Chhetri Academy

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GCSE COMPUTER SCIENCE

1.2

OCR J277 | Specification point 1.2.3

Units

Untiered

Past paper question booklet

10	2016-2025	Untiered
question groups	available papers	tier

Before you begin

1. Show working and use units where appropriate.
2. Use extra paper if you need more space.
3. Print at actual size (100%) for measurement questions.

Name _____ **Date** _____

Whole questions are retained for context; some parts cover other points. Legacy sources are labelled.

5 Alex is producing images and sound effects for a website.
Part of a bitmap image is shown in Fig. 2:

W	W	R	R	R	B	B
W	W	R	Y	R	B	B
B	B	R	R	R	B	B
B	B	B	LG	B	DG	B
B	DG	DG	LG	DG	B	B
B	B	DG	LG	B	B	B
B	B	B	LG	B	B	B

Fig. 2

The letters represent a colour, as shown in Fig. 3:

Letter	Colour
W	White
B	Blue
R	Red
Y	Yellow
DG	Dark Green
LG	Light Green

Fig. 3

(a) Using the example in Fig. 2, explain how a bitmap image is stored on a computer.

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..... **[3]**

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(b) Explain how reducing the number of colours in an image can reduce its file size.

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

(c) The final image file may contain metadata. Describe, using an example, what is meant by metadata.

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

(d) Alex needs to create an audio recording of himself playing his guitar.

(i) Explain how sampling is used to make the recording.

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..... **[3]**

(ii) State the effects of increasing the sample rate of the recording.

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

1 William is creating a film for a school project using a digital video camera.

(a) The digital video camera has a secondary storage device.

(i) Explain why the digital video camera needs secondary storage.

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

(ii) The digital video camera uses solid state storage.

Explain why solid state storage is the most appropriate type of storage for the digital video camera.

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..... **[4]**

(b) William transfers the videos to a computer for editing.

(i) The computer has 1GB of storage free.

Calculate the number of videos that could be stored on the computer if each video was 100MB in size.

Show your working.

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

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(ii) A program needs to calculate the size of files in bytes. The program must:

- Ask the user to input a file size in megabytes
- calculate and output the number of bytes this represents in a user friendly format (e.g. `"There are 5242880 bytes in 5MB"`).

Write an algorithm using pseudocode to calculate the number of bytes in a given number of megabytes.

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..... **[6]**

(c) William's computer has utility programs installed including automatic backup.

(i) William can choose between a full or incremental backup.

Identify the backup method William should use to backup the computer, justifying your choice.

Method: .....

Justification: .....

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..... **[3]**

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Turn over

(ii) Give **one** additional utility program William could make use of and describe how he would use it.

Utility program: .....

Description of use: .....

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[3]

(d) William wants to upload his videos on the Internet and is considering releasing them under a Creative Commons license.

Explain how a Creative Commons license will impact the use of William's videos by other people.

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..... **[3]**

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1 **(a)** A radio station records an interview with a computer scientist using a computer and audio recording software.

(i) Explain how sampling is used to store audio recordings.

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

A second interview with the computer scientist is recorded. Before this interview, the sampling frequency in the audio software is increased.

(ii) Define what is meant by the term **sampling frequency**.

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

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(iii) Tick (✓) **two** boxes to show the effects of increasing the sampling frequency.

Data type of returned value	Tick (✓) **two** boxes
The file size of the digital recording will be smaller.	
The file size of the digital recording will be larger.	
The quality of playback of the digital recording will be better.	
The quality of playback of the digital recording will be worse.	

[2]

(b) The radio station uses a digital camera to take a photograph of the computer scientist for their website. The photograph is stored as a bitmap image.

(i) Describe how bitmap images are represented in binary.

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..... **[3]**

(ii) Explain why computers represent data in binary form.

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

The image is compressed using lossy compression before being uploaded to the radio station's web server. The image will be used on the radio station's website.

(iii) Describe **one** advantage and **one** disadvantage of using lossy compression on the image that will be used on the website.

Advantage .....

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Disadvantage .....

