

12.2_H

Original text

The idea of developing quantum computers is not a new one, but practical developments are relatively recent. It was first suggested by Richard Feynman in 1981, but the science which underpins the idea goes back much further. The term 'quantum mechanics' was first used in 1924. Subsequently, a textbook outlining the theories (*The Principles of Quantum Mechanics* [3]) was published in 1930; it is still in use. The idea of 'superposition' values was described by Schrodinger in 1935 and 'quantum entanglement' was described by Einstein in 1947. However, there was a considerable wait before a functioning quantum computer was produced. The first commercially available quantum computer was offered by D-Wave Systems in 2011. By 2019, Google was able to report that its 53-qubit Sycamore processor had outperformed a traditional supercomputer, taking 3.3 minutes to complete a task that would take a conventional supercomputer at least 2.5 days. In 2021, a Chinese 66-qubit computer was able to complete the task 1 million times faster. IBM announced plans to create a 1,000-qubit processor in 2023, which would result in even higher speeds.

Quantum computers which could be used for general purposes would represent a major step forward for computing. Although this is likely to take some time, the development of working computers shows rapid progress is being made. General purpose quantum computers could have many uses. In the same way machine learning has been able to advance drug discovery and materials development, general purpose quantum computers could have a similar impact. They could also carry out calculations in mathematics and physics which could greatly expand human understanding of our world. It is also likely they could decode almost all existing cryptography, making it possible to read all types of secret communications. Twenty years ago, it was difficult to imagine that computers would have the capabilities they now have. It is even more difficult to predict the future capabilities of quantum computing and the changes that this could make possible.

Student text

Quantum computing is not a new idea. As Franco P & Chavez M [1] explain that the science which underpins quantum computing goes back a long time. For example, the first time the words quantum mechanics was used was in the 1920s and a textbook outlining these theories, which is still in use, was published in 1930. General purpose 'quantum computers' could be extremely powerful. According to Franco and Chavez, they say that general purpose quantum computers could break almost all existing cryptography. This means that it would be possible to read any messages sent by computer. However, Franco and Chavez ([2] p. 135) suggest that 'we are still a long way from a quantum computer which is general purpose' although there is considerable progress.

12.2_H Model answers

Original text	Student text	Corrected student text	Comments
The idea of developing quantum computers is not a new one, but practical developments are relatively recent. It was first suggested by Richard Feynman in 1981, but the science which underpins the idea goes back much further.	Quantum computing is not a new idea. As Franco P & Chavez M [1] explain that the science which underpins quantum computing goes back a long time.	Quantum computing is not a new idea. As Franco & Chavez [1] explain, 'the science which underpins the idea goes back much further'. (pp. 135–138)	Because as has been used, that has been removed. It would be equally appropriate to use that and remove as. Most of the sentence from 'the science ...' onward has been copied directly from the text. This is plagiarism. To avoid it, the easiest way is to use the original as a quotation and change <i>a long time</i> to the <i>much further</i> in the original. A page number needs to be added because a quotation is used.
The term 'quantum mechanics' was first used in 1924. Subsequently, a textbook outlining the theories (The Principles of Quantum Mechanics [1]) was published in 1930; it is still in use.	For example, the first time the words quantum mechanics was used was in the 1920s and a textbook outlining these theories, which is still in use, was published in 1930.	For example, the phrase 'quantum mechanics' originated in the mid-1920s. By 1930, key theories of quantum mechanics had been published in a textbook.	This is quite a reasonable attempt. The student has made a number of changes. They have replaced 1924 with <i>in the 1920s</i> , <i>term</i> with <i>words</i> and <i>first used</i> with <i>first time</i> and <i>used</i> . However, most of the second part of the sentence is copied directly from the source, so a paraphrase is needed.

Quantum computers which could be used for general purposes would represent a major step forward for computing ... they could decode almost all existing cryptography, making it possible to read all types of secret communications.	General purpose 'quantum computers' could be extremely powerful. According to Franco and Chavez, they say that general purpose quantum computers could break almost all existing cryptography. This means that it would be possible to read any messages sent by computer.	General purpose 'quantum computers' could be extremely powerful. According to Franco and Chavez [1], these devices could read any secret messages sent by computer.	The student has rephrased <i>which could be used for general purposes</i> as <i>general purpose</i> , which is good. They have also replaced <i>major step forward for computing</i> with <i>extremely powerful</i> , which seems to have a similar meaning in the paragraph. However, they have used <i>they say</i> , which is not needed, and they have also forgotten to include the source.
Quantum computers which could be used for general purposes would represent a major step forward for computing. Although this is likely to take some time, the development of working computers shows rapid progress is being made.	However, Franco and Chavez ([1] pp. 135-138) suggest that 'we are still a long way from a quantum computer which is general purpose' although there is considerable progress.	However, Franco and Chavez ([1] pp. 135-138) suggest that a general-purpose quantum computer is some way off, although there is considerable progress. or However, Franco and Chavez ([1] pp. 135-138) suggest that a general-purpose quantum computer is 'likely to take some time' although there is considerable progress.	The student has used the correct format for a quotation. However, the text in quotation marks does not appear in the source text. The student should create a paraphrase of the original text. Alternatively, they could include part of the original as a quotation.