QUESTION 1.

2 (a) Sound can be represented in a computer in a digital format.

(i) Give the definition of the term sampling.

....

....

....[1]

(ii) Give **one** reason why 16-bit sampling is used in an audio compact disc (CD).

....

....[1]

(iii) Explain what is meant by the term sampling resolution.

....

....

....

....[2]

(iv) Give **one** benefit and **one** drawback of using a higher sampling resolution.

Benefit ....

....

Drawback ....

....[2]

(b) Describe **two** typical features found in software for editing sound files.

1 ....

....

2 ....

....[2]

(c) Explain the difference between *lossless* and *lossy* data compression techniqu

....

....

....

....

....

....[3]

QUESTION 2.

4 A group of students broadcast a school radio station on a website. They record ... (programmes) in advance and email them to the producer.

(a) Describe how sampling is used to record the sound clips.

....

....

....

....

....

....[3]

(b) The students use software to compress the sound clips before emailing them.

(i) Circle your chosen method of compression and justify your choice.

Lossy / Lossless

Justification: ....

....

....

....[3]

Students also email images to the radio station for use on its website.

These are compressed before sending using run-length encoding (RLE).

(ii) Explain what is meant by run-length encoding.

....

....

....

....

....

....[3]

(iii) The following diagrams show:

*   the denary colour code that represents each colour
*   the first three rows of a bitmap image

Colour symbol	Colour code (denary)
B	153
W	255

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	B	B	B	B	B	B	B	B	B	B	W	W	W	B	B	B
1	B	B	B	B	B	B	B	B	B	W	W	W	W	W	W	B
2	B	B	B	B	B	B	B	W	W	W	W	W	W	W	W	W
...																
95																

Show how RLE will compress the first three rows of this image.

Row 1: ....

Row 2: ....

Row 3: ....[2]

QUESTION 3.

1 A product designer is creating a poster.

(a) The designer creates a 6-colour bitmap image for the poster as shown.

Each colour is represented by a letter, for example, R = red, B = blue.

R	R	P	P	P	G
B	R	R	P	G	G
B	W	B	B	O	O
B	W	W	P	P	O
B	B	R	P	G	O
B	R	R	P	G	O

(i) State the minimum number of bits needed to represent each pixel in the image in **part (a)**.

....[1]

(ii) Calculate the minimum file size of the image shown in **part (a)**. Show your working.

Working ....

....

....

File size ....
[3]

(b) (i) The designer takes a photograph to put on the poster. The photograph has a resolution of 50 000 pixels by 50 000 pixels. The colours are represented using 4 bytes per pixel.

Estimate the file size of the photograph in gigabytes. Show your working.

Working ....

....

....

....

Estimated file size ....
[4]

(ii) The photograph needs to be sent by email but the file size is too big compressed.

The table lists several methods of making an image file size smaller.

Tick (✓) **one** box on each row to indicate whether each method is lossy or lossless.

Compression method	Lossy	Lossless
Cropping the image		
Reducing the resolution of the image		
Using run-length encoding (RLE)		
Reducing the colour depth of the image		

[4]

(c) Explain how run-length encoding would compress the image in **part (a)**.

....

....

....

....

....

....[3]

QUESTION 4.

1 Devices connected to the Internet have IP (Internet Protocol) addresses.

(a) Three IPv4 addresses are given.

Circle either Valid or Invalid to indicate whether each address is valid or invalid. Explain decision.

Address 1:   3A.21.2H.1   Valid / Invalid

Explanation ....

....

Address 2:   299.53.2.2   Valid / Invalid

Explanation ....

....

Address 3:   192.2.1.0   Valid / Invalid

Explanation ....

....
[3]

(b) A website can be accessed using either the Uniform Resource Locator (URL) or the IP address.

Describe how a URL is converted into its matching IP address.

....

....

....

....

....

.... [3]

(c) People use the Internet to stream media.

Complete the following statements by filling in the names of the missing methods of bit streaming.

.... bit streaming is used when watching a live stream of events that are currently taking place. The event is captured live with a video camera connected to a computer, and it cannot be paused or rewound.

.... bit streaming is used when watching an event that has taken place in the past. Existing media are encoded to bit streaming format and uploaded to a server. It can be paused and rewound.
[2]

(d) A recording of a concert is stored as a file. The file is compressed using lo_ _ _ _ _ before it is streamed to users.

(i) State why this file needs to be compressed.

....

.... [1]

(ii) Define the term **lossy compression**.

....

.... [1]

(iii) The file could be compressed using lossless compression.

Explain why lossy compression is a more appropriate compression technique than lossless for this file.

....

....

....

....

....

.... [3]