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[4]

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5 A program is being created to convert the data capacity of a storage device into a different measure.

The function, `calculate()`, takes the measurement (e.g. gigabytes) and the number (e.g. 2) as two parameters. It then returns the value in bits. The function returns –1 if an invalid measurement was entered.

Complete the function `calculate`

```
function calculate(....., number)
  if measurement = = "gigabytes" then
    value = number * 1024 * 1024 * 1024 * 8
  elseif measurement = = "....." then
    value = number * 1024 * 1024 * 8
  elseif measurement = = "....." then
    value = number * 1024 * 8
  elseif measure = = "bytes" then
    value = number * .....
  else
    .....
  endif
  return .....
endfunction
```

[6]

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1 ASCII, extended ASCII and Unicode are all examples of character sets.

(a) Tick (✓) **one or more** boxes in each row to identify whether each statement applies to each character set.

	ASCII	**Extended ASCII**	**Unicode**
Can represent thousands of different characters, including Russian and Chinese symbols.			
Can represent European characters such as ç or â.			
Uses different character codes for upper-case and lower-case letters.			

[3]

(b) The character **D** is represented by the binary ASCII code **1000100**

Give the ASCII code for the following characters in binary.

E .....

.....

H .....

.....

[2]

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(c) Sound data is also sampled and stored in binary.

A 30-second section of sound data is sampled at a rate of 48 KHz using 24 bits per sample.

(i) Describe the data that is recorded when sound is sampled.

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

(ii) Explain what is meant by a sample rate of **48 KHz**.

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

(iii) Describe how the file size of the sound recording could be reduced.

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..... **[4]**

1 Computers represent data in binary form.

(a) Tick (✓) **one** box in each row to identify the binary unit equivalent of each of the given file sizes.

File size	2 megabytes	2 petabytes	2 kilobytes	2 bytes	2 gigabytes
2000 bytes					
2000 terabytes					
16 bits					
4 nibbles					

[4]

(b) Convert the denary number 221 into 8 bit binary. Show your working.

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

(c) Convert the hexadecimal number 2F into denary. Show your working.

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

(d) Convert the binary number 10110000 into hexadecimal.

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

(e) Identify how many unique values can be represented by 4 bits.

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

(f) Perform a binary shift of 3 places right on the binary number 10001110.

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

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6 A student is creating a range of documents for a school project.

(a) The student records a podcast about computer science.

(i) Describe how an analogue sound wave is converted into digital form.

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..... **[3]**

(ii) Tick (✓) **one or more** boxes on each row to identify the effect(s) that each change will have on the sound file.

Change	File size increases	File size decreases	Accuracy increases	Accuracy decreases
Duration changes from 10 minutes to 20 minutes				
Sample rate changes from 44 kilohertz to 8 kilohertz				
Bit depth changes from 8 bits to 16 bits				

[3]

(b) The student writes a report about volcanoes.

(i) The computer stores text using the ASCII character set.

Part of the ASCII character set is shown:

Character	ASCII denary code
M	77
N	78
O	79
P	80
Q	81

Identify the character that will be represented by the ASCII denary code 84.

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

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(ii) Identify a second character set.

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

(c) The student takes a photograph of their science experiment. The image file includes metadata.

Identify **three** pieces of metadata that is often stored with an image.

1 .....

2 .....

3 .....

[3]

(d) The student compresses all their documents before emailing them to their teacher.

(i) Give **two** benefits of compressing the data before it is emailed.

1 .....

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2 .....

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[2]

(ii) Explain why lossy compression may **not** be appropriate to compress all of the student's files.

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

3 Binary numbers can represent different forms of data.

(a) One form of data is characters.

Complete the description of how computers represent characters in binary using the given list of terms. Not all terms will be used.

2	4	8	9	16	32	256	
71	72	74	76	78	80	81	
all	different	identical	one	repeated	similar	some	unique

A character set stores ..... of the characters that the computer can represent. Each character is given a ..... binary code. Lower-case and upper-case letters in a character set are given ..... binary codes.

