenuation per unit length of  $200 \text{ dB km}^{-1}$ .  
 The length of the co-axial cable between an aerial and the receiver is 12 m.  
 Calculate the ratio

$$\frac{\text{input signal power to coaxial cable}}{\text{output signal power from coaxial cable}}$$

ratio = ..... [3]

7 The use of ionospheric reflection of radio waves for long-distance communication has, to a great extent, been replaced by satellite communication.

(a) State and explain two reasons why this change has occurred.

- 1. ....  
.....  
.....
- 2. ....  
.....  
.....

[4]

(b) The radio link between a geostationary satellite and Earth may be attenuated by as much as 190 dB.  
Suggest why, as a result of this attenuation, the uplink and downlink frequencies must be different.

- .....  
.....  
.....  
.....

[2]