



Give the marks for the points in the marking scheme; an answer in other words that says the same is right.

1 Key words

1. ICT
2. satellite
3. uplink
4. geostationary
5. carrier wave
6. modulation
7. firewall
8. digital footprint

K • 4

Each carries 0.5 mark.

2 Label the diagram

- | | |
|----------------------------|-----------------|
| 1. microphone | 4. oscillator |
| 2. audio amplifier | 5. antenna |
| 3. transmitter (modulator) | 6. carrier wave |

K • 3

Each carries 0.5 mark.

3 Multiple choice

- i. b. geostationary orbit

K • 1

A geostationary satellite circles above the equator in exactly the time the Earth turns, so it seems still. A geosynchronous orbit has the same period, but if it is tilted to the equator, the satellite drifts north and south in the sky every day; only the one above the equator is stationary.

- ii. b. the satellite goes round once in exactly the time the Earth turns once, so it stays above the same place

U • 1

A geostationary satellite does move, at about 3 km every second, but it goes round the Earth in exactly the time the Earth takes to turn, in the same direction. So, seen from the turning Earth, it seems to stay still.

- iii. c. noise mostly changes a wave's height, and an FM receiver ignores the height

U • 1

Lightning and electrical sparks add bumps to a wave's **amplitude**. In AM the sound is the amplitude, so the bumps are heard as crackle. In FM the sound is in the **frequency**, and the receiver ignores the amplitude, so the noise is ignored too. FM uses much **higher** frequencies than AM, and those waves pass through the ionosphere.

- iv. c. plant tissue filetype:pptx

A • 1

The search words come first, then the operator filetype: with the file type straight after the colon.

- v. a. AM on medium wave

A • 1

Medium-wave AM signals are reflected by the ionosphere, especially at night, so they come down far beyond the hills. FM signals travel only in straight lines and are stopped by the hills, though they sound clearer where they do reach.

4 Very short answers

- a. MARKING SCHEME

K • 1

✓ NepaliSat-1.



- b. MARKING SCHEME K · 1
✓ Modulator–demodulator (both needed).
- c. MARKING SCHEME U · 1
✓ Stealing a person’s information through a fake link, message or form (such as one promising a prize).

5 Short answers

- a. MARKING SCHEME U · 2
✓ Any one difference, e.g. a firewall controls the data passing between a computer and the internet; an antivirus scans the files and programs on the computer.
✓ Any second difference, e.g. a firewall blocks unsafe connections before they get in; an antivirus finds and removes viruses that have already got in (from pen drives, downloads, attachments).
- b. MARKING SCHEME U · 2
✓ Any one difference, e.g. in AM the amplitude of the carrier wave changes with the sound; in FM its frequency changes.
✓ Any second difference, e.g. AM waves are reflected by the ionosphere and travel hundreds of kilometers; FM waves go in straight lines, only as far as the tower can see; or AM is affected by noise, FM is clear.
- c. MARKING SCHEME U · 2
✓ A geostationary satellite goes round once in the time the Earth turns once, so it stays above the same place and seems still in the sky.
✓ Dishes on the ground can stay pointed at it, and it is always in view, so TV, telephone and internet links never break.
- d. MARKING SCHEME U · 2
✓ High-frequency waves (microwaves) travel in straight lines and pass through the ionosphere, so from a tower they reach only as far as the horizon; hills block them.
✓ A satellite high above sees a huge area, so it can amplify the signal and send it back down over thousands of kilometers.



6 Long answer

ANSWER

U • 4

Every telecommunication system has three parts:

1. **Transmitter:** it turns the input information (from a microphone, camera or computer) into a signal that can be sent, and usually **modulates** a high-frequency carrier wave with it.
2. **Channel:** it carries the signal: radio waves, microwaves, a metal cable or an optical fiber.
3. **Receiver:** it receives the signal, **demodulates** it, and turns it back into the original form for the user.

Example, FM radio: a presenter speaks into a microphone, which turns the sound into an audio signal. The transmitter amplifies it and uses it to modulate the frequency of a carrier wave (say 100 MHz), and the antenna broadcasts it as radio waves (the channel). A radio set tuned to 100 MHz receives the waves, demodulates them to get the audio signal back, and its loudspeaker turns it into sound.

MARKING SCHEME

- ✓ The transmitter turns the input (from a microphone, camera or computer) into a signal and modulates a carrier wave with it.
- ✓ The channel carries the signal: radio waves, microwaves, a metal cable or an optical fiber.
- ✓ The receiver receives the signal, demodulates it and turns it back into sound or pictures for the user.
- ✓ A correct example, e.g. FM radio: microphone → transmitter modulates a 100 MHz carrier → radio waves → radio set demodulates → loudspeaker.

7 Numerical problems

a. ANSWER

A • 2

Distance = speed × time = 300 000 km/s × 0.07 s = 21 000 km.

MARKING SCHEME

- ✓ Distance = speed × time, with 300 000 km/s and 0.07 s put in.
- ✓ 21 000 km.

b. ANSWER

A • 2

Distance = 2 × 35,786 = 71,572 km. Time = distance ÷ speed = 71,572 ÷ 300 000 ≈ 0.24 s.

MARKING SCHEME

- ✓ Distance up and down = 71,572 km, and time = distance ÷ speed.
- ✓ About 0.24 s.

8 Think

ANSWER

HA • 2

The ground curves away below the ball as fast as the ball falls, so it never lands: it falls all the way round the Earth. A satellite is the same: launched sideways fast enough above the air, it keeps falling around the Earth, with nothing to slow it.

MARKING SCHEME

- ✓ The Earth curves away beneath the ball as fast as it falls, so it never lands and goes round the Earth.
- ✓ A satellite is launched sideways fast enough, above the air, so it keeps falling around the Earth without needing fuel.



9 Activity: The parts of each technology (Activity 13.9)

(not marked)

WHAT STUDENTS SHOULD FIND

TV: the station's transmitter and tower (or a satellite uplink); radio waves, cable or microwaves via a satellite; a TV with an antenna, cable box or dish. Radio: the station's transmitter and antenna; radio waves; a radio set. Landline: the mouthpiece; the wire; the other phone's earpiece. Mobile: the phone; radio waves, towers and optical fiber; the other phone. Wi-Fi: the router; radio waves; a phone or laptop. GPS: the navigation satellite; radio waves; the GPS receiver in a phone (GPS is one-way).

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	10	15	6	2	33