One example of a character set is ASCII. This character set uses ..... bits for each character. If the code value for the character 'F' is 70 then the code value for the character 'L' is ..... .

[5]

(b) Binary numbers can also represent images.

The table shows the colours that are used in an image and the binary value for each colour.

Colour	Binary value
Red	0000
Green	0010
Blue	1000
Purple	0110

The metadata states that the image is 3 pixels wide by 4 pixels high.

The data in the file starts in the top left of the image and goes from left-to-right, top-to-bottom.

(i) State what is meant by **metadata** in an image file.

.....

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

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(ii) The binary data stored for the image is given:

00000000011010000010100001100110011000000010100 0

A grid is given for the image. Each square is one pixel.

Write the name of the colour in each square that the pixel will show for this image.

[2]

(iii) A colour depth of 4 is used. This means 4 bits are used to store the colour for each pixel.

State the maximum number of different colours that can be represented in 4-bits.

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

(iv) The colour depth is increased to 2 bytes.

State **two** effects that this change can have on the image.

1 .....

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2 .....

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[2]

(c) A student has a text document and an image file that need to be compressed separately.

The student needs to reduce the file size of both of these files as much as possible.

(i) Identify the most suitable type of compression for the **text** document. Justify your choice.

Type of compression .....

Justification .....

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.....

[3]

(ii) Identify the most suitable type of compression for the **image** file. Justify your choice.

Type of compression .....

Justification .....

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.....

[3]

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5 A musician uses a computer to make and record music.

(a)

(i) Tick (✓) **one** box to identify the correct description of sound sampling.

- ☐ The frequency of the wave is measured a set number of times each second.
- ☐ The amplitude of the wave is measured at set intervals.
- ☐ The digital sound wave is measured a set number of times each second.
- ☐ The analogue sound wave's resolution is measured at set intervals.

[1]

(ii) Explain how changing the bit depth will affect the sound file.

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

(b) The musician has run out of storage space on their secondary storage device and needs to buy a replacement.

(i) Identify whether the musician should buy a magnetic secondary storage device or a solid state secondary storage device for their computer.

Justify your choice.

Type .....

Justification .....

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[4]

(ii) Identify **one other** type of secondary storage.

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

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(iii) Tick (✓) **one** box to identify the smallest secondary storage capacity.

- [ ] 2.1 GB
- [ ] 300 MB
- [ ] 200 000 KB
- [ ] 0.0021 TB

[1]

(iv) The musician's recordings have an average (mean) file size of 3 MB. The musician has 1000 recordings.

Calculate an estimate of the storage space in GB that the 1000 files will require, assuming they are each 3 MB in size. Show your working out.

Working space:

Answer: ..... GB **[2]**

1 A student is creating a presentation containing images and sound.

(a) One of the files is an audio recording.

Complete the description of how a computer stores sound. Fill in the gaps using the given list of terms. Not all terms will be used.

analogue	colour depth	higher	repeated	smaller
binary	digital	lower	sample rate	unique
bit depth	height	measuring	sampling	
byte	hertz	recording	seconds	

An ..... sound wave needs to be converted into a digital sound wave.

Sound ..... is when the amplitude of the sound wave is measured at set intervals.

The ..... is the number of times a second the sound wave is measured. This is given in Hertz.

Each amplitude is given a ..... binary number. The number of bits allocated to each sample is the ..... .

The ..... the number of bits, the wider the number of amplitudes can be measured.

[6]

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(b) The student creates 10 bitmap images using a computer.

Each image has a colour depth of 8-bits and a resolution of 800 × 500 pixels.

(i) Define the term pixel.

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

(ii) Calculate the total file size of the 10 images in kilobytes.

Show your working out.

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File size: ..... kilobytes

[2]

(iii) State the minimum number of bits that will be needed to represent 240 different colours.

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

(c) The student wants to use a secondary storage device to move their files to their home computer.

Identify whether the student should use an optical or solid-state type of secondary storage device. Justify your choice.

Optical or solid-state .....

Justification .....

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..... **[4]**