



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. analog
2. digital
3. bit
4. byte
5. ADC
6. channel
7. baseband
8. netizen

K • 4

Each carries 0.5 mark.

2 Label the diagram

- | | |
|----------------------|----------------|
| 1. Input transducer | 5. Encoder |
| 2. Source | 6. Decoder |
| 3. Output transducer | 7. Modulator |
| 4. Output | 8. Demodulator |

K • 4

Each carries 0.5 mark.

3 Multiple choice

- i. b. 00000000

K • 1

A byte is 8 bits. 0000 is 4 bits (a nibble); the other two have 6 bits.

- ii. c. MP3

K • 1

MP3 is for sound. AVI, MP4 and 3GP are video formats.

- iii. d. medium wave radio

U • 1

MW (and SW) radio broadcasts are analog. Infrared thermometers, computers and smartwatches all process and display digital data.

- iv. b. broadband

U • 1

Broadband modulates each signal onto a different carrier frequency, like several radio stations sharing the air. Baseband puts the bits on the cable directly, so only one signal can use it at a time.

- v. d. digital reputation management

A • 1

Sharing useful, reliable posts regularly builds the person's reputation as someone knowledgeable and trustworthy online: that is managing a digital reputation.

4 Very short answers

- a. MARKING SCHEME

K • 1

✓ A device that changes one form of energy into another.

- b. MARKING SCHEME

K • 1

✓ Digital-to-analog converter (DAC).

- c. MARKING SCHEME

K • 1

✓ Being a responsible citizen (netizen) of the online world: using the internet safely, respectfully, honestly and lawfully.



5 Short answers

a. MARKING SCHEME

U • 2

- ✓ Any one difference, e.g. an analog signal changes continuously and can have any value in a range; a digital signal has only two values, 0 and 1.
- ✓ Any second difference, e.g. analog is shown by a sine wave, digital by a square wave; or analog is easily affected by noise, digital very little.

b. MARKING SCHEME

U • 2

- ✓ The data is modulated onto carrier waves (light in optical fibers, radio waves for 4G and Wi-Fi), each signal on its own carrier frequency.
- ✓ So many signals travel through the same fiber or air at once, over long distances, and a very large amount of data flows every second.

c. MARKING SCHEME

U • 2

- ✓ Any two positive effects, e.g. digital payment by QR code without carrying cash; books and lessons available anywhere in digital libraries.
- ✓ Any two negative effects, e.g. too much screen time causes obesity, eye strain and poor sleep; cybercrime such as online fraud and cyberbullying.

6 Long answer

ANSWER

A • 4

- Any two, with the reason: different nicknames make him hard to recognize and his profile look less genuine; sharing an unchecked message spreads rumors, and people stop trusting what he posts; a weak password can be guessed, and someone could then post harmful things in his name. (His phone number and address in public put his safety at risk.)
- Any two: use the same real name on all his profiles; keep his public details few and remove his phone number and address; check news before sharing it; use a long, different password for each account and turn on two-step verification.

MARKING SCHEME

- ✓ One harmful habit with its reason, e.g. sharing an unchecked flood message spreads rumors, so people stop trusting his posts.
- ✓ A second harmful habit with its reason, e.g. one weak password for every account can be guessed, and someone could post harmful things in his name.
- ✓ One correct step, e.g. use the same real name on every profile and remove his phone number and address from public view.
- ✓ A second correct step, e.g. check before sharing, or use a long, different password for each account with two-step verification.

7 Numerical problems

a. ANSWER

A • 2

- The places from the right are worth 1, 2, 4 and 8. $1101 = (1 \times 8) + (1 \times 4) + (0 \times 2) + (1 \times 1) = 13$.
- $20 = 16 + 4$, so the 16 and 4 places are 1 and the rest 0: 10100.

MARKING SCHEME

- ✓ i. $1101 = 8 + 4 + 1 = 13$.
- ✓ ii. $20 = 16 + 4 = 10100$.

b. ANSWER

A • 2

$32 \text{ GB} = 32 \times 1024 \text{ MB} = 32,768 \text{ MB}$.
Number of songs = $32,768 \text{ MB} \div 4 \text{ MB} = 8,192$, about 8,000 songs.

MARKING SCHEME

- ✓ $32 \text{ GB} = 32 \times 1024 = 32,768 \text{ MB}$.
- ✓ $32,768 \div 4 = 8,192$ songs (about 8,000).



8 Think

ANSWER

HA - 2

TV satellites are **geostationary**: they orbit above the **equator** at exactly the height where one orbit takes as long as one turn of the Earth. So each satellite stays above the same point on the equator, and from your roof it seems fixed in the sky. Nepal is north of the equator, so to see the equator's sky the dishes must look **south**. Dishes on the same satellite all point the same way. (A dish in Australia, south of the equator, points north.)

MARKING SCHEME

- ✓ TV satellites are geostationary: above the equator, they go round once each time the Earth turns, so each seems to stand still in the sky and a fixed dish can stay pointed at it.
- ✓ Nepal is north of the equator, so the dishes must look south to see it.

9 Activity: Screen time at home (Activity 13.3)

(not marked)

WHAT STUDENTS SHOULD FIND

Most students find that they, or the youngest members of the family, spend the most time on phones, often several hours a day. Long-term effects include obesity, poor sleep, eye problems, stress and less time with people face to face. Ways to reduce it: screen-free times (meals, the hour before sleep), daily time limits set in Digital Wellbeing or Screen Time, notifications turned off, the phone kept out of the bedroom.

See it at Science Playground

Exhibits and plants at the center, Bhaktapur, that go with this unit. Book a class visit at science-playground.com/booking.

- **Whisper Dishes — Send a Whisper Across the Garden** (exhibit): A curved dish gathers waves to one point: whispers here, satellite signals on a roof.

Marks by level	Knowledge	Understanding	Application	Higher ability	Total
Marks	13	8	9	2	32

