1	1	**Mark is for AO1 (knowledge)**	1
		(Using an algorithm) to convert a message into a form that is not understandable (without the key to decrypt it); (Using an algorithm) to convert a message into a form that is only understandable by the intended parties // can only be read with the correct key; (Using an algorithm) to convert a message into cipher text; **N.E.** Scrambling unless further explanation is provided **N.E.** Coding **A.** "Unreadable" for "understandable" **A.** "Data" for "a message" **R.** Responses that do not make clear that encryption is a process **Max 1**	
1	2	**Marks are for AO1 (understanding)**	2
		Vernam cipher (if implemented correctly) is unbreakable / harder to crack / Caesar cipher can be easily cracked; Frequency / statistical analysis of ciphertext reveals nothing about plaintext; More possible keys; Vernam cipher does not always translate a ciphertext character to the same plaintext character (removing repeated patterns); **A.** Points made in reverse, ie as disadvantages of the Caesar cipher **Max 2**	

1	3	**Marks are for AO2 (apply)**	3
		1 mark for identifying 1001000 1001111 1000111 as the binary representation of 'HOG'	
		1 mark for final result being 21 bits long;	
		R. if result is the same as HOG (1001000 1001111 1000111) or SON (1010011 1001111 1001110)	
		1 mark for correct application of XOR; 　　　　0011011 0000000 0001001	
		A. follow through mistakes	

2	1	**Mark is for AO2 (analyse)** Subtract 48 / 00110000 from the character code / bit pattern; AND the character code / bit pattern with the bit pattern 00001111; XOR the character code / bit pattern with the bit pattern 00110000; **Max 1**	1
2	2	**Marks are for AO1 (understanding)** Introduced to support a larger range of characters; Due to increased international communication // use of files in multiple countries; **A.** sensible alternatives to international communication: eg facilitate interchange of documents between countries. eg culturally unacceptable to only allow non-English speaking countries to communicate in English **NE.** use in other countries or examples of this. Each character code is always interpreted as the same character; **Max 2**	2

| 3 | 1 | **Marks are for AO1 (understanding)**

Parity bits can only detect errors not correct them // Majority voting can correct (most) errors that occur during transmission;
Majority voting can detect multiple (bit) errors;
Majority voting is more efficient at detecting errors;
Majority voting can (sometimes) detect an even number of errors;
Max 1 | 1 |

Qu		Marks	
4	1	**Mark is for AO2 (analyse)** C;	1
5	1	**2 marks are for AO1 (knowledge)** Consists of a digit calculated (using an algorithm); from the other digits/letters (in the input sequence); **A.** Answer by example.	2

| 6 | 1 | **2 marks are for AO1 (understanding)**

If the number of 1s received/in the byte is even, the data is (assumed to have been) received correctly // has not been corrupted; **A**. the data is correct

If the number of 1s received/in the byte is odd, the data has been corrupted / is incorrect;

A. odd/even part of second point by implication eg if student has written "is even" for the first point and then "otherwise" for the second. | 2 |

Qu	Pt	Marking Guidance	Marks
7	1	**Mark is for AO1 (knowledge)** A (unique) <u>number</u> used to represent a character; **R.** code	1

Qu	Pt	Marking Guidance	Marks
7	2	**Marks are for AO1 (understanding)** Introduced to support a larger range of characters; Due to increased international communication // use of files in multiple countries // requirement to use additional symbols (allow examples, eg mathematical / scientific / engineering / emoji symbols) // facilitates interchange of documents between countries // culturally unacceptable to only allow non-English speaking countries to communicate in English// (concurrent) support for <u>multiple</u> languages; **A.** representation of characters in languages other than English (using codes that are globally unique). **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
7	3	**Marks are for AO1 (understanding)** The number of 1s is summed / counted; if the total is even, the parity bit is set to 0, otherwise it is set to 1 // if the total is odd, the parity bit is set to 1, otherwise it is set to 0 // the parity bit is set to ensure the total number of 1s is even; The bits are XOR'd with each other; and the result is the parity bit; **MAX 2**	2

Qu	Pt	Marking Guidance	Marks
7	4	**Mark is for AO2 (application)** `0;`	1

Qu	Pt	Marking Guidance	Marks
7	5	**Marks are for AO2 (application)** Showing that 'EGG' is represented by 1000101 1000111 1000111; Providing a 21-bit answer that is not 'DAB' or 'EGG'; Correct answer (reached by applying XOR): 0000001 0000110 0000101; **A.** Correct result of XORing 1000100 1000001 1000010 with an incorrect representation of 'EGG'.	3